Supplementary information

A global benchmark of urban heat adaptation

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This Supplementary Information file contains a glossary of key terms, score reconciliation results, an analysis of score differences, supplementary tables, the complete Heat Adaptation Scoring Rubric, and scoring results and de-identified scoring sheets for each of the 46 city case studies. Supplementary Data 1 contains the final expert evaluator scores, city-level and aggregated group-level score summaries, and post-reconciliation score differences. Supplementary Data 2 provides the plotting data and summary statistics for the bar charts and box-and-whisker plots.

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Supplementary glossary

Assessment question: One of the 18 questions used within the Heat Adaptation Benchmark to evaluate a specific aspect of heat adaptation. Each benchmark criterion contains three assessment questions.

Assessment score: An expert evaluator's rating for an individual assessment question, assigned on a point scale from 0 (none) to 4 (very high) using the Heat Adaptation Scoring Rubric.

Mean assessment score: At the city level, the mean of the two expert evaluators' final assessment scores for an assessment question following score reconciliation, where required. For grouped results, it is the mean of the consolidated city-level assessment scores across the included city case studies.

Benchmark criterion: One of the six dimensions of heat adaptation included in the Heat Adaptation Benchmark. Each benchmark criterion contains three assessment questions.

Benchmark criterion score: The sum of the three mean assessment scores within a benchmark criterion. Benchmark criterion scores are reported on a 0-12 point scale.

City: An urban or metropolitan area. The term is used as shorthand for the geographic area represented by a city case study.

City characteristic: A contextual attribute used to compare city case studies. The three characteristics included metropolitan area population, country-level economic resources, and historical climate.

City characteristic category: A category within one of the three city characteristics used to group city case studies for descriptive comparison.

City case study: The primary unit of evaluation, comprising a specific metropolitan area and the available evidence on its heat adaptation efforts.

City case study evaluation: The complete assessment of one city case study by two expert evaluators, with each evaluator's independent assessment documented in a separate scoring sheet.

Confidence score: An expert evaluator's rating of their confidence in the assessment scores assigned within a benchmark criterion. Confidence scores range from 0 (no confidence) to 4 (very high confidence) and were not used to weight or adjust assessment scores.

Degree of Confidence Scoring Rubric: The rubric used to assign confidence scores based on the quantity and quality of available evidence and the remaining uncertainty in an expert evaluator's judgment.

Evaluation evidence: Information considered by expert evaluators when assessing a city case study. Evaluation evidence could include publicly available documents, stakeholder survey responses, and expert evaluators' firsthand knowledge of the local context.

Evaluation package: The materials provided to an expert evaluator for a city case study, including the Heat Adaptation Benchmark, Heat Adaptation Scoring Rubric, Degree of Confidence Scoring Rubric, and available initial evaluation evidence.

Expert evaluator: A researcher selected to conduct city case study evaluations based on their research training, interdisciplinary experience, knowledge of heat risk, and experience relating to urban systems and environments.

Global region: One of the six geographic regions used in the study: Africa, Asia, Australia and New Zealand, Central and South America, Europe, and North America.

Heat adaptation: Deliberate human efforts intended to reduce observed heat impacts or anticipated heat risks to human health, human activity, infrastructure, or other urban systems.

Heat Adaptation Benchmark: The multi-criteria framework developed to evaluate heat adaptation efforts systematically through structured expert judgment. It contains six benchmark criteria and 18 assessment questions.

Heat Adaptation Scoring Rubric: The detailed rubric that defines the scope, scale, and dimensions of each assessment question and provides question-specific guidance for assigning assessment scores.

Score reconciliation: The structured review of assessment or confidence scores that differed by three or more points between the two expert evaluators assigned to a city case study. Reconciliation allowed evaluators to review evidence and interpretations but did not require consensus.

Scoring sheet: The tool completed by one expert evaluator for one city case study. It documented the evaluation evidence used, the assessment score and rationale for each assessment question, and the confidence score for each benchmark criterion.

Structured expert judgment: A systematic approach to eliciting and synthesizing expert assessments when empirical evidence is limited or uncertain.

Total absolute benchmark criterion score difference: The sum of the absolute differences between the two expert evaluators' six benchmark criterion scores for a city case study, reported on a 0-72 point scale.

Total heat adaptation benchmark score: The sum of all 18 mean assessment scores. Total benchmark scores are reported on a 0-72 point scale and can be calculated for an individual city case study or a group of city case studies.

Score reconciliation results

Of the 46 city case studies, 24 were flagged for score reconciliation because at least one assessment or confidence score comparison differed by three or more points on the 0-4 point scale. Across these 24 city case studies, 64 scoring items were flagged for review. These included 51 assessment score comparisons and 13 confidence score comparisons. A flagged scoring item refers to one assessment question or one benchmark criterion-level confidence score comparison within a city case study.

Following reconciliation, at least one expert evaluator score was updated for 34 of the 64 flagged scoring items. These included 30 assessment score comparisons and four confidence score comparisons. The updates involved 45 individual expert evaluator score changes because both evaluators sometimes revised their scores for the same scoring item. Of the 24 flagged city case studies, 14 had at least one score update and 10 had none.

An updated scoring item indicates that at least one evaluator revised their score. However, it does not necessarily mean that the difference fell below the reconciliation threshold. Following reconciliation, 22 assessment score comparisons and nine confidence score comparisons continued to differ by three or more points.

City-level results

Addis Ababa, Ethiopia

- Assessment score comparisons flagged:
  - 2.2 Is there a range of short- to long-term goals?
  - 4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?
  - 5.1 Are adaptation actions monitored and evaluated?
  - 6.1 Are heat governance structures established?
  - 6.2 Is there technical expertise in place and accessible?
- Confidence score comparison flagged:
  - 6. Heat governance
- Reconciliation outcome:
  - No score updates were made to any of the six flagged scoring items.

Kisumu, Kenya

- Assessment score comparison flagged:
  - 6.2 Is there technical expertise in place and accessible?
    - Before reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.
    - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 0.
- Confidence score comparisons flagged:
  - 4. Adaptation strategy
  - 5. Monitoring and evaluation

    - 6. Heat governance
- Reconciliation outcome:
    - One of the four flagged scoring items was updated.

Lusaka, Zambia

- Confidence score comparison flagged:
    - 5. Monitoring and evaluation
- Reconciliation outcome:
    - No score update was made to the flagged scoring item.

Windhoek, Namibia

- Confidence score comparisons flagged:
    - 4. Adaptation strategy
    - 6. Heat governance
- Reconciliation outcome:
    - No score updates were made to either flagged scoring item.

Ahmedabad, India

- Assessment score comparison flagged:
    - 4.1 Are costs and benefits of heat adaptation options analyzed?
- Reconciliation outcome:
    - No score update was made to the flagged scoring item.

Beijing, China

- Assessment score comparison flagged:
    - 5.2 Is there evidence of reducing heat risk?
- Reconciliation outcome:
    - No score update was made to the flagged scoring item.

Colombo, Sri Lanka

- Confidence score comparison flagged:
    - 5. Monitoring and evaluation
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 2.
- Reconciliation outcome:
    - The flagged confidence score comparison was updated.

Dubai, United Arab Emirates

- Assessment score comparison flagged:
    - 6.2 Is there technical expertise in place and accessible?
- Confidence score comparison flagged:

    - 4. Adaptation strategy
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 1.
- Reconciliation outcome:
    - One of the two flagged scoring items was updated following reconciliation.

Hong Kong, China

- Assessment score comparison flagged:
    - 5.2 Is there evidence of reducing heat risk?
- Reconciliation outcome:
    - No score updates were made following reconciliation.

Jakarta, Indonesia

- Confidence score comparison flagged:
    - 5. Monitoring and evaluation
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 3.
- Reconciliation outcome:
    - The flagged confidence score comparison was updated following reconciliation.

Kuwait City, Kuwait

- Assessment score comparisons flagged:
    - 1.1 Are current heat hazards identified?
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 1.
    - 1.3 Are future heat risks projected?
- Reconciliation outcome:
    - One of the two flagged scoring items was updated following reconciliation.

Melbourne, Australia

- Assessment score comparison flagged:
    - 6.3 Is there dedicated and sustainable heat adaptation funding?
- Reconciliation outcome:
    - No score updates were made following reconciliation.

Sydney, Australia

- Assessment score comparisons flagged:

    - 4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 2.
    - 5.2 Is there evidence of reducing heat risk?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 3.
- Confidence score comparison flagged:
    - 6. Heat governance
- Reconciliation outcome:
    - Two of the three flagged scoring items were updated following reconciliation.

Monterrey, Mexico

- Assessment score comparisons flagged:
    - 1.3 Are future heat risks projected?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
    - 3.3 Are identified actions being implemented?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
    - 4.1 Are costs and benefits of heat adaptation options analyzed?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 1.
    - 4.2 Are synergies and trade-offs between heat adaptation options assessed?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 2.
    - 4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 2.
    - 5.2 Is there evidence of reducing heat risk?

        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 2.
    - 6.1 Are heat governance structures established?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 2.
- Reconciliation outcome:
    - All seven flagged scoring items were updated following reconciliation.

Montevideo, Uruguay

- Assessment score comparisons flagged:
    - 1.2 Are current drivers of heat exposure and vulnerability identified?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
    - 6.1 Are heat governance structures established?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
    - 6.3 Is there dedicated and sustainable heat adaptation funding?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 1.
- Reconciliation outcome:
    - All three flagged scoring items were updated following reconciliation.

Amsterdam, Netherlands

- Assessment score comparisons flagged:
    - 1.1 Are current heat hazards identified?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 4.
    - 4.2 Are synergies and trade-offs between heat adaptation options assessed?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.

        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 1.
    - 5.1 Are adaptation actions monitored and evaluated?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 3.
    - 5.2 Is there evidence of reducing heat risk?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 2.
- Reconciliation outcome:
    - All four flagged scoring items were updated following reconciliation.

Athens, Greece

- Assessment score comparison flagged:
    - 6.1 Are heat governance structures established?
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 1.
- Reconciliation outcome:
    - The flagged scoring item was updated following reconciliation.

Barcelona, Spain

- Assessment score comparisons flagged:
    - 1.3 Are future heat risks projected?
        - Before reconciliation: Expert Evaluator 1 scored 1 and Expert Evaluator 2 scored 4.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 4.
    - 4.1 Are costs and benefits of heat adaptation options analyzed?
        - Before reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 3.
        - After reconciliation: Expert Evaluator 1 scored 0 and Expert Evaluator 2 scored 1.
- Reconciliation outcome:
    - Both flagged scoring items were updated following reconciliation.

Istanbul, Turkey

- Assessment score comparison flagged:
    - 1.3 Are future heat risks projected?

- Confidence score comparison flagged:
    - 4. Adaptation strategy
- Reconciliation outcome:
    - No score updates were made following reconciliation.

Milan, Italy

- Assessment score comparisons flagged:
    - 2.1 Is there a dedicated heat adaptation plan?
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 0.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.
    - 2.2 Is there a range of short- to long-term goals?
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 2.
    - 3.3 Are identified actions being implemented?
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 1.
    - 4.1 Are costs and benefits of heat adaptation options analyzed?
    - 4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?
    - 5.1 Are adaptation actions monitored and evaluated?
    - 5.2 Is there evidence of reducing heat risk?
    - 6.2 Is there technical expertise in place and accessible?
- Confidence score comparison flagged:
    - 4. Adaptation strategy
        - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
        - After reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 3.
- Reconciliation outcome:
    - Four of the nine flagged scoring items were updated following reconciliation.

Baltimore, USA

- Assessment score comparisons flagged:
    - 2.2 Is there a range of short- to long-term goals?
    - 2.3 Are stakeholder and community engagement mechanisms in place?
- Reconciliation outcome:
    - No score updates were made following reconciliation.

Philadelphia, USA

- Assessment score comparisons flagged:
  - 4.1 Are costs and benefits of heat adaptation options analyzed?
    - Before reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.
    - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 2.
  - 4.2 Are synergies and trade-offs between heat adaptation options assessed?
    - Before reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.
    - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
  - 4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?
    - Before reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.
    - After reconciliation: Expert Evaluator 1 scored 2 and Expert Evaluator 2 scored 2.
  - 5.1 Are adaptation actions monitored and evaluated?
    - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 0.
    - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 1.
  - 5.2 Is there evidence of reducing heat risk?
    - Before reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 1.
    - After reconciliation: Expert Evaluator 1 scored 4 and Expert Evaluator 2 scored 2.
- Reconciliation outcome:
  - All five flagged scoring items were updated following reconciliation.

Phoenix, USA

- Assessment score comparisons flagged:
  - 1.3 Are future heat risks projected?
  - 4.2 Are synergies and trade-offs between heat adaptation options assessed?
- Reconciliation outcome:
  - No score updates were made following reconciliation.

Sacramento, USA

- Assessment score comparison flagged:
  - 6.1 Are heat governance structures established?
    - Before reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 0.

        - After reconciliation: Expert Evaluator 1 scored 3 and Expert Evaluator 2 scored 3.
- Reconciliation outcome:
    - The flagged scoring item was updated following reconciliation.

Score differences following reconciliation

To characterize the variation remaining between expert evaluators' scores, we calculated the absolute differences between their assessment and confidence scores for each city case study. Assessment score differences were calculated for each assessment question on the 0-4 point scale. Confidence score differences were calculated for each benchmark criterion on the 0-4 point scale.

We also calculated the absolute difference between the expert evaluators' scores for each benchmark criterion on the 0-12 point scale. For each city case study, we added these six differences to calculate a total absolute benchmark criterion score difference reported on a 0-72 point scale. This metric differs from the absolute difference between the expert evaluators' total heat adaptation benchmark scores because the six criterion-level absolute differences were calculated before being added.

Across the 46 city case studies, the mean absolute differences between expert evaluator scores were relatively similar across the six benchmark criteria, ranging from 1.93 to 2.39 points on the 0-12 point scale. The mean total absolute benchmark criterion score difference was 13.17 points on the 0-72 point scale. The largest total differences occurred for Milan, Italy (34), Amsterdam, Netherlands (26), and Kuwait City, Kuwait (24).

Across 828 paired assessment score comparisons, the mean absolute difference was 0.88 points on the 0-4 point scale. Scores matched exactly in 34.9% of comparisons. In total, 80.1% differed by no more than one point and 97.3% differed by no more than two points. Only 22 comparisons (2.7%) differed by three or more points. No assessment question had a mean absolute difference greater than 1.04 points. The assessment questions with the largest mean absolute differences were the range of short- to long-term goals (1.04), evidence of reducing heat risk (1.04), and the projection of future heat risks (1.02).

Across 276 paired confidence score comparisons, the mean absolute difference was 0.81 points on the 0-4 point scale. Confidence score differences followed a similar pattern to assessment score differences, with exact matches in 37.7% of comparisons. In total, 84.4% differed by no more than one point and 96.7% differed by no more than two points. Nine comparisons (3.3%) differed by three points, and none differed by four points.

Overall, most paired assessment and confidence scores differed by no more than one point. Large differences were uncommon and concentrated in particular city case studies. These results describe the extent of agreement after evaluators had the opportunity to discuss and revise their scores. Paired evaluations also identified items for which the evidence or its interpretation warranted further review.

These absolute difference values represent residual differences following score reconciliation rather than the initial differences between independently completed evaluations. During reconciliation, expert evaluators could review additional evidence and one another's rationales before revising or

retaining their original scores. Because some scores were revised during this process, reconciliation reduced certain initial differences, although it did not require expert evaluators to reach consensus. The remaining differences highlight areas in which reasonable variation in interpretation persisted following review.

Supplementary tables

Supplementary Table 1 | Stakeholder survey

Survey section	Survey question	Response format	Requirement
1. Basic info	**1.1** What is your role or title?	Text	Optional
	1.2 What is your email in case we need to clarify any survey responses?	Text	Optional
	1.3 What city or metropolitan area are you responding about?	Text	Required
	1.4 Are you directly involved in heat adaptation efforts? If not, what is your connection to these efforts?	Single-select (Yes; No) + Text	Required
	1.5 Who is primarily responsible (for example, individuals, departments, or organizations) for heat adaptation efforts in the city?	Text	Required
2. Climate impact, vulnerability, and risk assessment	**2.1** Are *current* heat hazards (for example, extreme heat events, long-term warming) assessed by the city? If yes, how?	Single-select (Yes; No; Not sure) + Text	Required
	2.2 Are the *current* drivers of heat exposure and vulnerability (for example, demographics, land cover, cooling infrastructure) assessed by the city? If yes, how?	Single-select (Yes; No; Not sure) + Text	Required
	2.3 Are *future* heat risks (both hazards and drivers of exposure and vulnerability) or changing heat risks into the future assessed by the city? If yes, how?	Single-select (Yes; No; Not sure) + Text	Required
3. Adaptation plan	**3.1** Is there a dedicated heat adaptation plan developed or followed by the city? If yes, what is it called?	Single-select (Yes; No; Not sure) + Text	Required

	3.2 Are there specific goals for heat adaptation set by the city? If yes, describe them.	Single-select (Yes; No; Not sure) + Text	Required
	3.3 Are stakeholders and community members engaged in developing or implementing heat adaptation efforts in the city? If yes, who are they and how are they involved?	Single-select (Yes; No; Not sure) + Text	Required
4. Adaptation actions	**4.1** What heat adaptation actions are currently being implemented in the city? If possible, include where they are taking place.	Text	Required
	4.2 What are the challenges limiting or preventing the implementation of heat adaptation actions in the city?	Text	Required
5. Adaptation strategy	**5.1** How are heat adaptation actions selected and prioritized by the city?	Text	Required
	5.2 Are heat adaptation strategies and actions implemented in phases or sequences by the city? If yes, how?	Single-select (Yes; No; Not sure) + Text	Required
6. Monitoring and evaluation	**6.1** Are heat adaptation actions monitored (that is, tracked over time) or evaluated (that is, assessed for effectiveness) by the city? If yes, how and by whom?	Single-select (Yes, both monitored and evaluated; Yes, only monitored; Yes, only evaluated; No, neither monitored nor evaluated; Not sure) + Text	Required
	6.2 Is there evidence that heat adaptation actions have reduced heat risks in the city? If yes, describe how and who is affected.	Single-select (Yes; No; Not sure) + Text	Required

	6.3 Are there efforts to prevent or reduce unintended harms (that is, maladaptation) from heat adaptation actions by the city? If yes, describe it.	Single-select (Yes; No; Not sure) + Text	Required
7. Heat governance	**7.1** What are the biggest governance-related challenges to heat adaptation in the city?	Text	Required
8. Final thoughts	**8.1** How would you rate the overall effectiveness of heat adaptation efforts by the city so far?	Dropdown (None; Low; Moderate; High; Very High)	Required
	8.2 What opportunities or challenges do you see for improving future heat adaptation efforts in the city?	Text	Required
	8.3 Any additional insights or challenges you'd like to share?	Text	Optional

Heat Adaptation Scoring Rubric

This rubric provides detailed guidance for evaluating each assessment question. It builds on the Heat Adaptation Benchmark and helps expert evaluators systematically review the evaluation evidence available for each city case study. The accompanying scoring sheet provides a standardized format for each expert evaluator to document the evidence considered, assessment scores and rationales, and confidence scores for an assigned city case study.

For the Heat Adaptation Scoring Rubric, the following definitions apply:

- **Climate adaptation** refers to adjustments made in response to observed or anticipated climate change[1,2]. In human systems, climate adaptation aims to reduce or prevent harm and, where possible, realize benefits[1,2].
- **Hazard** refers to the possible occurrence of a natural or human-induced physical event or trend that could cause harm or loss to people, property, or other valued systems[1,2].
- **Exposure** refers to the presence of people, livelihoods, ecosystems, infrastructure, natural resources, or other valued assets in places that could be adversely affected by a hazard[1,2].
- **Vulnerability** refers to the susceptibility or tendency of people, systems, or assets to experience adverse effects[1,2].
- **Risk** refers to the possibility of uncertain consequences for something of value, recognizing that values can differ across people and contexts[1]. Climate-related risk arises from interactions among hazards and the exposure and vulnerability of affected human or ecological systems[1].
- **Heat adaptation** refers to deliberate human efforts intended to reduce observed heat impacts or anticipated heat risks to human health, human activity, infrastructure, or other urban systems.
- **Adaptation plan** refers to a formal document, policy, or framework that outlines overarching goals, priorities, and commitments for climate adaptation.
- **Adaptation strategy** refers to the specific approaches and decision-making processes for achieving the goals set in an adaptation plan, bridging high-level planning and implementation.
- **Adaptation action** refers to a specific initiative or measure, either proposed or implemented, aimed at achieving elements of an adaptation plan or strategy.
- **Drivers of heat exposure** refer to factors within human or natural systems that increase the likelihood that people, infrastructure, or ecosystems are directly exposed to heat, such as land cover, urban design, vegetation, or the prevalence of outdoor labor.
- **Drivers of heat vulnerability** refer to factors within human or natural systems that increase the likelihood of harm to people, infrastructure, or ecosystems from heat, such as age, health conditions, socioeconomic status, ecosystem sensitivity, or infrastructure fragility.
- **Maladaptation** refers to a heat adaptation action or strategy that leads to unintended consequences, causes greater harm than good, or introduces new risks.

- **Heat governance** refers to the governmental structures, roles, and processes through which heat adaptation is coordinated and managed.

Each assessment question includes specific parameters and a scoring breakdown to support consistency. **Scope** identifies what is being assessed, such as types of climate risks or timeframes. **Scale** identifies where the assessment is being applied, such as the geographic or administrative level. **Dimensions** identify what factors are considered, such as relevant social, economic, environmental, or governance factors.

The general scoring instructions are as follows:

1. **Assess the city.** Assess the city (metropolitan area) represented by the city case study.
2. **Include only explicit heat adaptation efforts.** Include efforts that explicitly connect to reducing heat impacts or heat risk, rather than efforts that may provide indirect heat benefits through broader objectives.
3. **Focus on local heat adaptation.** Focus the assessment on local efforts and include higher-scale actions only when they directly inform or support heat adaptation within the city.
4. **Review all available evidence.** Review publicly available documents, stakeholder survey responses when available, and firsthand knowledge of the local context.
5. **Complete evaluations independently.** Complete one scoring sheet independently for each assigned city case study before score reconciliation.
6. **Record assessment and confidence scores.** Record one assessment score for each assessment question and one confidence score for each benchmark criterion.
7. **Use whole-number scores.** Use only 0, 1, 2, 3, or 4 for assessment and confidence scores. When evidence falls between two levels, select the score that best represents the overall evidence.
8. **Document scoring rationales.** Document how the evidence supports each assessment score and note any inconsistencies, alternative interpretations, or evidence limitations.
9. **Keep confidence scores separate.** Keep confidence scores separate from assessment scores by applying the Degree of Confidence Scoring Rubric and not using confidence scores to weight or adjust assessment scores.

1. Climate impact, vulnerability, and risk assessment

1.1 Are current heat hazards identified?

1.1 Parameters	Description
Scope	Identification of current heat hazards, including both chronic heat stress (for example, long-term rising temperatures or progressively warmer summers) and acute heat shocks (for example, short-term extreme heat events, or heatwaves), and their direct impacts across aspects of human health, human activity, infrastructure, and more
Scale	Focus on the assessment at the local scale, with an emphasis on neighborhood-level understanding
Dimensions	Depth of information on current heat hazards, including complex risk perspectives (for example, cross-hazard interactions, compounding hazards, or cascading impacts) and data integration (for example, types and sources of data, data resolution, or use of analytical tools)[3]
Assessment question scoring rubric	
1.1 Assessment score	**Scoring criteria**
0	Heat hazards are not identified or explicitly dismissed
1	Heat hazard(s) are identified and address either or both chronic heat stress and acute heat shocks, but they lack local context or consideration of multiple dimensions
2	Heat hazards are identified, addressing either chronic heat stress or acute heat shocks in detail, or both with limited depth, but lacking local context, complex risk perspectives, or data integration
3	Heat hazards are identified, addressing both chronic heat stress and acute heat shocks at a local scale, with some depth in complex risk perspectives and data integration
4	Heat hazards are comprehensively identified, addressing both chronic heat stress and acute heat shocks at the neighborhood level, with detailed complex risk perspectives and advanced data integration

1.2 Are current drivers of heat exposure and vulnerability identified?

1.2 Parameters	Description
Scope	Identification of current drivers within human or natural systems that increase heat exposure or vulnerability of people, infrastructure, or ecosystems (for example, land cover, vegetation, urban density, proximity to water bodies, age, health, socioeconomic status, ecosystem sensitivity, or infrastructure fragility)
Scale	Focus on the assessment at the local scale, with an emphasis on neighborhood-level understanding
Dimensions	Depth of information on current drivers of heat exposure and vulnerability, including underlying risk factors and root causes of vulnerability, and data integration (for example, types and sources of data, data resolution, or use of analytical tools)[3]

Assessment question scoring rubric	
1.2 Assessment score	**Scoring criteria**
0	Drivers of exposure and vulnerability are not identified or explicitly dismissed
1	Drivers of exposure and vulnerability are identified, but relate to only one affected area (people, infrastructure, or ecosystems) and lack local context or consideration of multiple dimensions
2	Drivers of exposure and vulnerability are identified, addressing either one affected area (people, infrastructure, or ecosystems) in detail or multiple affected areas with limited depth, but lacking local context, analysis of underlying risk factors, or data sources
3	Drivers of exposure and vulnerability are identified, addressing people, infrastructure, and ecosystems with local relevance and some consideration of underlying risk factors and data integration
4	Drivers of exposure and vulnerability are comprehensively identified, addressing people, infrastructure, and/or ecosystems at the neighborhood level, with detailed analysis of risk drivers and inclusion of multiple and reliable data sources

1.3 Are future heat risks projected?

1.3 Parameters	Description
Scope	Projection of future heat risks (for example, climate models or projections), including hazards (chronic heat stress and acute heat shocks), exposure, and vulnerability trends
Scale	Focus on relevant and useful local-scale information
Dimensions	Depth and variety of projections of future heat risks, including multiple climate, environmental, and socioeconomic scenarios, their interconnections (how heat risks relate to or affect one another), and data integration (for example, types and sources of data, data resolution, or use of analytical tools)
Assessment question scoring rubric	
1.3 Assessment score	**Scoring criteria**
0	Heat risks are not projected or explicitly dismissed
1	Heat risk(s) are projected but do not address future hazards, exposure, and vulnerability trends in detail, lack relevance to the local context, or fail to consider multiple dimensions
2	Heat risks are projected, addressing some or all future hazards, exposure, and vulnerability trends in detail, but lacking relevance to local context or consideration of scenarios, interconnections, and data integration
3	Heat risks are projected, addressing most or all future hazards, exposure, and vulnerability trends in detail at a relevant local scale, with some depth and variety in scenarios, interconnections, and data integration
4	Heat risks are comprehensively projected, addressing most or all future hazards, exposure, and vulnerability trends in detail at a relevant local scale, with a variety of detailed scenarios, interconnections, and advanced data integration

2. Adaptation plan

2.1 Is there a dedicated heat adaptation plan?

2.1 Parameters	**Description**
Scope	Development of a dedicated and formal document, policy, or framework for heat adaptation
Scale	Focus on local-scale policies
Dimensions	Implementation of the plan and depth of information, including the presence of concrete goals, priorities, commitments, formal adoption, or dedicated roles and budget
Assessment question scoring rubric	
2.1 Assessment score	**Scoring criteria**
0	No heat adaptation plan exists or it is explicitly dismissed
1	Plan that references heat is mentioned, but it is vague, preliminary, not dedicated to heat adaptation, and lacks local context or evidence of implementation
2	Dedicated heat adaptation plan exists with some relevant details, but lacks local context or does not include clear goals, priorities, commitments, formal adoption, or dedicated roles and budget
3	Dedicated heat adaptation plan exists with sufficient detail and relevance to the local context, and includes some concrete goals, priorities, commitments, or evidence of formal adoption or implementation mechanisms
4	A comprehensive, locally relevant heat adaptation plan exists, with clearly defined goals, priorities, and commitments, formal adoption, and evidence of implementation support through dedicated roles and/or budget

2.2 Is there a range of short- to long-term goals?

2.2 Parameters	**Description**
Scope	Development of heat adaptation-related goals across short-term (<5 years), medium-term (5-10 years), and long-term (>10 years) timeframes
Scale	Focus on local-scale goals
Dimensions	Measurability and depth of goals, including their connection to heat-related assessments, interplay between different goals, and strategies for achieving these goals
Assessment question scoring rubric	
2.2 Assessment score	**Scoring criteria**
0	No goals exist or goals are explicitly dismissed
1	Goal(s) exist but lack detail and are not present across the full range of short- to long-term timeframes, lack local context, or fail to consider multiple dimensions
2	Detailed goals exist but are only partially present across short- to long-term timeframes, and lack local context or consideration of measurability, assessments, interconnections, and strategies

3	Detailed goals exist across short- to long-term timeframes, with local context and some consideration of measurability, assessments, interconnections, and strategies for achieving the goals
4	Comprehensive goals exist across short- to long-term timeframes, with local context, and include detailed consideration of measurability, assessments, interconnections, and strategies for achieving the goals

2.3 Are stakeholder and community engagement mechanisms in place?

2.3 Parameters	**Description**
Scope	Development of communication and engagement mechanisms (for example, town halls, community workshops, or departmental meetings) for stakeholders and community members in heat adaptation efforts
Scale	Focus on local-scale engagement with stakeholders, leaders, constituents, and community members
Dimensions	Depth of participation, emphasizing participatory and empowering approaches (for example, consultation, collaboration, or co-production with diverse community groups) in heat adaptation planning[3,4]
Assessment question scoring rubric	
2.3 Assessment score	**Scoring criteria**
0	Engagement mechanisms are not in place or explicitly dismissed
1	Engagement mechanisms are mentioned, but are vague and limited in their relevance to local context and depth of participation
2	Engagement mechanisms are in place but are limited in their relevance to the local context or reflect a low depth of participation (for example, one-time or one-way communication)
3	Engagement mechanisms are in place and relevant to the local context, and reflect a moderate depth of participation (for example, multiple consultations or involvement in shaping plans)
4	Engagement mechanisms are comprehensive, in place at a relevant local scale, and reflect a high depth of participation (for example, iterative collaboration, co-production, or meaningful influence in decision-making)

3. Adaptation actions

3.1 Are actions addressing heat hazards identified?

3.1 Parameters	Description
Scope	Identification of multiple actions (for example, engineered solutions, behavioral interventions, or nature-based solutions) addressing chronic heat stress (for example, long-term rising temperatures or progressively warmer summers) and acute heat shocks (for example, short-term extreme heat events, or heatwaves), along with their direct impacts
Scale	Focus on actions that can be implemented at the local scale
Dimensions	Variety and depth of identified actions, addressing both current hazards and future changes
Assessment question scoring rubric	
3.1 Assessment score	**Scoring criteria**
0	No actions are identified, or actions are explicitly dismissed
1	Action(s) are identified that address either or both chronic heat stress and acute heat shocks, but lack relevance to the local context or consideration of multiple dimensions
2	Multiple actions are identified that address either or both chronic heat stress and acute heat shocks and are relevant to the local context, but show little to no consideration of future changes
3	Multiple actions are identified that address a mixture of chronic heat stress and acute heat shocks, are relevant to the local context, and demonstrate some consideration of future changes
4	Multiple actions are comprehensively identified, addressing a mixture of chronic heat stress and acute heat shocks, with local context, and strong consideration of future changes

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

3.2 Parameters	Description
Scope	Identification of multiple actions (for example, engineered solutions, behavioral interventions, or nature-based solutions) addressing drivers within human or natural systems that increase heat exposure or vulnerability of people, infrastructure, or ecosystems (for example, land cover, vegetation, urban density, proximity to water bodies, age, health, socioeconomic status, ecosystem sensitivity, or infrastructure fragility)
Scale	Focus on actions that can be implemented at the local scale
Dimensions	Variety and depth of identified actions, addressing current drivers, root causes, and future changes in exposure and vulnerability
Assessment question scoring rubric	
3.2 Assessment score	**Scoring criteria**
0	No actions are identified, or actions are explicitly dismissed

1	Action(s) are identified that address drivers for only one affected area (people, infrastructure, or ecosystems), and lack local context or fail to consider multiple dimensions
2	Multiple actions are identified that address drivers for either one affected area (people, infrastructure, or ecosystems) in detail or multiple areas with limited depth, but lack local context and consideration of root causes or future changes
3	Multiple actions are identified that address drivers of exposure and vulnerability for people, infrastructure, and/or ecosystems in a local context, while partially addressing root causes and future changes
4	Multiple actions are comprehensively identified, addressing drivers of exposure and vulnerability for people, infrastructure, and/or ecosystems in a local context, with detailed consideration of root causes and future changes

3.3 Are identified actions being implemented?

3.3 Parameters	**Description**
Scope	Implementation of multiple actions (for example, engineered solutions, behavioral interventions, or nature-based solutions) addressing the range of heat risks, including heat hazards (chronic heat stress and acute heat shocks) and drivers of heat exposure and vulnerability
Scale	Focus on the implementation of actions at the local scale, with an emphasis on neighborhood-level actions
Dimensions	Variety and depth of implemented actions, including an understanding of potential maladaptation risks (possible harms) and evidence of implementation
Assessment question scoring rubric	
3.3 Assessment score	**Scoring criteria**
0	No actions are implemented, or implementation is explicitly dismissed
1	Action(s) are reported as implemented, but there is little to no evidence to verify implementation
2	Action(s) are implemented with some evidence verifying implementation, but they do not fully address the range of heat risks, lack relevance to the local context, and do not consider potential maladaptation risks
3	Multiple actions are implemented with verified evidence, addressing a range of heat risks in a locally relevant context, but maladaptation risks are not considered
4	Multiple actions are implemented with strong evidence of implementation, comprehensively addressing a range of heat risks in a local context, and fully considering potential maladaptation risks

4. Adaptation strategy

4.1 Are costs and benefits of heat adaptation options analyzed?

4.1 Parameters	Description
Scope	Development of multiple heat adaptation options (for example, strategies or actions) and their associated costs and benefits, including both economic and non-economic aspects (for example, health or quality of life)
Scale	Focus on adaptation options, costs, and benefits relevant at the local scale, with potential insights from broader-scale studies
Dimensions	Depth and variety of cost-benefit analysis, including both economic and non-economic factors, with consideration of potential maladaptation risks (possible harms)
Assessment question scoring rubric	
4.1 Assessment score	**Scoring criteria**
0	Costs and benefits for heat adaptation options are not analyzed or explicitly dismissed
1	Costs and benefits are noted only in economic terms for one or more heat adaptation options, but lack detail, relevance to the local context, or consideration of multiple dimensions
2	Costs and benefits for multiple heat adaptation options are analyzed but are limited in relevance to the local context or lack depth and variety in analysis
3	Costs and benefits for multiple heat adaptation options are analyzed in detail, relevant to the local context, and include some economic and non-economic factors and maladaptation risks
4	Costs and benefits for multiple heat adaptation options are comprehensively analyzed, relevant at a local scale, with a variety of detailed analyses of both economic and non-economic factors and maladaptation risks

4.2 Are synergies and trade-offs between heat adaptation options assessed?

4.2 Parameters	Description
Scope	Assessment of multiple heat adaptation options (for example, strategies or actions) and their synergies (beneficial interactions) and trade-offs (conflicting interactions) across different timeframes
Scale	Focus on heat adaptation options and their interactions at the local scale, with potential insights from broader-scale studies
Dimensions	Depth of assessment, including science-based evaluations and consideration of synergies and trade-offs across short-term (<5 years), medium-term (5-10 years), and long-term (>10 years) timeframes
Assessment question scoring rubric	
4.2 Assessment score	**Scoring criteria**
0	Synergies and trade-offs are not assessed or explicitly dismissed

1	Synergies and trade-offs between heat adaptation options are noted but lack detail, relevance to the local context, or consideration of multiple dimensions
2	Synergies and trade-offs between heat adaptation options are assessed but are limited in relevance to the local context or lack depth in assessment
3	Synergies and trade-offs between heat adaptation options are analyzed in detail, relevant to the local context, and include science-based assessment across different timeframes
4	Synergies and trade-offs for heat adaptation options are comprehensively analyzed, relevant at a local scale, with detailed science-based assessments across different timeframes

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

4.3 Parameters	**Description**
Scope	Development of heat adaptation options (for example, strategies or actions) within a flexible, iterative, and sequenced pathway-based planning approach across different timeframes
Scale	Focus on planning at the local scale, with potential insights from broader-scale studies
Dimensions	Depth of planning, including how heat adaptation options are integrated into a structured local adaptation pathway that considers their costs, benefits, synergies, and trade-offs, and spans short-term (<5 years), medium-term (5-10 years), and long-term (>10 years) timeframes or includes regular review and updates
Assessment question scoring rubric	
4.3 Assessment score	**Scoring criteria**
0	Heat adaptation options are not integrated into a pathway-based approach or are explicitly dismissed
1	Heat adaptation options are integrated but not organized within a pathway-based approach, lack relevance to the local context, or do not account for multiple dimensions
2	Heat adaptation options are organized within a pathway-based approach but have limited relevance to the local context or lack depth in planning
3	Heat adaptation options are structured within a flexible, iterative, and sequenced pathway-based approach relevant to the local context, with an emerging ‘local adaptation pathway’ that spans multiple timeframes or includes mechanisms for regular review and updates
4	Heat adaptation options are comprehensively planned through a flexible, iterative, and sequenced pathway-based approach that is highly relevant to the local context, with a well-defined “local adaptation pathway” integrating multiple factors across different timeframes and supported by regular review and update mechanisms

5. Monitoring and evaluation

5.1 Are adaptation actions monitored and evaluated?

5.1 Parameters	Description
Scope	Establishment of regular monitoring and evaluation processes for adaptation actions (for example, engineered solutions, behavioral interventions, or nature-based solutions)
Scale	Focus on local-scale monitoring and evaluation, with potential insights from broader-scale studies
Dimensions	Depth of monitoring and evaluation, including measurability, target setting, and course correction mechanisms
Assessment question scoring rubric	
5.1 Assessment score	**Scoring criteria**
0	No monitoring and evaluation processes are identified, or actions are explicitly dismissed
1	Monitoring and evaluation processes are identified but are preliminary or limited in scope, lack local context, or fail to consider multiple dimensions
2	Monitoring and evaluation processes are identified and partially implemented but lack local context, or fail to consider measurability, target setting, and course correction mechanisms
3	Monitoring and evaluation processes are fully implemented in a local context, while partially addressing measurability, target setting, and course correction mechanisms
4	Monitoring and evaluation processes are comprehensively implemented in a local context, fully addressing measurability, target setting, and course correction mechanisms

5.2 Is there evidence of reducing heat risk?

5.2 Parameters	Description
Scope	Establishment of evidence (for example, scientific literature, grey literature, measurements, or local community insights) demonstrating how adaptation plans, strategies, and actions contribute to reducing observed heat impacts and anticipated heat risks
Scale	Focus on local-scale evidence, with potential insights from broader-scale studies
Dimensions	Depth of evidence, including effectiveness (relationship between response and risk reduction), measurability, sustainability (risk reduction is sustained over the long term) and consensus (level of agreement among different sources)
Assessment question scoring rubric	
5.2 Assessment score	**Scoring criteria**
0	No evidence is identified, or it is explicitly dismissed
1	Evidence exists but is limited, lacks local relevance, or does not address multiple dimensions

2	Evidence is partially established but lacks local relevance or does not sufficiently consider effectiveness, measurability, sustainability, and consensus
3	Evidence is well-established in a local context and partially addresses effectiveness, measurability, sustainability, and consensus
4	Evidence is comprehensively established in a local context, fully addressing effectiveness, measurability, sustainability, and consensus

5.3 Is there evidence of reducing maladaptation risk?

5.3 Parameters	**Description**
Scope	Establishment of evidence (for example, scientific literature, grey literature, measurements, or local community insights) demonstrating that adaptation plans, strategies, and actions do not contribute to increasing heat risks or other climate risks (for example, flooding or drought)
Scale	Focus on local-scale evidence, with potential insights from broader-scale studies
Dimensions	Depth of evidence, including target setting (to reduce maladaptation risk), effectiveness (relationship between response and risk reduction), and consensus (level of agreement among different sources)
Assessment question scoring rubric	
5.3 Assessment score	**Scoring criteria**
0	No evidence is identified, or it is explicitly dismissed
1	Evidence exists but is limited, lacks local relevance, or does not address multiple dimensions
2	Evidence is partially established but lacks local relevance or does not sufficiently consider target setting, effectiveness, and consensus
3	Evidence is well-established in a local context and partially addresses target setting, effectiveness, and consensus
4	Evidence is comprehensively established in a local context, fully addressing target setting, effectiveness, and consensus

6. Heat governance

6.1 Are heat governance structures established?

6.1 Parameters	Description
Scope	Establishment of heat governance structures through dedicated roles (for example, Chief Heat Officer, Chief Resilience Officer, or Chief Climate Officer), dedicated bodies (for example, Office of Heat Response and Mitigation or Climate Resilience Department), or an integrated role or body (for example, a climate office that explicitly coordinates heat adaptation alongside other climate-related priorities)
Scale	Focus on local-scale heat governance structures, with potential insights from broader-scale governance arrangements
Dimensions	Depth of the governance mechanism, including institutionalization (whether governance roles are formally established by law, appointment, or embedded in existing structures), authority (the level of decision-making power and autonomy), and connectivity (the degree of integration with other governance structures)
Assessment question scoring rubric	
6.1 Assessment score	**Scoring criteria**
0	No heat governance structures are identified or are explicitly dismissed
1	Heat governance structures are identified but not yet established, in early development, lack local relevance, or fail to address multiple dimensions
2	Heat governance structures are partially implemented but lack local relevance or do not sufficiently address institutionalization, authority, or connectivity
3	Heat governance structures are fully implemented in a local context, with partial consideration of institutionalization, authority, and connectivity
4	Heat governance structures are comprehensively implemented in a local context, fully addressing institutionalization, authority, and connectivity

6.2 Is there technical expertise in place and accessible?

6.2 Parameters	Description
Scope	Establishment and accessibility of technical expertise (for example, climate science, public health, urban planning, or emergency management) necessary for heat adaptation within the city administration, which may be supported through various human or institutional arrangements (for example, advisory bodies, expert networks, or dedicated technical teams)
Scale	Focus on the availability and accessibility of locally relevant technical expertise, with potential insights from broader-scale networks and institutions
Dimensions	Variety and depth of expertise, including availability, accessibility, capacity-building (for example, knowledge sharing and training), and integration of technical expertise into decision-making

Assessment question scoring rubric	
6.2 Assessment score	**Scoring criteria**
0	No technical expertise is in place or is explicitly dismissed
1	Technical expertise is identified but not yet established, lacks local relevance, or does not address multiple dimensions
2	Technical expertise is partially in place but lacks local relevance or does not sufficiently address availability, accessibility, capacity-building, and integration
3	Technical expertise is fully implemented in a local context, with partial consideration of availability, accessibility, capacity-building, and integration
4	Technical expertise is comprehensively implemented in a local context, fully addressing availability, accessibility, capacity-building, and integration

6.3 Is there dedicated and sustainable heat adaptation funding?

6.3 Parameters	**Description**
Scope	Establishment and availability of sustainable funding for heat adaptation, either through dedicated mechanisms (for example, grants, budget allocations, funded roles, or dedicated agencies and programs) or through integration within broader climate- or risk-related funding streams
Scale	Focus on funding at the local level, with potential insights from broader-scale financial mechanisms (for example, regional, national, or international funding opportunities)
Dimensions	Depth of funding, including quantity (level of funding) and long-term sustainability (continuity and security of funding over 10 years)
Assessment question scoring rubric	
6.3 Assessment score	**Scoring criteria**
0	No funding is in place, or funding is explicitly dismissed
1	Funding is identified but not yet established, lacks local relevance, or does not address multiple dimensions
2	Dedicated funding is partially established but is short-term, lacks local relevance, or does not sufficiently address the required quantity and long-term sustainability
3	Dedicated funding is fully implemented and sustainable in a local context, with partial consideration of both adequate quantity and long-term sustainability
4	Dedicated funding is comprehensively and sustainably implemented in a local context, fully integrated into budgets at appropriate levels and secured for long-term sustainability

City case study scoring sheets

This section presents the two final, de-identified scoring sheets for each of the 46 city case studies. Each scoring sheet records the assessment score and rationale for each assessment question, the confidence score for each benchmark criterion, and the evaluation evidence used. The scoring sheets reflect any updates made during score reconciliation. The city case studies are grouped by global region, with the regions and cities within each region listed alphabetically:

1. Addis Ababa, Ethiopia
2. Cairo, Egypt
3. Cape Town, South Africa
4. Fez, Morocco
5. Freetown, Sierra Leone
6. Kisumu, Kenya
7. Lagos, Nigeria
8. Lusaka, Zambia
9. Windhoek, Namibia
10. Ahmedabad, India
11. Amman, Jordan
12. Bangkok, Thailand
13. Beijing, China
14. Chongqing, China
15. Colombo, Sri Lanka
16. Dhaka, Bangladesh
17. Dubai, UAE
18. Hong Kong, China
19. Jakarta, Indonesia
20. Jodhpur, India
21. Karachi, Pakistan
22. Kolkata, India
23. Kuwait City, Kuwait
24. Tokyo, Japan
25. Auckland, New Zealand
26. Melbourne, Australia
27. Sydney, Australia
28. Buenos Aires, Argentina
29. Medellín, Colombia
30. Mexico City, Mexico
31. Monterrey, Mexico
32. Montevideo, Uruguay
33. Santiago, Chile
34. São Paulo, Brazil
35. Amsterdam, Netherlands

36. Athens, Greece
37. Barcelona, Spain
38. Istanbul, Turkey
39. Milan, Italy
40. Paris, France
41. Baltimore, USA
42. Miami, USA
43. Philadelphia, USA
44. Phoenix, USA
45. Sacramento, USA
46. Toronto, Canada

Addis Ababa, Ethiopia

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Addis Ababa, Ethiopia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The documents specifically identify both chronic heat stress - an increase in mean annual temperatures, as well as acute heat shocks, listing heat waves and extreme hot days and nights, the frequency of which has increased by 20% between 1960 - 2003. These were assessed as being high probability with high consequences. However, there is no clear definition of these acute heat events. The documents also identify the broader impacts of heat on the health of residents, energy demands, productivity, and heat-vulnerable infrastructure. Compounded and cascading impacts are mentioned though the quantification of these impacts is not specific. The documents mention the UHI, high density, and low-levels of urban greening, indicating that residents are experiencing higher temperatures. Using Landsat 8 satellite imagery and data integration, the variations of LST were analysed and local hotspot and cool zones across the city were identified. The number of hotspot areas (>37 degrees) has tripled.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The documents identify rapid urbanisation, population growth, and the UHI effect as a major driver of heat exposure, resulting from changes in land use and land cover e.g the increase in impervious surfaces. Approximately 51% of the city's developed areas were identified as UHI hotspots. This analysis was done at a localized scale

Assessment score:	3
	for sub-districts of Addis. The urban poor are identified as a high-risk group due to poor quality housing and/or poor working conditions. Vulnerability is identified across ecosystems, infrastructure and people and is supported by the completion of a Climate Change Risk Assessment. The documents identify particular sectors as being vulnerable to heat. Vulnerable groups are identified due limited livelihood options, inadequate ability to withstand or absorb disasters, chronic food insecurity, shortage of drinking water, lack of health facilities, socio-economic inequalities etc but these are mentioned in relation to climate risks more generally, not only heat, and are not identified at the local-scale. A specific mention of physiological vulnerability to heat, for the elderly for example, would be a good addition.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future climate risks, including temperature stress, are identified for the short term (2020-2025) and the medium term (2026-2050). The increase in both frequency and intensity of various heat stress events, and their subsequent impact on sectors, at the city-level emerged from a qualitative assessment. Specific projections of max and min temperatures per decade were included under two RCP scenarios and the EPCC provided projections indicating temperatures increases from -0.5° to 6°C 2100 relative to the 1975-2005 baseline period for all the RCPs. Included is a population growth estimate indicating the increase in the number of exposed persons.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	Addis Ababa does not have a stand-alone heat adaptation plan but rather a general climate risk adaptation plan which identifies heat as a priority area. Many of the action items are targeted at heat reduction including urban greening to combat the UHI effect and regulating development of climate-proof infrastructure. There are also goals to strengthen emergency response capacity, according to the document this will mostly protect against flooding but will also alleviate impacts from higher temperatures. While urban greening etc will reduce chronic heat exposure there is little evidence of planning for acute heat exposure such as the provision of cooling centres. Other critical aspects of a heat action planning such as early warning systems, advisories, and surveillance are not detailed in relation to heat.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The Addis Ababa CAP provides detailed, quantitative goals addressing climate risk adaptation across short-term (2025), medium-term (2030), and long-term (2040, 2050) timeframes. These goals are grounded in the local context (the UHI effect) and are clearly measurable e.g., net green coverage percentage. The Ethiopia National Adaptation Plan also provides the national strategic context for the city's plan. It confirms that the Addis Ababa CAP is part of a larger national effort to build climate resilience and supports the city-level plan's legitimacy and integration into a national policy framework. However these goals are not specifically drafted as a heat action plan.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	There is evidence of engagement mechanisms and reflect a moderate depth of participation. The CAP details the importance of inclusion and participatory processes during its development. Stakeholders, including city and community representatives, were involved in prioritising risks in the city. Multiple formal workshops and follow-up activities (surveys, monitoring/reporting plans) were used. However there are no described mechanisms for continued feedback or iteration of the plan. While community representatives were involved in the planning stages the on-going involvement of communities is not detailed.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes a number of actions detailed in the CAP are targeted at reducing heat hazards, both through mitigation (achieving carbon neutrality by 205) and adaptation. These are centred around the reduction of the UHI effect through urban greening initiatives with specific quantifiable plans e.g increasing net green coverage by 10% in the short term (by 2025) and by 20% in the medium term (2030). As well as targeted development of climate resilient buildings and infrastructure.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Majority of the adaptation plans are aimed at improving living standards for residents with alignment to the SDGs. Co-benefits of the plans are categorised into economic, social and environmental, e.g job creation and energy cost saving at the household level. A primary focus of the actions is urban greening and regulated building materials to reduce vulnerability of urban residents.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Much of the documentation only details the frameworks and governance around the plans. There is little evidence of implemented actions specifically identified in the plan. However the document states that the CAP builds on climate initiatives which are underway. There is a table listing the previous activities in Addis, many of which have a similar focus as the plan, particularly urban greening.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	There is indication of an initial effort toward financial analysis and acknowledging co-benefits, but a lack of a formal, detailed cost- benefit analysis for specific heat adaptation options. The Addis Ababa CAP includes a section on “Financing Strategy and Resource Mobilization” and “Wider benefits of Climate Actions”. The Ethiopia National Adaptation Plan provides a high-level, national cost estimate. However, neither plan presents a detailed, monetized breakdown of the costs versus the economic and social benefits for the specific adaptation actions (e.g., the urban greening strategy).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The Addis Ababa (CAP) addresses the links between various actions, indicating an initial assessment of synergies and co- benefits. The plan includes dedicated sections on “Links Between “Mitigation and Adaptation Actions” and “Wider benefits of Climate Actions” e.g, urban greening efforts deliver co-benefits for air quality, health, and social equity. The national adaptation plan specifies the principle of “coherent interventions” across sectors, suggesting an underlying strategy to manage potential trade-offs. While there is more evidence for the assessment of positive synergies, the plans do not formally analyse trade-offs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	The overarching goal of Addis Ababa CAP is a climate resilient city by 2050 with short and medium term goals for climate risk adaptation.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	The CAP has assigned institutional responsibility for M&E, including a committee of external evaluators/facilitators, project staff, donors, and stakeholders. The process is conducted through regular meetings, interviews, monthly and quarterly reviews, etc. and the CAP is updated every 5 years for course correction. A clear framework and 'logic model' is referenced to assess a reduction in climate risk resulting from adaptation actions across three elements (societal, economic and environmental impacts).

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is no formal assessment of heat reduction post- implementation. There is however evidence for the cooling effect of greening at the city level from modelling.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	The Addis Ababa CAP details the importance of taking an integrated and holistic approach "to avoid any conflicts - such as ensuring the mitigation actions do not result in maladaptation". It further clarifies that adaptation actions must not "increase emissions or cause 'lock-in' to unsustainable solutions". While consideration of maladaptation is mentioned there is no post- implementation evidence for reduced risk. The plan was valid until 2025 and so the assessment of actions may be underway.

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	There are no specific heat governance structures. However the Addis Ababa CAP does establish governance structures for general climate mitigation and adaptation. Prioritised within that document is both chronic and acute heat risk. It uses an integrated body (AAEPGDC) and teams (Climate Change Mainstreaming Team) that are tasked with addressing locally- relevant climate risks (UHI). The governance is

Assessment score:	3
	institutionalised and accountable to the Mayor.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	The Addis Ababa CAP has identified technical expertise that spans several key sectors. These include dedicated teams within the AAEPGDC that are responsible for overseeing climate adaptation actions as well as some 40 experts at various levels of the government hierarchy including a dedicated climate change expert at several sub-districts. The document tabulates available staff within various departments across the city that may participate in the delivery of climate adaptation actions. There is also a formal assessment of power for delivering the CAP, at city government and federal government levels. The broader Ethiopian adaptation plan cites the National Meteorology Agency (NMA) as a key source of climate expertise. As well as academic institutions for undertaking research.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Dedicated funding for general climate risk adaptations is described for the local context through budget mainstreaming. The city describes mechanisms for both internal and external financing. There is limited evidence of appropriate quantity of funding as no clear cost estimates (at the city-level) are included. Cost estimates included at the national level are said to be divided proportionally across various programmes, it is not clear which of these is specific to heat. The sustainability is questionable given that the document acknowledges challenges with secure long-term funding.

References

Tadesse, T. A., Ayele, N. A., Reda, T. M., & Jothimani, M. (2025). Assessing urban heat island effects in Addis Ababa, Ethiopia using remote sensing and LULC analysis: Implications for sustainable development. *Scientific African, 20*, e03081. https://doi.org/10.1016/j.sciaf.2025.e03081

Addis Ababa Environmental Protection and Green Development Commission. (2021). *Addis Ababa Climate Action Plan (2021–2025): Towards a climate-resilient, inclusive, carbon-neutral city by 2050* [Climate action plan]. https://faolex.fao.org/docs/pdf/eth216552.pdf

Federal Democratic Republic of Ethiopia. (2019). *Ethiopia's national adaptation plan* [National adaptation plan]. https://www4.unfccc.int/sites/NAPC/Documents/Parties/NAP-ETH%20FINAL%20VERSION%20%20Mar%202019.pdf

Scoring sheet

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City case study:	Addis Ababa, Ethiopia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The Addis Ababa Climate Action Plan clearly identifies heatwaves, extreme hot days and hot nights as the current heat hazards.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Several key drivers of heat exposure and vulnerability have been identified and highlighted. These range from the Urban Heat Island, land use and land cover changes and the socio-economic vulnerability in Addis Ababa. What lacks is a detailed analysis of these risk drivers at a local scale.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	The significant future heat risks are identified through various climate scenarios. Climate projections indicate an increase in temperature by 2050, intensifying hotspots in Addis Ababa with surface temperatures exceeding 37 degrees Celsius nearly tripled between 2010 and 2023 and several sectoral impacts expected to increase the demand for water and energy etc.

2. Adaptation plan

Confidence score:	1

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated plan to heat adaptation. The Addis Ababa Climate Action Plan does not exclusively refer to heat, instead it includes a climate action roadmap for new development permits that account for extreme temperatures and the National Adaptation Plan that identifies the need to deal with increasing temperatures.

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	There are no documented existing goals at the moment.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Both the Addis Ababa Climate Action Plan and the Ethiopia National Adaptation Plan have established stakeholder and community engagement mechanisms to ensure transparency, public trust and effective implementation. For example, stakeholder workshops held between 2018 and 2020, the Technical Steering Committee are in place but their scope is not dedicated in heat adaptation efforts.

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Several actions are identified to address the heat hazards. These include the Enhanced Urban Greenery and Irrigation for cooling to reduce the impacts of the heat hazards.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Both the national and the local plans identify the actions to mitigate the impacts of the Urban Heat Island and socio-economic vulnerability. The Addis Ababa Action

Assessment score:	3
	Plan promotes the Resilient Development Permitting that requires all new developments and in-situ upgrades to be future proofed against extreme temperature, Nature Based solutions in Addis Ababa to advocate for the integration of green roofs and use of high albedo pavements to reduce surface heat retention.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	The actions such as the Resilient Development Permitting and Nature Based solutions are reported as implemented but there is little evidence to verify the implementations.

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4. Adaptation strategy

Confidence score:	0

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	The costs and benefits of heat adaptation options are mentioned but have not been fully analyzed.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	There is no evidence of the assessment of the synergies and the trade-offs of multiple heat adaptation options across short-term and long-term timeframes.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	The heat adaptation options are not integrated into a pathway-based approach, instead, there are sectoral broader climate change mitigation and adaptation strategies with no intended and specific reference to heat.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	There are no identified monitoring and evaluation processes, the depth of monitoring and evaluation, including target setting and measurability are close to non-existent.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Evidence regarding the reduction of heat risk in Addis Ababa is mixed; while there is empirical evidence that specific interventions like urban greening are effective, long-term scientific data indicates that overall city-wide heat risk is currently increasing due to rapid urbanization. For example, Scientific analysis of Addis Ababa provides strong evidence that the city's primary adaptation strategy—expanding green infrastructure—is physically capable of reducing heat: • Cooling Effect of Vegetation: The sources show a strong negative correlation (r = -0.8293) between vegetated areas and Land Surface Temperature (LST). • Temperature Differentials: Forested areas within the city maintain a significantly lower mean LST (24.3°C) compared to impervious surfaces like asphalt roads (34.9°C) and built-up settlements (32.5°C) There is also evidence of completed and ongoing actions. The Addis Ababa Climate Action Plan (CAP) lists several initiatives already undertaken or underway that aim to reduce heat vulnerability: • Greening Projects: The city has implemented the "Sheger beautification project" and various tree-planting campaigns to restore natural cooling mechanisms. • Vulnerability Targets: The city has established a pathway to reduce vulnerability to climate hazards (including heatwaves) by 30% by 2030 and 100% by 2050. • Resilient Design: Ongoing efforts include the "one home one garden" campaign and the updating of building codes to require new developments to account for extreme temperatures.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No clear evidence is identified

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6. Heat governance

Confidence score:	0

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	No governance structures are identified and established exclusively for heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	No established technical team of experts necessary for heat adaptation within the city administration.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No dedicated funding is in place for heat related programs.

References

Tadesse, T. A., Ayele, N. A., Reda, T. M., & Jothimani, M. (2025). Assessing urban heat island effects in Addis Ababa, Ethiopia using remote sensing and LULC analysis: Implications for sustainable development. *Scientific African, 20*, e03081. https://doi.org/10.1016/j.sciaf.2025.e03081

Addis Ababa Environmental Protection and Green Development Commission. (2021). *Addis Ababa Climate Action Plan (2021–2025): Towards a climate-resilient, inclusive, carbon-neutral city by 2050* [Climate action plan]. https://faolex.fao.org/docs/pdf/eth216552.pdf

Federal Democratic Republic of Ethiopia. (2019). *Ethiopia's national adaptation plan* [National adaptation plan]. https://www4.unfccc.int/sites/NAPC/Documents/Parties/NAP-ETH%20FINAL%20VERSION%20%20Mar%202019.pdf

Cairo, Egypt

Scoring sheet

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City case study:	Cairo, Egypt
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current heat hazards are identified by the city through short-term weather and seasonal forecasts. The city recognizes increasing daytime and nighttime temperatures, heat stress, and extreme heat. There is also high-level acknowledgment of complex risk perspectives and the role of heat in urban heat island effects, indoor overheating, desertification, dust storms, and air pollution. Data tools are used to visualize urban heat across Cairo and track temperature changes. However, there could be more detail on how heat manifests at the neighborhood level, as well as on cross-hazard interactions, compounding risks, and cascading impacts.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Multiple current drivers of heat exposure and vulnerability are identified. Urban density and informal settlements are noted, along with heightened vulnerability among the elderly, pregnant women, residents of poorly adapted buildings, and outdoor workers. However, there is limited detail on these drivers, underlying risk factors, or root causes.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat risks are projected through long-term climate studies and risk modeling. These projections primarily focus on rising temperatures and heat hazards, rather than the drivers of exposure and vulnerability. Overall, the information on future risks is broad and lacks detail, particularly regarding the drivers of exposure and vulnerability and their interconnections with other risks.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is no explicit or dedicated heat adaptation plan for the city, although a national-level plan for extreme weather events does include extreme heat. The city also has a "Green City Action Plan," which incorporates heat and heat adaptation as one of its components.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	The city has set short- and long-term goals related to urban resilience, aiming to provide Cairo's citizens with a more livable city. As part of this vision, there are goals to reduce exposure to extreme heat events. However, these goals are broad and do not specifically outline heat adaptation targets for the city. Ongoing efforts to address this are underway through a national committee led by the Ministry of Health.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	There is stakeholder and community engagement in adaptation efforts through workshops and other projects. For Cairo's "Green City Action Plan," which includes elements of heat adaptation, there were extensive and varied forms of engagement, including workshops, working groups, expert discussions, presentations, and online surveys. However, it is unclear how these engagement mechanisms have been integrated into or influenced decision-making around heat adaptation.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Actions have been identified to address heat hazards, particularly in support of creating a more livable city. These include efforts to reduce acute and chronic temperatures through the development of urban green spaces, such as tree planting programs, park expansion, and park rehabilitation. Additional measures include resilient streetscape design, with the installation of cool surfaces and reflective paint, permeable paving, and shading structures. There are also initiatives focused on green buildings and retrofitting, including double-glazed windows, reflective paint, and green roofs. However, it is unclear how these actions will evolve over time or account for future climate changes.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions have been identified to address the drivers of heat exposure and vulnerability, particularly in support of creating a more livable city. These include urban greening efforts such as tree planting, and the construction and renewal of parks. These actions are targeted at areas that lack green space and are either highly exposed to heat or home to vulnerable communities, such as low-income, densely populated neighborhoods. Similarly, interventions like increased access to water, the installation of water fountains and cool resting spaces, and resilient streetscape design will focus on low-income areas and places where groups are most exposed to extreme heat. However, it remains unclear how these actions will evolve over time or respond to future changes.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Actions are being implemented, including new building designs, urban greenery and tree planting, and green engineering techniques. There is some verification of implementation, though planning and financial constraints limit progress. It is unclear how extensively these actions have been carried out or whether the risks of maladaptation are being considered.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Costs are explicitly noted for heat adaptation actions, including capital expenditures as well as operational and maintenance costs, in the context of creating a livable and resilient city. A wide range of benefits are also identified for these actions, including reduced heat risks, improved thermal comfort, better health outcomes,

Assessment score:	2
	and more. However, there is no explicit mention of maladaptation risks.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Co-benefits between different heat adaptation and reduction actions are identified. However, there does not appear to be any mention of trade-offs between actions or strategies. Heat adaptation measures are selected and prioritized by national committees based on the most urgent challenges the city faces.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Heat adaptation efforts are integrated with broader urban development and resilience actions and are implemented through a pathway approach involving sequenced phases, prioritization of adaptation actions, and supporting policies. However, it remains unclear to what extent a truly pathway-based approach, one that is flexible, iterative, and phased, is being applied.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	There is a monitoring and evaluation process in place for Cairo's "Green City Action Plan," which includes various heat adaptation actions. However, it is unclear whether these specific heat adaptation measures are currently being monitored or evaluated, as they are relatively new.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	There is currently no evidence that heat adaptation actions have led to a reduction in heat risks.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	There appears to be broad and vague efforts to prevent or reduce maladaptation, but nothing tangible.

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	There does not appear to be a dedicated role, office, or integrated body responsible for managing heat adaptation in Cairo. However, several primary entities are involved in heat adaptation efforts, including the Cabinet of Ministers, the Governorate's Crisis and Disasters Management Units, the Ministry of Electricity and Renewable Energy, and the Ministry of Health.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Cairo's "Green City Action Plan" acknowledges and integrates expert knowledge, along with associated climate science and data. The plan also identifies technical support from UN agencies and development banks. However, it is unclear how available, accessible, and well-integrated these forms of technical expertise are.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There are funding opportunities identified for heat adaptation actions, but it is unclear if there is dedicated and sustainable heat adaptation funding.

References

Dabaieh, M., Maguid, D., El Mahdy, D., & Al Hegazi, S. (2024). Climate change adaptation at the margins: The case of Cairo, Egypt. *Cities, 154*, Article 105390. https://doi.org/10.1016/j.cities.2024.105390

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Carnegie Endowment for International Peace. (2023, October). *Climate change in Egypt: Opportunities and obstacles*. Retrieved July 7, 2025, from https://carnegieendowment.org/research/2023/10/climate-change-in-egypt-opportunities-and-obstacles?lang=en

Scoring sheet

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City case study:	Cairo, Egypt
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	List of hazards, but limited depth of each, and limited understanding of connection between dimensions of hazards

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Several contextual drivers are identified, but underlying causes less explored

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Just an assertion of future heat risks with some appeal to global statements

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	At least one detailed plan exists but unclear about implementation and accountability

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	There are plans and implementation ideas but unclear about tradeoffs between short and long term actions, or how resources should be allocated between short and long term goals

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Local engagement might well exist but it is not explicit

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Individual actions itemized, relationships between them less clear

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Individual actions itemized, relationships between them less clear; this question seems very similar to 3.1

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Unaware of evidence or monitoring of implementation

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No evidence of which i'm aware

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No discussion

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There is some evidence of immediate and slightly-less-immediate but it would be overstating it to say that pathways are systematically or systemically considered

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	mention is made of accountable agencies but only a mention

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No discussion at all

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No discussion at all

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	Not discussed

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	Not discussed

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	Not discussed

References

Dabaieh, M., Maguid, D., El Mahdy, D., & Al Hegazi, S. (2024). Climate change adaptation at the margins: The case of Cairo, Egypt. *Cities, 154*, Article 105390. https://doi.org/10.1016/j.cities.2024.105390

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European Bank for Reconstruction and Development. (2025, June). *Cairo Green City Action Plan*. EBRD Green Cities Programme. https://ebrdgreencities.com/assets/Uploads/PDF/Cairo-GCAP-final_June25.pdf

German Development Cooperation, & GIZ. (2016). *Qualitative vulnerability and adaptation assessment: Protecting health from heat stress in informal settlements of the Greater Cairo Region*. German Federal Ministry for Economic Cooperation and Development (BMZ). https://health.bmz.de/wp-content/uploads/page/Qualitative_vulnerability_and_adaptation_assessment_Cairo_2016.pdf

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Cape Town, South Africa

Scoring sheet

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City case study:	Cape Town, South Africa
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Heat hazards are identified. An increase in the number of very hot days (35+ Degrees Celsius) and the frequency and intensity of heatwaves (three days or more of 32+ Degrees Celsius) has been mentioned as one of the climate hazards (Cape Town Climate Change Plan). The Red Cross Red Crescent Climate Centre also identified heat and heatwaves as simultaneously one of the most dangerous climate risks and hazards. It threatens the lives and health of vulnerable populations and leads to strained health, reduced economic output and productivity.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The drivers of heat exposure and vulnerability are clearly stated. The urban heat island, increased emissions and overcrowded human settlements are recorded to be the significant drivers of heat exposure and vulnerability (City of Cape Town, 2021; Simpson et al., 2023).

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	There is evidence of changes projected to occur in the mid-future and far-future

Assessment score:	4
	periods. Average, maximum and minimum temperatures have been projected to increase by 1-3 Degrees Celsius for the period 2021-2050 and 3-4 Degrees Celsius for the period 2070 - 2099. Heatwave days and very hot days have been projected from 2021 - 2099.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	The City has drafted a heatwave and high heat day action plan that has not been published for implementation.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There is evidence of efforts to have several cooling centres, proper PPE for the outdoor workers to mitigate being affected by extreme heat, and long-term greening the city efforts through increased tree planting.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	There is evidence of several stakeholders working together in addressing the challenges of extreme heat. There is the Climate Change Team as the lead, supported by other departments such as Disaster Risk Management and City Health, which work closely with communities.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	A few actions to address the heat risk. The first action is to draft and implement a heatwave and high-heat day action plan and a standard operating procedure focused on operational actions that need to be taken by the City to reduce risks during a heat event. **NB** - It is critical to note that this has only been drafted and yet

Assessment score:	2
	to be published and implemented by the City. The other action is to develop and implement a network of cooling centres, promote cool roofing and reflective surfaces to reduce heat absorption, increase urban greenery through tree planting and green corridors, and develop and implement an early warning system and real-time monitoring system for heat. **NB** - Most of these are still concepts yet to be developed and actioned by the City.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Provision of heat advisories and an attempt to early warning systems have been identified. There are efforts to decongest the city to reduce heat exposure and vulnerability; however, no significant efforts have been recorded to reduce the urban heat island effect.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Heat advisories have been sent to informal settlements and communicated among City staff workers. Outdoor workers have been provided with PPE to use on hot days. Tree planting programmes to reduce the heat island effect and provide shading have been recorded; however, most of these efforts have been insignificant, mostly in informal settlements.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No evidence of the costs and benefits of heat adaptation options has been analysed as yet.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No evidence demonstrated the synergies and trade-offs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The adaptation plans are planned in a sequenced manner, with the hope of implementing them similarly. For example, first, there is a need for mapping heat-prone areas and developing relevant low-cost adaptation options.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The adaptation actions to be implemented in the High Heat Day and Heat Wave action plan are yet to be monitored and evaluated. However, it is worth acknowledging to note that the plan will consist of a seasonal review, a heat readiness survey and an evaluation framework that measures resilience based on specific quantitative and qualitative indicators.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No notable evidence of reducing heat risk has been documented

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No notable evidence of reducing maladaptation risk has been documented.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	There is an already existing Climate Change Team leading the fight against extreme heat. The team is supported by other departments such as Disaster Risk Management, City Health, Facilities Management, Environmental Management, Urban Planning and Design, Development Management, the Library and Information Services, which are already established. Businesses and Industrial associations also work with the City in addressing heat challenges.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The above-mentioned structures provide expertise and are always accessible to the City

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No dedicated and sustainable heat adaptation funding has been recorded.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Cape Town, South Africa
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	CoCT has nationally-standardised definitions of heat hazards, namely: Heat waves: three or more consecutive days of 32°C or hotter. High heat days: a day hotter than 35°C. An analysis of historic temperature data from across the city identified the average number of heat waves/high heat days per annum, the duration, monthly occurrences, and average temperatures during these events. Other documents highlight indoor temperatures as a risk in buildings made with certain materials and in areas with high air pollution. A range of health impacts were also identified e.g recorded increases in mortality rate during extreme heat events. An urban heat island mapping exercise was conducted across the site to identify high risk areas. The combined effects of humidity/low wind were mentioned but not specifically analyzed (though likely less relevant for the summer climate conditions of Cape Town).

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Heat exposure is identified as a combination of climate factors (temperature and humidity), socio-economic status, and location within the urban environment. Both exposure factors (manual laborers, informal settlement-dwellers, homelessness) and physiological factors (elderly, infants and children, certain medications, comorbidities) are identified as contributing to vulnerability. A detailed description of

Assessment score:	4
	factors contributing to heat risk in Cape Town is included and 14 vulnerable groups in the city are identified.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Heat related climate projections for Cape Town show that average, maximum, and minimum (nighttime) temperatures will increase. As will the frequency and intensity of heat waves/high heat days. Projections are given for both mid-future period (2021-2050) and future period (2070-2099). The scientific evidence that underpins the heat action plan is based on the findings of a climate change hazard, vulnerability and risk assessment, complemented by the IPCC special report on global warming at 1.5°C. This included mapping of climate hazards, identification of vulnerability both spatially and across sectors, economic risk analysis, as well as identification of key risk areas under RCP 8,59 scenarios As well as a city-wide UHI risk map. A range of impacts and risks (health, infrastructure, energy etc) are identified. Estimated loss of productivity and other heat-related impacts are referenced from global studies such as Lancet. There is limited evidence for the projections of certain city-level impacts such as mortality rates.

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	The CoCT has formulated the “High Heat Day and Heat Wave Action Plan” (unpublished). Which details specific goals and heat adaptation activities to reduce risks to the public, vulnerable communities, city staff, service delivery, the economy, and infrastructure due to heat events.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Yes the CoCT has identified a range of specific goals (and actions) and associated sub-actions for heat adaptation (e.g Develop and implement a network of cooling centres and Develop and implement an early-warning and real-time monitoring system for heat). The timeframe to implementation is listed for each: exiting; short-term (1-2 years); medium terms (3-5 years); and long term (5+ years).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Yes, stakeholder engagement mechanisms are in place. The CoCT acknowledged that the planning process required, and relied on, active engagement and cooperation of many stakeholders within the City, across Cape Town and beyond (including councillors, advocacy groups, international partners among others). Both formal and informal stakeholder engagement activities occurred during 2018-2020 utilising workshops, online meetings, and facilitated civil engagements. The plan was also submitted for public comment and engagement. Key engagement actions are identified such as Community-based risk assessment workshops: Sets out a participatory approach by all stakeholders and wide consultation with communities at risk (in implementation phase as of 2021). There is less evidence for on-going engagement with particularly vulnerable or underrepresented groups regarding heat adaptation actions.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	The CoCT identifies both mitigation (City's carbon-neutral commitment and would see emissions decrease by 90% between 2016 and 2050), and adaptation actions to target heat. The two primary goals in the broader climate change action plan are to reduce immediate risks to health during heatwaves and high-heat days and proactively reduce heat impacts on the city through urban greening. A number of specific sub-actions are listed to achieve these goals. A scale of the adaptation impact is provided. The heat adaptation plan is fully focused on the identification and planning of heat adaptations across a range of sectors (primarily health and infrastructure). Some of which still need to identify and develop targeted heat response interventions.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, the CoCT has primarily focused heat exposure and vulnerability interactions among informal settlement dwellers and low-income residents. Urban heat island effects, housing characteristics, and limited access to cooling resources are identified. Targeted actions such as the provision of public cooling centres will reduce exposure but likely not affect long-term vulnerability. Broader actions are targeted at settlement development (including greening), spatial planning, and resource inclusivity. The provision of low-cost housing that is climate-resilient is mentioned but non-specific. Other actions are the formulation of policy and guidelines to protect outdoor workers and manual laborers but these are not fully outlined.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Yes there is an annexure of climate change adaptation actions that are identified by the City as 'existing' (e.g Devise and implement a focused tree-planting programme to reduce the heat island effect and provide shading, application forms for this programme are available to the public). There is also media communication that activities listed in the heat adaptation plan are underway (see https://www.capetownetc.com/news/cape-town-prepares-for-a-safer-summer-with-lifeguard-assessments/). However there is limited information around the scale and progress of these actions as yet.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	There is evidence that every three years the CoCT undertakes a review of the cost benefits of major **mitigation** opportunities across sectors but does not mention adaptation actions in this. A list of costs is listed alongside adaptation actions (including those for heat) and identifies the potential co-benefits but these are not systematically evaluated. There is also some comparison of adaptation options e.g the choice to implement spray parks rather than investing in more public pools due to water usage and maintenance and running costs. The climate change and action plan officially states that it does not fully express the future costs of climate change or the benefits and avoided costs of actions within the city boundary (these will happen progressively as the plan moves through implementation).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	There is general consideration of the synergies and trade-offs particularly across departments and initiatives, for example producing heat wave response plans alongside the department of health's climate change preparedness. A list of strategic focus areas and cross-cutting work areas are tabulated. Trade-offs are broadly acknowledged such as increasing local energy and carbon emissions from cooling centers but they are not evaluated.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Implementation of actions in the plan occur in three distinct stages: Phase 1 pre-activation planning before the hot season; Phase 2 activation readiness following communications from SAWS ; Phase 3 activation during heat events.

Assessment score:	3
	These are applied across each of the actions. Longer-term adaptation plans such as urban greening initiatives are identified with sub-actions and associated timeframes indicating a pathway approach to implementation.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	The proposed evaluation process for actions implemented in the High Heat Day and Heat Wave Action plan consist of a seasonal review (every year), a heat readiness survey (every 2-3 years) , and an evaluation framework that measures resilience based on specific quantitative and qualitative indicators, based on the objectives of the plan (centred around efficacy, stakeholder engagement and improved heat-health outcomes). While there is a detailed strategy for M&E, the heat action plan is still under review so it is not clear if M&E activities have started. Efficacy indicators suggested by the DoH include the number of deaths or serious illnesses, all-cause mortality data, and number of hospital admissions, calls to helpline calls, primary health clinic visit records, ambulance calls, fire brigade interventions and visits to casualty departments.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Currently there does not appear to be any publicly available city-level evidence for heat reduction. However the plan is in the early stages. Cape Town is involved with the Data for Cool Cities initiative which is using modelling to map heat exposure, there is potential that this would be done before and after adaptation to estimate efficacy. There are also on-going collaborations with the city and research projects that are evaluating heat adaptation interventions which the city hopes to incorporate into its planning (e.g HABVIA).

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Maladaptation is clearly defined in the plans. There is also a mention of maladaptation as an implementation challenge. Specifically around increased carbon emissions. There is no systematic evaluation of maladaptation risk.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	The heat plan identifies specific actions to be implemented by city departments, through a coordinated approach to ensure alignment between governance arrangements and departmental functions. Part of the plan is focused on governance and systems to efficiently manage heat events. Within this, the city aims to establish a climate change response community of practice consisting of relevant internal and external stakeholders. Cape Town has also assigned specific roles such as Officers for Climate Change Planning, Risk and Resilience.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	CoCT has strong technical expertise at both city and national levels. There are well established relationships with universities and research organisations. Some challenges have been identified such as the associated costs with accessing data from National organisations such as SAWS. There are identified gaps in the current levels of climate change and heat risk assessment/knowledge in departments which are incorporated into the action plans. It is not clear how accessible technical expertise is to grassroots organisations or local communities.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The CoCT primarily relies on allocated funding from the national government. As well as a relatively small budget from property rates and tariffs which need to be kept affordable for low-middle income residents. The CoCT have piloted alternative financing models such as Green bonds to partially fund a set of eligible projects. However there is no clear financing for heat adaptation.

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Fez, Morocco

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Fez, Morocco
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The Fès Resilience Strategy explicitly identifies températures extrêmes and heatwaves as one of the main interconnected hazards facing the city, noting that heatwaves have become more frequent over the last 20 years and distinguishing between acute extreme heat events and more chronic, prolonged heatwaves. These are linked to impacts on health (especially for the young and elderly), infrastructure (e.g. overheating of energy substations), water scarcity, and fire risk. The Action Plan similarly highlights high summer temperatures, extreme weather conditions and the contribution of green and blue infrastructure to mitigating urban heat island effects. Taken together, these documents clearly identify both chronic heat stress (warmer, drier summers) and acute heat shocks (heatwaves) at the city scale and discuss cross-hazard interactions (e.g. links to drought, water stress, and infrastructure). However, there is no evidence of systematic neighborhood-level heat mapping or highly detailed data integration. This aligns best with a score of 3

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Local documents identify several drivers of heat exposure and vulnerability in Fès. The Resilience Strategy links extreme temperatures and heatwaves to health risks for vulnerable population groups (particularly children and older people), as well as to infrastructure fragility (ageing, poorly insulated buildings; stress on energy and water systems). It also discusses broader socioeconomic vulnerability, including

Assessment score:	3
	high unemployment, gendered division of labour, informality, and resulting economic insecurity, which heighten vulnerability to climate hazards more generally. The Action Plan notes an ageing building stock, exposure to “conditions météorologiques extrêmes” including high summer temperatures, and the role of nature-based solutions (urban forests, parks, water features) in reducing urban heat islands, implicitly recognizing current land cover and limited green/blue infrastructure as drivers of exposure. The 2019 diagnostic underlying the Strategy and Action Plan explicitly assessed exposure and vulnerability to extreme temperatures alongside other hazards. National-level documents (Morocco NAP; Climate Risk Country Profile) further underline the vulnerability of urban populations, especially the elderly, people with pre-existing health conditions, and low-income groups, to increasing heat extremes. Overall, drivers affecting people (age, health, socioeconomic status), infrastructure (old, poorly insulated housing and stressed services), and aspects of the urban environment (limited green/blue infrastructure, urban form) are identified with some local context and underlying risk factors, but without systematic neighborhood-level analysis or fully integrated multi-source datasets. This is most consistent with a score of 3.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	The Fès Resilience Strategy states that climate projections indicate more frequent and more intense episodes of extreme heat in future, noting that heatwaves are already more common, especially over the past two decades, and highlighting likely implications for health, water availability, and building integrity. The Action Plan is explicitly framed around climate change and refers to increasing climate extremes as a rationale for adaptation planning and for nature-based cooling interventions in Fès. At the national scale, the Morocco Climate Risk Country Profile and the Hammoudy et al. (2024) study provide detailed projections using multiple climate models and indices (e.g., increases in hot extremes, hot days, tropical nights, and warming under future scenarios), showing significant future warming and more frequent hot extremes across Morocco. The Morocco NAP similarly anticipates more intense and frequent heatwaves and outlines sectoral vulnerabilities. However, for Fès specifically, the available evidence summarizes future heat hazards qualitatively and does not present detailed, city-scale, or neighborhood-level projections that fully integrate future exposure and vulnerability trends, scenario variants, or complex interconnections in a structured manner. The combination of city-level qualitative projections with more detailed but national/regional-scale modelling therefore fits best with a score of 2 rather than 3 or 4.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is **no standalone heat adaptation plan** for Fès. Neither the *Stratégie de Résilience 2022–2027* nor the *Plan d'Action* provides a dedicated heat-specific strategy. Instead, heat is addressed **indirectly** as part of broader climate risks, resilience objectives, sustainable urban development, and nature-based solutions. Evidence includes: The Resilience Strategy recognizes *temperature extremes* and *vagues de chaleur* as priority climate risks but embeds them within a general multi-hazard resilience framework, not a heat-specific plan. The Action Plan includes measures such as green corridors, urban forestry, and water-sensitive design, actions that reduce heat, but these fall under broader environmental or urban planning themes rather than a structured heat adaptation framework. The Morocco NAP (2022–2030) acknowledges heatwaves nationally and outlines sectoral responses but does not constitute or mandate a dedicated municipal heat plan for Fès. Because heat is referenced meaningfully but not addressed through a *dedicated, formal heat adaptation document*, this fits the scoring description for **1**.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	The Resilience Strategy and Action Plan clearly articulate **short- and medium-term goals (2022–2027)** relevant to urban cooling and climate adaptation. These include: Expanding green spaces (urban forests, parks, ecological corridors) to mitigate heat. Plan d'Action de Fès 2022-2027 Reducing exposure to extreme weather through improved water management, urban planning, and infrastructure resilience. These qualify as **detailed and measurable** targets within a defined 5-year horizon. However: There is **limited evidence of explicit long-term (>10 years) heat adaptation goals** specific to Fès. The NAP (2030 horizon) offers national long-term direction but does **not specify city-level long-term heat targets** for Fès. Interconnections and measurable indicators for heat-specific outcomes are not consistently outlined. Thus, goals exist and are moderately detailed but are **not fully distributed across short, medium, and long-term horizons**, aligning best with a score of **2**.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	There is strong evidence of structured stakeholder and community engagement in developing Fès's resilience and climate planning documents. Key points: The *Stratégie de Résilience de Fès* was built using the City Resilience Program (World Bank) methodology, which requires **multi-stakeholder consultations**, departmental workshops, and engagement with civil society, private sector, and local technical units. These processes are explicitly documented in the Strategy. The Action Plan was developed through **participatory workshops**, interdepartmental coordination, and consultations with local actors responsible for

Assessment score:	3
	implementation. Engagement is framed as iterative and problem-driven. Although engagement is not *heat-specific*, it is still locally relevant and demonstrates moderate depth of participation, consistent with multiple consultations. National-level processes under the Morocco NAP also emphasise stakeholder engagement, though not specific to Fès. This meets the rubric criteria for moderate depth and locally relevant engagement mechanisms, corresponding to a score of **3**.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Fez identifies multiple actions that address both chronic heat stress and acute heatwaves. The Resilience Strategy outlines measures to reduce exposure to extreme temperatures, including: expanding urban green spaces, developing ecological corridors, restoring and protecting oases and water bodies, increasing shaded public spaces, and improving energy and water infrastructure stressed by extreme temperatures. The Action Plan further details actions such as creating new parks, reinforcing urban forests, rehabilitating wetlands, promoting sustainable mobility, and introducing nature-based cooling solutions, all of which directly reduce heat hazards and mitigate urban heat islands. These actions address both acute heat events and long-term warming trends, with some consideration of future changes. However, they are not systematically framed within a dedicated heat hazard portfolio. This best aligns with a score of **3**.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The Resilience Strategy identifies and proposes actions that target key drivers of exposure and vulnerability in Fez, including: upgrading ageing, poorly insulated buildings, improving water distribution networks stressed by drought and extreme heat, enhancing social services for vulnerable populations (elderly, low-income groups), expanding green and blue infrastructure to address high urban density and limited vegetation cover. The Action Plan reinforces these with targeted interventions such as: reforestation programmes, rehabilitation of rivers and wetlands, integrated stormwater and water-saving systems, inclusive public spaces designed for climate-sensitive populations. These actions address drivers linked to people (health, age, socioeconomic

Assessment score:	3
	vulnerability), infrastructure (inadequate insulation, overstressed services), and ecosystems (loss of vegetation, degradation of natural cooling systems). Root causes and future changes are partially considered, though not comprehensively modelled. The appropriate score is 3.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is evidence that several adaptation-related actions are being implemented in Fez, but the documentation provides moderate rather than strong verification. Examples include: active restoration of green spaces and ecological corridors, ongoing urban forestry and reforestation activities, rehabilitation of the Fez River and associated wetlands, improvements to solid waste management and water systems, expanded public space projects integrated with climate resilience objectives. These actions contribute to reducing heat exposure and strengthening adaptive capacity, but the documents do not provide systematic implementation data (e.g., project completion rates, timelines, or detailed monitoring outcomes). Maladaptation considerations, such as the risk that certain infrastructure could increase heat exposure, are not explicitly assessed. Implementation is therefore partial and verified in a general way, consistent with a score of 2.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	The available evidence does **not** show a systematic cost–benefit analysis for heat adaptation options in Fez. The Resilience Strategy and Action Plan describes broad categories of benefits, such as improved public health, reduced exposure to extreme temperatures, enhanced quality of life, and ecosystem restoration, but these are qualitative and not presented as structured economic or multi-dimensional analyses. Examples include: Recognition that greening, river rehabilitation, and ecological corridors help mitigate heat and improve wellbeing. Acknowledgement that nature-based solutions reduce environmental stress and support long-term resilience. However, the documents do not specify: comparative costs of different cooling interventions; quantified benefits (economic or non-economic); explicit assessment of maladaptation risks; locally contextualized cost scenarios for Fez.

Assessment score:	1
	Because costs and benefits are only noted in general terms and lack analytical depth, the scoring criteria correspond to 1.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Some implicit synergies are mentioned, for example, that green spaces, urban forests, and wetland rehabilitation simultaneously contribute to heat mitigation, biodiversity, water conservation, and improved public spaces. Similarly, integrated mobility and land-use planning produce co-benefits for air quality and reduced heat exposure. However, no explicit framework is used to assess synergies and trade-offs across different heat adaptation options. Missing elements include: structured comparison of different cooling approaches, quantified evaluations, assessment of trade-offs (e.g., increased water demands from greening under drought conditions), multi-timeframe analysis (short/medium/long-term), science-based evaluations. As the available documentation only mentions general co-benefits but does not systematically evaluate synergies or trade-offs, the appropriate score is 1.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	The Resilience Strategy and Action Plan outline a set of strategic priorities for 2022–2027, including expansion of green infrastructure, environmental rehabilitation, mobility improvement, and urban renewal. These elements reflect strategic direction but are not organized into a sequenced, pathway-based framework for heat adaptation. Specifically: Actions are outlined across thematic pillars, but not arranged into an iterative, flexible pathway that evolves over short-, medium-, and long-term horizons. There is no mechanism describing how actions should adapt to future climate projections or decision points. No pathway diagrams, staging plans, or criteria for adjusting strategies based on new climate data are included. Long-term (>10 years) heat adaptation planning is not articulated at the municipal level (though the national NAP extends to 2030). Because Fez shows strategic intent but no explicit pathway approach, the scoring corresponds to **1**.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	The Fez Resilience Strategy and the 2022–2027 Action Plan outline general monitoring intentions and governance structures for project oversight, particularly for urban renewal, greening, environmental rehabilitation, and infrastructure upgrades. These include: programme-level follow-up mechanisms, coordination structures within the municipality, periodic review of project implementation under the Action Plan. However, based on the available documentation: no heat-specific monitoring and evaluation system exists, measurable indicators for heat-related outcomes (e.g., temperature reduction, heat exposure metrics) are not defined, monitoring processes are described in general terms without detailed methodologies, no evidence is provided of structured course-correction mechanisms linked to M&E results. Since monitoring processes exist conceptually but are not yet operationalized for heat adaptation, this aligns with a score of 1.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is some evidence that ongoing actions in Fez may contribute indirectly to reducing heat risks. For example: expansion of green spaces and ecological corridors, restoration of water bodies and wetlands, urban forestry and nature-based solutions, improvements in environmental quality and public spaces. These interventions are widely recognized for reducing urban heat island effects. However, the documentation does not provide measurable evidence that these actions have reduced observed heat impacts or future heat risks in Fez. Missing elements include: before-and-after temperature data, assessments of population-level heat exposure reductions, health outcome data related to heat, sustainability of risk reduction over time, scientific or community-validated measures of effectiveness. Because the evidence remains indicative but unmeasured, the appropriate score is 1.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	None of the documents reviewed, including the Resilience Strategy, the Action Plan, the Morocco NAP, or national climate profiles, provides evidence that Fez formally evaluates or tracks maladaptation risks in relation to heat adaptation. Missing elements include: identification of potential maladaptive outcomes (e.g., increased water demand from greening, heat-trapping construction materials, social exclusion), targeted indicators or thresholds for maladaptation monitoring, scientific, quantitative, or community-based assessments,

Assessment score:	0
	documentation showing that implemented actions avoid creating new risks. Although some implemented measures (e.g., green infrastructure) are unlikely to be maladaptive, there is no explicit evidence that Fez assesses or monitors maladaptation risks, which corresponds to a score of 0.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	The Fez Resilience Strategy defines a robust governance framework for climate resilience, including multi-departmental coordination, municipal leadership, and integration with national climate directives. It references: municipal units responsible for environment, urban planning, and infrastructure; cross-sectoral working groups under the City Resilience Programme; institutional arrangements for delivering the 2022–2027 Action Plan. However: there is no dedicated heat governance body (e.g., Chief Heat Officer, Heat Office, Heat Taskforce), heat is treated as one risk among several, not as a distinct governance portfolio, the governance roles are not formally institutionalised specifically for heat adaptation. Because structures relevant to heat exist but are not heat-specific and remain embedded within general climate or resilience governance, the appropriate score is 1.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There is evidence of accessible technical expertise for climate resilience within Fez's municipal system, supported by national and international institutions. The Resilience Strategy and Action Plan reflect contributions from: municipal technical departments (environment, water, infrastructure, land use), World Bank technical teams, national climate adaptation and risk assessment agencies, scientific expertise embedded through Morocco's national climate initiatives. The documents demonstrate: availability of expertise in urban planning, environmental management, water systems, and disaster risk reduction; some integration of technical assessments into planning processes; collaboration with external experts (e.g., World Bank resilience specialists). However: technical capacity is not explicitly dedicated to heat adaptation,

Assessment score:	2
	there is limited evidence of structured capacity-building programmes for heat, no explicit local heat risk technical unit is identified. For these reasons, technical expertise is partially in place and partially relevant, corresponding to a score of 2.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	The Fez Action Plan outlines significant municipal and national investments for resilience, infrastructure upgrades, ecological rehabilitation, and environmental management. Funding streams include: municipal budget allocations for the 2022–2027 priorities, national programmes supporting urban development and environmental protection, donor-supported resilience initiatives (e.g., World Bank City Resilience Programme). However: no funding is specifically dedicated to heat adaptation, heat-related actions (such as greening or water system improvements) rely on broader environmental or infrastructure budgets, long-term (10+ years) sustainable financing for heat-specific activities is not documented, there is no evidence of a protected or recurring heat adaptation budget line. Funding is therefore identified but not heat-specific, and not secured in the long term, which aligns with a score of 1.

References

World Bank. (2022). *Stratégie de résilience de Fès 2022–2027* [Report]. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099805009272211200

World Bank. (2022). *Plan d'action de Fès 2022–2027* [Report]. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099810109272235184

Morocco. (2024). *Morocco National Adaptation Plan 2022–2030* [Publication]. UNFCCC. https://unfccc.int/documents/636730

Hammoudy, W., Ilmen, R., & Sinan, M. (2024). Climate change and its impacts in extreme events in Morocco (observation, monitoring, and forecasting). *Journal of Water & Climate Change, 15*(12), 5817–5842. https://doi.org/10.2166/wcc.2024.382

World Bank Group. (2021). *Climate risk country profile: Morocco* [Country climate risk profile]. World Bank. https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/17189-WB_Morocco%20Country%20Profile-WEB.pdf

Scoring sheet

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For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Fez, Morocco
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current heat hazards are identified across both chronic rising temperatures and acute heat shocks. There is acknowledgement that extreme heat and heat waves are occurring more often in the city. Direct impacts from both chronic and acute heat are noted across health, infrastructure, and energy. There is also some mention of cross-hazard interactions, including how heat contributes to drought and water shortages and can exacerbate fire hazards. However, there is no detailed discussion of heat hazards at the neighborhood level.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Drivers of heat exposure and vulnerability at the city level are identified mainly in relation to vulnerable populations, such as young people and older adults, and social inequalities including poverty, education, income, and housing. These social inequalities are discussed with detailed local relevance, especially in terms of the city's makeup, how different populations are impacted and vulnerable, and where they reside. There is also mention of infrastructure vulnerability at the city level, but in less detail. However, drivers of exposure and vulnerability are not always explicitly connected to heat, and root causes of heat exposure and vulnerability are not explored. There is also a lack of multiple data sources or deeper analysis at the neighborhood level. At the national level, there is considerably more detail on drivers of heat exposure and vulnerability.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat risks are identified, including an indication that climate projections show heat risks are rising as extreme heat events occur more frequently and with greater intensity in the city. There is also mention that drivers of exposure and vulnerability may change as the city grows or develops. However, these risks are described broadly and not at a detailed local scale, and they are not explored through multiple scenarios or supported by a range of data sources.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated heat adaptation plan. Instead, elements of city-level heat resilience and adaptation are referenced across other plans, including the *Plan d'Action de Fès 2022–2027* and the *Stratégie de Résilience de Fès 2022–2027*.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There are short- to medium-term goals noted across a list of proposed actions. These actions vary in their level of implementation, but most are proposed to occur within or around the next five years. For each proposed action, there is considerable detail, including a description, partners, cost, indicators, and measures of impact. The actions are often tied to the UN Sustainable Development Goals, especially those focused on making cities more resilient and sustainable. However, there is a lack of long-term goals, particularly at the city level.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	There are a variety of stakeholder and community engagement mechanisms in place. Multiple stakeholders, partners, and local officials were involved in creating the action and resilience plans relevant to heat adaptation. There is also documentation of workshops and the wide breadth of community actors involved. For future climate adaptation planning and actions, there are proposals to continue these stakeholder and community engagement mechanisms. However, there is limited evidence of deeper participation through iterative collaboration or co-production.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	A variety of actions to address heat hazards are identified, primarily through nature-based approaches and green infrastructure. Potential actions include expanding green spaces, reforestation and urban forest growth, restoring waterways and water bodies, and more. These actions are framed at the city level and reflect the city's geography and landscape. There is mention that the actions will build resilience to heat waves, with an implicit acknowledgement that they address both chronic and acute heat hazards. There is also some mention of future changes, but it is not described in detail.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions that address drivers of heat exposure and vulnerability are identified. Many heat-relevant actions, such as expanding green infrastructure, emphasize a focus on vulnerable parts of the city or vulnerable populations, including those with limited economic resources. These actions also connect to supporting existing aging infrastructure that may be more exposed or vulnerable to heat. However, there is limited detail on actions that address root causes or anticipate future changes.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is evidence that some actions are being implemented, particularly around green infrastructure and urban greening. One recent example is the restoration of the Jnan Sbil Gardens. However, there is limited evidence of implementation across multiple actions, and maladaptation risks are not mentioned or considered.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Estimated costs are provided for a variety of heat adaptation actions, especially those related to green infrastructure or nature-based solutions. Financing options are also listed, along with factors that may affect overall costs. Benefits and co-benefits are described as well, often highlighting wellbeing, economic

Assessment score:	2
	revitalization, employment, and other economic and non-economic gains. However, much of the costs and benefits are presented at a high-level without deeper economic analysis and there is no mention of maladaptation risks.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	There are limited details on synergies and trade-offs between different heat adaptation options or actions. Some synergies are noted, such as how different urban greening projects can be connected into a network of public spaces to improve health, wellbeing, climate resilience, and more. However, trade-offs are not explicitly discussed, and the assessment of these synergies and trade-offs is limited and lacks depth.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Heat adaptation options are prioritized and broadly planned in a sequenced way, primarily through an implementation sequence for specific actions. There is also mention of progress monitoring processes, including proposals for a regular feedback mechanism to track how different options and actions are performing and to inform what should be prioritized given funding and other constraints. However, planning remains limited in depth when it comes to a comprehensive, pathway-based approach that spans multiple time frames and clearly explains how actions will be selected and prioritized over time.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Monitoring and evaluation processes are identified and proposed through different municipal departments and committees. Indicators and measures to evaluate heat adaptation actions are also outlined. However, these monitoring and evaluation processes appear preliminary, and there does not seem to be data or measurements collected yet. There is also a lack of detailed, concrete target setting and clear course-correction mechanisms.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is mention that city-level action and resilience plans, and the corresponding

Assessment score:	1
	actions, can contribute to increased heat resilience and reduced heat risk. However, the evidence is preliminary and high level, and it lacks depth and supporting documentation.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no mention of maladaptation risk or evidence of reducing maladaptation risk.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Governance structures explicitly tied to heat are not noted or mentioned. Instead, heat-related adaptation actions appear to be coordinated across multiple municipal departments, levels of government, and committees. Heat also sits within broader governance structures for climate-related risks, rather than being an explicit governance focus on its own.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There is technical expertise broadly supporting climate adaptation and resilience planning through dedicated municipal departments, the World Bank, and other organizations. Technical specialists and steering committees are also mentioned as providing assistance for the city's climate adaptation strategy and related heat adaptation actions. However, the depth of expertise explicitly focused on heat appears more limited, and it is difficult to tell how this technical support accounts for availability, accessibility, capacity building, and integration into decision-making.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There is mention of funding needs for a variety of heat-related actions, along with potential funding opportunities and sources to support those actions and projects. Municipal budgets and allocations for specific priorities are also referenced. However, there does not appear to be dedicated, long-term, and sustainable funding in place to support heat adaptation.

References

World Bank. (2022). *Stratégie de résilience de Fès 2022–2027* [Report]. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099805009272211200

World Bank. (2022). *Plan d'action de Fès 2022–2027* [Report]. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099810109272235184

Morocco. (2024). *Morocco National Adaptation Plan 2022–2030* [Publication]. UNFCCC. https://unfccc.int/documents/636730

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World Bank Group. (2021). *Climate risk country profile: Morocco* [Country climate risk profile]. World Bank. https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/17189-WB_Morocco%20Country%20Profile-WEB.pdf

Khamis, J. (2025). *How rooftop gardens and urban greenery are transforming Arab cities*. Arab News. https://www.arabnews.com/node/2616114/middle-east

Freetown, Sierra Leone

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Freetown, Sierra Leone
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	chronic and acute risks discussed along with factors that lead to differential risk; some time-limited neighborhood level heat mapping has been conducted

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Comprehensive description of vulnerability factors, but not detailed data driven neighborhood level assessment

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Country-level future heat projections considered as well as broad regional differences and urban-rural differences, but not detailed consideration of vulnerability trends or localized hazard projections.

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	A comprehensive heat adaptation plan exists.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Goals are mostly less than 10 years but do name specific timeframes.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Heat action plan has already meaningfully engaged communities, NGO's, government etc. Principles of engagement are present throughout plan.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Many actions identified with local context. Consideration of future changes not explicitly related to each action.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Range of actions address both exposure and vulnerability.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Many existing actions are detailed with local context.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Heat strategy aims to achieve social, economic, and environmental co-benefits but these are not analyzed in a cost-benefit framework.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Synergies and tradeoffs are not discussed. They may have been considered in engagement processes that led to the plan but this is not explicitly stated.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Multiple goals are sequenced in time. Although not framed as pathway dependence, clearly the time sequencing of actions has been thought through.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Importance of monitoring is noted in heat adaptation plan but most efforts are preliminary or aspirational thus far. Some actions like the tree planting effort have robust monitoring and targets baked in.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	A few cases studies identified by no comprehensive assessment of risks and how they’ve changed over time

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Malaptation is not addressed in the heat action plan or related documents.

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Need for heat governance is identified with clear goals to establish task force etc, but not fully implemented. Chief heat officer role has been established.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise has been leveraged through partnerships and establishment of chief heat officer.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Clear financing goals have been identified and some funded partnerships, but more is still needed to fully implement plans.

References

Climate Resilience for All. (2025). *Freetown heat action plan*. https://www.climateresilience.org/resources/freetown-heat-action-plan

Freetown City Council. (2025). *Heat Action Plan (HAP)* [PDF]. https://freetownthetreetown.sl/wp-content/uploads/2025/03/HAP-2025-new-HM-SS-Update-1.pdf

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Scoring sheet

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City case study:	Freetown, Sierra Leone
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Current heat hazards across the city are identified in terms of heat stress, through rising average and maximum temperatures, and heat shocks, such as increased frequency and duration of heat waves. Cascading and compounding risks are also noted, including interactions with moisture content, humidity, wind speed, and wildfires. There is neighborhood-level mapping and the use of multiple data sources. Overall, comprehensive information on current heat hazards is identified and made available.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Current drivers of heat exposure and vulnerability are identified across the city. Detailed references are made to informal urban settlements, proximity to water bodies, land cover and vegetation, and heat-vulnerable groups such as children, women, the elderly, outdoor workers, farmers, waste pickers, and persons with disabilities. Root causes are also noted, including population growth, deforestation, and the use of heat-retaining construction materials. Overall, comprehensive information on the current drivers of heat exposure and vulnerability is identified and provided.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks are projected across the city, including trends in temperature, humidity, and wind speed, as well as rising chronic poverty and population growth. Climate models and analytical tools, such as the Mann-Kendall analysis, are used to assess and project these risks. While the projections are detailed and address both heat hazards and some drivers of exposure and vulnerability, there is a lack of scenario planning and limited analysis of the interconnections between different heat-related risks.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	The city has a dedicated and formally adopted heat adaptation plan known as the “Heat Action Plan.” There are clear commitments, priorities, and implemented support highlighted.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	There are a range of short- to long-term goals on heat awareness, coordination, and preparation, heat adaptation solutions, and heat adaptation partnerships. Within each of these goals, there are designated targets and actions, and consideration of metrics and impact.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Stakeholder and community engagement mechanisms have been used to develop heat adaptation plans and strategies. The plan also outlines intentions for close collaboration with stakeholders and continued use of engagement mechanisms to build awareness and preparedness around heat and heat adaptation. There is a high level of participation, with stakeholders and local community members having meaningful influence in decision-making.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Actions have been identified to address heat hazards. These include both nature-based and engineered solutions to enhance urban cooling, such as afforestation and reforestation, the creation of cooling zones and corridors, the installation of shade covers, and the use of cool and reflective roofing materials. There are also explicit measures to address extreme heat and heatwaves through early warning systems. Lastly, there is some acknowledgement of future changes and how these actions are intended to respond to them.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions have been identified to address the drivers of heat exposure and vulnerability. These include raising heat awareness among residents of informal settlements and vulnerable groups, establishing coordination networks, increasing the participation of women and youth in heat adaptation efforts, and targeting specific interventions in high-exposure and high-vulnerability areas such as informal settlements and open-air markets. There is limited mention of actions to address the root causes of these drivers, such as deforestation, lack of education and awareness, and broader socioeconomic factors. Finally, there is only limited acknowledgment of future changes and how these actions will respond to them.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	There is evidence that several identified actions have been or are currently being implemented, including tree planting and reforestation, the installation of shade structures in open-air markets, and a pilot project to install cool roofs using mirror-reflective materials in informal settlements. However, it is unclear whether potential maladaptation risks have been considered.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	There is limited to no information available on the costs of heat adaptation options, although one of the stated goals is to mobilize seed funding to support heat adaptation efforts more broadly. A wide range of detailed benefits is highlighted for each identified action. However, there is generally limited cost-benefit analysis, and it remains unclear whether potential maladaptation risks have been considered.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Co-benefits between different heat adaptation and reduction actions are identified, along with how various adaptation options work together. However, there is limited to no mention of potential synergies or trade-offs between these options.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Heat adaptation strategies and actions are sequenced, with identified pathways that these actions can follow. However, it remains unclear to what extent a truly pathway-based approach, one that is flexible, iterative, and phased, is being applied.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring and evaluation of heat adaptation actions are acknowledged, particularly through the tracking of specific metrics. For certain actions, such as tree planting, the installation of shade structures, and heat season awareness campaigns, there is evidence of progress and results being monitored. However, it is unclear whether heat adaptation actions are being comprehensively monitored and evaluated, or whether mechanisms for course correction are in place.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	There is some initial evidence of potential reductions in heat risk from tracked and monitored heat adaptation actions, such as the number of residents reached through awareness campaigns, trees planted, and cooling benefits provided by shade structures. However, evidence could be more thoroughly collected to evaluate effectiveness, sustainability, community consensus, and other key outcomes.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no mention of evidence in reducing maladaptation risk.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	Heat governance structures are in place through the Chief Heat Officer, the Office of the Chief Heat Officer, and the Climate and Environmental Department. Looking ahead, there are goals to establish inter-agency coordination mechanisms and an extreme heat task force. There are also plans to formalize and integrate Freetown's "Heat Action Plan" into city regulations and policies, particularly within Sierra Leone's National Adaptation Plans.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	Detailed and clearly defined strategic partners have been identified across city offices and departments, technical agencies, and non-governmental organizations to support heat adaptation goals and actions. Within the Freetown City Council team, individuals are designated to provide technical expertise and advice on climate science, climate adaptation, and environmental issues. In addition, several heat adaptation actions focus on building capacity among both city staff and the broader population.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Funding has been used to support and implement heat adaptation efforts. However, additional seed funding is currently being identified to sustain and expand these efforts across the city.

References

Climate Resilience for All. (2025). *Freetown heat action plan*.
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Kisumu, Kenya

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Kisumu, Kenya
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Heat is identified for Kisumu in recent research and county-level planning documents. Research studies introduce definitions and thresholds of heatwaves. It is suggested that forthcoming Heat Action Plans will distinguish between acute heat waves and longer-term rising temperatures. Note: studies and plans are for Kisumu country rather than city.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Drivers are identified, mostly at the county scale or discussed in larger scale assessment for the case of Kisumu. Some detail is provided in the Participatory Climate Risk Assessment Report.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Hazard is projected with low detail: increased duration of heat and extreme heat conditions by about 9 to 30 days

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Difficult to score. No plan exists at present, yet Kisumu country is currently in the process of developing a Heat Action Plan (HAP). “**The Heat Action Plan Initiative focuses on three main goals: addressing immediate needs, promoting long-term strategies, and integrating plans into national strategies. It develops emergency response measures, such as early warning systems and public health efforts, while mobilizing investments and resources. In addition, it emphasizes sustainable urban planning, infrastructure improvements, and alignment with existing policies for a comprehensive response to heat waves.**”

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Goals exist. There is not a plan with short and longer term goals. Rather there are short term goals and an indication of future work. Goals are to be designed to address both the immediate dangers of acute heatwaves and the long-term challenges posed by rising mean temperatures. From the different document shorter and longer term goals can be deduced.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The community participatory risk assessment covers a range of climate hazard, with heat being a (minor) one. Formally the Kisumu County Climate Change Act 2020 mandates a "bottom-up" institutional arrangement. Formal Institutional Structures and participatory planning mechanisms are specified (not for heat specific). There are initiatives such as Voices for Climate Action https://voicesforjustclimateaction.org/news-and-views/climate-change-adaptation-planning-for-resilience-in-kisumu/ I score 2 for heat adaptation, as there is little has focus on heat. I cannot tell how the heat action plan is developed now. Could be 3.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	A range of actions addressing heat hazards has been identified across multiple strategic documents, including the Kisumu County Integrated Climate Change Action Plan (KCICCAP 2022–2027) [little attention to heat specifically] and the National Cooling Action Plan (NCAP) [most attention to cooling techniques]. Nature based solutions are mentioned, yet not specifically as heat planning an / or in research reports & papers.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Kisumu county has identified actions aimed at addressing both the physical drivers of heat exposure (such as the Urban Heat Island effect) and the socio-economic drivers of vulnerability (such as poverty and poor housing quality or cooling in houses). Actions are not explicitly / detailed planned for Kisumu city or heat. Eg 'Green elements also moderate and reduce temperature and heat island effects in urban hard-surfaced environments' in a research plan for Kisumu waterfront

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Hard to say. Mostly through specific sectoral projects, pilots and the creation of governance structures. The KISUMU COUNTY CLIMATE CHANGE POLICY of 2019 does have a 5 year planning table and budget estimates. From a critical review such as [https://kisumuassembly.go.ke/wp-content/uploads/2025/07/PICPAC-REPORT-ON-THE-EXAMINATION-OF-AG-REPORT-ON-THE-FINANCIAL-STATEMENTS-OF-KISUMU-COUNTY-CLIMATE-CHANGE-FUND-FOR-THE-YEAR-ENDED-30-JUNE-2024.pdf] it can be suggested that more detailed costing and implementation reports exist within the adminstration.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Costs of actions are indicated in the Kisumu County Climate Change Act 2020, but very few relate to heat. Similar for losses (eg flood-related losses are estimated). Benefits are not quantified. An exception is the benefits for cold storage (or the lack thereof).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	This may be further elaborated in the forthcoming heat action plans. Most explicit elaboration is for cooling (technical) in the cooling plan (eg Refrigerant Environmental Impact). Tradeoffs are reported in articles, eg a study on urban greening and nature-based solutions potential.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	I cannot find evidence of an explicit pathways approach. The documents do specify timelines and prioritisation for a stepwise approach.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The Kisumu County Climate Change Action Plan (KCCCAP) 2023–2027 introduces a Measurements/Monitoring, Reporting and Verification (MRV++). This is not unique for heat. Implementation remains uncertain. Individual project can be evaluated. The NAP also has a (generic) chapter on Adaptation Monitoring and Evaluation.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	At best for pilots

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	The concept is recognised in the NAP and the county climate plan. It also motivates the cooling plan.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Partially implemented also to develop the heat action plan. Governance is established for Kisumu County Climate Change Act 2020 (not heat specific), including Ward Climate Change Planning Committees (WCCPCs) established in all 35 wards. And the FLLOCCA (Financing Locally Led Climate Action project) process. For FLOCCA there is also a FLLOCA PROGRAM GRIEVANCES REDRESS MECHANISM (GRM) where in principle heat could be raised [https://www.kisumu.go.ke/wp-content/uploads/FLLoCA-GRM-FRAMEWORK-FOR-KISUMU-COUNTY.pdf] i have not found evidence that it was.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise is available yet rather sectoral and scattered.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Funding was made available for the development of the heat action plan. In the adaptation plans there is very little attention to heat. listed pilots and upcoming actions / projects are not in the domain of heat. Wards may have prioritized heat related measures in their FLLOCCA process.

References

County Government of Kisumu. (2023). *Kisumu County Climate Change Action Plan (KCCCAP) 2023–2027* [Climate change action plan]. https://maarifa.cog.go.ke/sites/default/files/2024-06/FINAL%20KISUMU%20CCAP%202023-2027.pdf

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[this version is more about cooling techniques and mitigation concerns [charts the best possible path for accommodating current and future cooling demand while minimizing possible impacts on the environment,especially climate impacts]. For the future it aims to include: urban planning and building design to reduce overall heat stress]

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Kisumu, Kenya
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	The current heat hazards are identified across several sectors such as health and livelihoods. There is moderate evidence of rising temperatures and heatwaves as significant hazards in Kisumu County Integrated Climate Plan.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The current drivers of heat exposure and vulnerability are clearly documented. The Kenya National Adaptation Plan to the local Kisumu County Climate Change Action Plan acknowledge that rapid urbanization, loss of green spaces and the socio-economic factors are the major drivers of exposure and vulnerability.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	The future risks are exposed through the Global Climate Modelling (GCM) data with the mean actual temperature projected to increase by 0.8 to 1.5 degrees Celsius by the 2030s and up to 3 degrees Celsius by 2100. Infrastructurally, increased heat is projected to reduce the life of asphalt and facilitate the spread of vector - borne diseases. However, these projections lack the local context of Kisumu County.

2. Adaptation plan

Confidence score:	1

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated heat adaptation plan. Instead, heat adaptation is just mentioned and mainstreamed into broader sectoral actions in infrastructure, urban planning, agriculture and health among others.

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	There are no set up short- or long-term goals with regards to heat adaptation.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	There is the National Climate Change Council chaired by the President and the Climate Change Directorate to provide overarching coordination, the Kisumu County Climate Change Council and the local Ward and Village Climate Change Planning Committees to identify and prioritize local adaptation needs. However, there is vagueness and no clear plan to respond to heat challenges.

3. Adaptation Actions

Confidence score:	1

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	They are broadly identified but lack relevance of the local Kisumu context.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Actions such as insulation for roofs and walls, natural ventilation and lighting, massive afforestation are identified to address the driver is several places, however, there is no clear action for Kisumu.

3.3 Are identified actions being implemented?

Assessment score:	0
Rationale:	No action has been explicitly implemented to address heat.

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4. Adaptation strategy

Confidence score:	0

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No costs and benefits for heat adaptation options are analyzed yet.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No identified synergies and trade-offs, hence cannot be assessed at the moment.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No heat adaptation options have been planned independently and organized to suit the Kisumu context.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	With the adaptation options non-existent in Kisumu, there is no monitoring and evaluation plan in place.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Afforestation and cool roofs have been proven to reduce heat risk in communities, but there is none in Kisumu at the moment.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no identified evidence at the moment.

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6. Heat governance

Confidence score:	0

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	There is no specialized heat governance structure established, instead the governance is handled through the general climate change institutions such as the National Climate Change Council and the Climate Change Directorate.

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	No identified technical expertise is in place and accessible.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No funding is in place to address any heat related problems.

References

County Government of Kisumu. (2023). *Kisumu County Climate Change Action Plan (KCCCAP) 2023–2027* [Climate change action plan]. https://maarifa.cog.go.ke/sites/default/files/2024-06/FINAL%20KISUMU%20CCAP%202023-2027.pdf

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County Government of Kisumu. (2020). *The Kisumu County Climate Change Act, 2020 (No. 7 of 2020)* [County legislation]. https://slo-countybills.go.ke/api/v1/bill/pdf/M6WQYXYWYN_07_The%20Kisumu%20County%20Climate%20Change%20Act,%202020-converted.pdf

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Republic of Kenya, Ministry of Environment and Natural Resources. (2016). *Kenya National Adaptation Plan 2015–2030* [National adaptation plan]. https://www4.unfccc.int/sites/NAPC/Documents%20NAP/Kenya_NAP_Final.pdf

Lagos, Nigeria

Scoring sheet

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City case study:	Lagos, Nigeria
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Current heat hazards in Lagos are well documented and clearly identified across multiple sources. Obe et al. (2023) provide the most detailed and locally specific assessment, using an urbanised WRF model to simulate the March 2020 heatwave. Their study maps Humidex-based heat stress at 100 m resolution and shows that large parts of Lagos experience severe heat stress, with particularly intense night-time heat conditions in highly urbanised Local Climate Zones (LCZ 3, 6, and 7). This includes dense neighbourhoods such as Mushin, Lagos Mainland, and Surulere. The study confirms that Lagos faces both chronic heat stress (persistently high temperatures and humidity) and acute, short-duration heatwaves, which increasingly occur earlier in the year. Obe et al. (2023) also characterise Lagos as a “hotspot of extreme humid heat,” where high humidity magnifies thermal stress compared with inland West African cities, making heat exposure physiologically dangerous even at moderate temperatures. This is reinforced by Gallogly (2024), who, in The New York Times, describes Lagos as being on the front line of an emerging “cooling crisis,” with residents routinely exposed to indoor and outdoor heat hazards due to poor ventilation and unreliable electricity. At national level, the Nigeria National Adaptation Plan (2024) identifies extreme heat as a priority climate hazard, and Lagos is repeatedly cited as one of the regions facing the highest projected temperature increases and the most intense heat impacts due to its coastal, densely built environment.

Assessment score:	4
	The Lagos Climate Action Plan explicitly identifies heat stress and urban heat island effects as priority climate hazards affecting multiple Local Government Areas, providing clear local hazard recognition that supports a higher score. Overall, evidence identifies both current heat hazards and their observed impacts. While extremely detailed, neighbourhood-level analysis exists, complex cascade interactions (e.g., heat–power grid–health system risks) are not fully elaborated, so this aligns with a score of 4.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Current drivers of heat exposure and vulnerability are identified with substantial depth across multiple Lagos-specific studies: Obe et al. (2023) offer a detailed heat-risk assessment that decomposes risk into hazard, exposure, and vulnerability, showing that densely built LCZs (LCZ 3, 6, 7), informal settlements, and slum areas such as Makoko and Ajegunle face heightened heat exposure due to overcrowding, poor-quality housing, limited vegetation, and low incomes. Obe et al. (2023) also highlight rapid urbanisation, deforestation, informal settlement expansion, and extensive land reclamation as structural drivers that intensify the urban heat island effect across Lagos. Gallogly (2024), in *The New York Times*, emphasises critical infrastructure-related drivers such as unreliable electricity, limited access to air-conditioning, dependence on small generators, and poorly ventilated housing, all of which severely reduce residents' capacity to cope with extreme heat. Nigeria's National Adaptation Plan (2024) identifies poverty, fragile infrastructure, informal housing, and inequality as national-scale vulnerability drivers, all of which manifest strongly in Lagos's urban metabolism. Abubakar et al. (2025) demonstrate that dense urban form, insufficient green infrastructure, weak planning enforcement, and dependence on fossil-fuel energy systems increase heat exposure and reduce adaptive capacity. Okunola & Bako (2021) provide empirical evidence from 384 Lagos households showing that socio-economic characteristics, including income, education, age, housing type, tenure, and residential density, significantly influence adaptation capacity. Their results reveal that poorer, high-density areas (e.g., Ijora Badiya) face intense heat vulnerability due to overcrowding, poor ventilation, substandard housing materials, and inadequate services, while wealthier areas have more effective coping mechanisms. The study also documents that 71.6% of Lagos residents perceive heat intensity as "very intense," further confirming widespread exposure to heat. Together, this evidence captures social drivers (poverty, age, education, and income), environmental drivers (vegetation loss, urban morphology, and land-use change), and infrastructure drivers (housing quality, electricity reliability, and ventilation). While highly comprehensive, further analysis of infrastructure-system fragilities (e.g., health system capacity, cascading failures) is limited, so a score of 3 is appropriate.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks for Lagos are acknowledged but only partially projected. Obe et al. (2023) note that Lagos will experience more frequent and intense extreme humid heat events under 1.5°C–2°C global warming, and they highlight that rapid urbanisation and vegetation loss will likely expand future heat hotspots. The Nigeria National Adaptation Plan (2024) also projects rising temperatures and increased hot days and nights at the national scale, which are directly relevant for Lagos. The Lagos Climate Action Plan projects increasing annual temperatures and more frequent extreme heat events, strengthening evidence that future heat risks are formally recognised within city planning processes. However, no study provides detailed, city-specific future climate scenarios or integrated projections linking future hazards with exposure and vulnerability trends. This corresponds to a score of 3

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	There is no dedicated heat adaptation plan for Lagos. The Lagos Resilience Strategy (2018) identifies climate change, flooding, heat stress, and environmental degradation as cross-cutting challenges; however, it does not establish a formal heat-specific framework with defined goals, timelines, roles, or budgetary commitments. Similarly, Abubakar et al. (2025) describe Lagos's climate planning landscape as fragmented across urban planning, environmental management, and disaster risk reduction, none of which contain a structured heat-adaptation component. The Nigeria National Adaptation Plan (2024) provides national-level guidance on extreme heat but does not establish a state or municipal heat strategy for Lagos.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Lagos has climate-related and resilience-oriented goals, but none are explicitly framed as heat adaptation targets across short-, medium-, and long-term horizons. The Lagos Resilience Strategy sets medium-term priorities (e.g., green infrastructure expansion, improved environmental management, better energy access), which have indirect benefits for heat mitigation. However, there are: • no short-term goals specifically targeting heat, • no measurable medium-term heat outcomes, and • no long-term (>10 years) heat-related commitments. Abubakar et al. (2025) also emphasise that Lagos lacks structured long-term adaptation planning and that existing climate goals are fragmented across sectors without heat-specific indicators. The Nigeria National Adaptation Plan (2024) includes national long-term climate objectives but does not translate them into municipal heat-specific goals for Lagos.

Assessment score:	1
	Because goals exist but are not explicitly heat-focused and do not span the full short- to long-term range, the score aligns with 1.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Stakeholder engagement is present in Lagos, but primarily through broader resilience, climate, and urban planning processes, rather than heat-specific engagement. The Lagos Resilience Strategy was developed through a multi-stakeholder process that involved civil society, private sector actors, transport unions, community organizations, academia, and local government departments. Engagement occurred through workshops, surveys, focus groups, and sectoral consultations. Abubakar et al. (2025) confirm that Lagos uses stakeholder forums and participatory approaches in urban planning and environmental governance, although they note inconsistency in how these engagements are implemented across districts. However: • There are no dedicated heat adaptation engagement processes, • Engagement is mostly consultative rather than co-productive, and • There is limited evidence of mechanisms that give communities ongoing decision-making influence on heat-related issues. Because engagement is present but not heat-specific, and the depth of participation is moderate, the score is 2.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Lagos has identified several actions that *indirectly* address heat hazards, although they are not framed as heat-specific interventions. The *Lagos Resilience Strategy (2018)* outlines actions such as: expanding urban green spaces and parks, rehabilitating wetlands and coastal ecosystems, improving public transportation to reduce vehicle emissions, strengthening environmental sanitation and drainage systems. These interventions help reduce urban heat island (UHI) effects and improve thermal comfort but are not explicitly labelled as heat adaptation. Abubakar et al. (2025) also highlight Lagos's recent focus on nature-based solutions, urban greening, energy transition projects, and environmental management, all of which mitigate chronic heat stress by improving ecological regulation and reducing

Assessment score:	3
	built-up density. The Lagos Climate Action Plan identifies concrete actions such as large-scale tree planting and nature-based solutions explicitly designed to reduce urban heat island effects and improve thermal comfort. However, no formal, comprehensive list of heat-specific actions exists, and the city does not yet conceptualize these actions as part of a dedicated heat risk portfolio. Therefore, a score of **3** is appropriate.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	There is strong evidence that Lagos has identified multiple actions targeting the drivers of heat exposure and vulnerability, even if these actions are not explicitly linked to heat adaptation. Key examples include: • Urban green infrastructure (tree planting, green buffers, wetland restoration) identified in the Resilience Strategy as mechanisms to reduce environmental degradation, improve air quality, and cool dense neighbourhoods. Housing and settlement upgrading, including slum improvement and redevelopment programmes, which address overcrowding, poor ventilation, and low building quality, major drivers of heat vulnerability. Abubakar et al. (2025) note that these reforms help reduce exposure in high-risk LCZs. • Electricity access and energy reforms, mentioned by Gallogly (2024) as essential for reducing vulnerability caused by unreliable electricity and low access to cooling appliances. While these efforts remain partial, they directly target infrastructural drivers of heat stress. • Socio-economic vulnerability interventions, including social protection measures and planning reforms that indirectly improve adaptive capacity. Okunola & Bako (2021) highlight that income, educational level, tenure, and household density are core determinants of climate adaptation capacity in Lagos; several ongoing programmes aim to strengthen these factors. Although these actions address people, infrastructure, and ecosystems, they are not organised into a heat-focused framework. Nonetheless, they demonstrate meaningful attention to underlying drivers, justifying a score of 3.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is evidence that Lagos is implementing a variety of environmental and resilience-related actions, but the verification of implementation is moderate, and actions are not explicitly linked to heat adaptation outcomes. Implementation examples include: urban greening projects led by the Lagos Parks and Gardens Agency, wetland and coastline restoration, traffic and transport reforms (e.g., BRT expansion), slum upgrading initiatives and environmental sanitation improvements, drainage and flood-control projects with co-benefits for heat mitigation. Abubakar et al. (2025) confirm ongoing implementation of nature-based solutions,

Assessment score:	2
	urban renewal projects, and environmental reforms aimed at improving urban liveability and climate resilience. Okunola & Bako (2021) note that households are also engaging in autonomous adaptation actions, such as shading, ventilation improvements, and behaviour changes, although these are reactive and not formally coordinated. However: Implementation lacks detailed monitoring indicators. Verification data (e.g., extent of greening, project completion rates) are not systematically documented. Maladaptation risks are not evaluated. Given partial but credible evidence of implementation, a score of **2** is appropriate.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	Neither the Lagos Resilience Strategy nor related planning documents provide a cost–benefit analysis for heat adaptation options. Benefits of greening and environmental management are described qualitatively, but no economic or multi-dimensional analysis is presented.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Synergies (e.g., between green infrastructure, mobility reforms, and environmental management) are mentioned indirectly, but no formal assessment of heat-related synergies or trade-offs exists. There is no analysis across timeframes or sectors.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Lagos has medium-term resilience priorities, but no heat-specific pathway, sequencing logic, or iterative planning framework is documented. Long-term (>10 years) heat adaptation pathways are not articulated.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	There is some evidence of monitoring processes within Lagos's broader resilience and environmental management systems, particularly through agencies involved in parks, gardens, drainage, and environmental sanitation. The Lagos Resilience Strategy outlines follow-up mechanisms for project implementation and interdepartmental coordination, indicating the presence of general monitoring and evaluation (M&E) structures. The Lagos Climate Action Plan introduces implementation indicators and tracking mechanisms, indicating a more structured monitoring framework than previously reflected in earlier assessments. However, none of these mechanisms are heat-specific, and no measurable indicators (such as canopy increase, surface temperature change, or community heat-health metrics) are defined. Evaluation results for implemented actions, such as greening, wetland restoration, or settlement upgrading, are not systematically documented or publicly reported. This aligns with a score of 1, reflecting preliminary but incomplete monitoring and evaluation (M&E) practice.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	Although Lagos has implemented several interventions with potential co-benefits for heat reduction, including green infrastructure, wetland rehabilitation, and mobility improvements, there is no documented evidence demonstrating that these actions have directly reduced heat risk. Studies by Obe et al. (2023) and Abubakar et al. (2025) highlight ongoing environmental and planning reforms; however, neither provides empirical measurements of reduced heat exposure, lower indoor temperatures, or improved heat-health outcomes resulting from government actions. Similarly, journalistic evidence (e.g., Gallogly 2024) emphasizes persistent heat stress and infrastructural challenges, suggesting that any reductions, if present, are not yet measurable or attributed to policy interventions. Therefore, available evidence does not confirm reductions in heat risk, warranting a score of 0.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no available evidence that Lagos formally monitors, evaluates, or reports maladaptation risks related to heat. Neither the Lagos Resilience Strategy nor related urban planning studies assess whether specific interventions may unintentionally worsen heat exposure, for example, increasing the use of heat-trapping materials, expanding impervious surfaces, or creating inequitable access to cooling. Furthermore, none of the available documents identify maladaptation indicators or offer assessments of potential unintended consequences. As a result, the appropriate score is 0.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	There is no dedicated heat governance structure in Lagos, no Chief Heat Officer, heat taskforce, heat action office, or institutional unit focused on extreme heat. The *Lagos Resilience Strategy (2018)* outlines governance for broader resilience issues, including climate change, flooding, environmental degradation, and infrastructure failure, but heat is not given a formal governance mandate, institutional role, or cross-departmental coordination mechanism. The Lagos Climate Action Plan establishes governance structures including a Climate Change Council, Technical Committee, and Secretariat, demonstrating institutional arrangements relevant to climate and heat-related coordination. Urban planning research (Abubakar et al., 2025) further indicates fragmentation across environmental management, planning, and disaster risk agencies, with no explicit governance arrangements for heat adaptation. Thus, the appropriate score is 2.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Lagos possesses general environmental and planning expertise, but there is little evidence of heat-specific technical capability. The Lagos Resilience Strategy identifies technical roles in environmental management, parks and gardens, public health, transportation, and drainage, indicating that expertise for resilience work is available. The governance framework outlined in the Lagos Climate Action Plan assigns technical responsibilities to expert committees and a climate secretariat, improving accessibility to climate-related technical expertise. However, none of these teams focus specifically on heat risk assessment, thermal comfort science, urban climatology, or heat-health surveillance. Abubakar et al. (2025) also highlight gaps in institutional capacity for climate adaptation more broadly, especially in integrating science-based evidence into municipal planning. While studies such as Obe et al. (2023) provide strong academic expertise on Lagos's heat risk, this expertise is external and not embedded in city governance structures. Because expertise exists but is not heat-specialized or consistently accessible within government, the score is 2.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	The Lagos Climate Action Plan identifies financing pathways including government budgets, donor support, and public–private partnerships, indicating emerging, though not ring-fenced, funding mechanisms relevant to heat adaptation. The Lagos Resilience Strategy outlines broader funding for environmental management, flood control, transportation, and urban development, but none of these allocations are earmarked for heat adaptation. Similarly, Abubakar et al. (2025) emphasize the need for fragmented and project-based financing for climate-related interventions, with no long-term funding framework in place for heat-related measures. Nationally, the Nigerian NAP (2024) recognizes extreme heat as a priority hazard; however, it does

Assessment score:	1
	not provide city-level financing mechanisms for Lagos. Given the absence of ring-fenced or sustainable heat financing, the score for this question is 0.

References

Lagos State Government. (2020). *Lagos Resilience Strategy* [Report]. Lagos State Resilience Office. https://lasbca.lagosstate.gov.ng/wp-content/uploads/2021/05/Lagos_Resilience_Strategy.pdf

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Lagos, Nigeria
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	The documents identify both chronic heat hazards such as the historic increase in mean surface temperatures, citing sources. As well as acute events through the modelling of Humidex-based heat stress during a specific heatwave event. This modelling was done at a local scale for Lagos, considering total population exposure and LCZs, to identify heat vulnerable zones across the city.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes, the assessment of heat risk in Lagos considers a range of heat exposure and vulnerability drivers by combining spatial coincidence of hazard, exposure, and vulnerability based on Crichton's Risk Triangle. In particular the combined impact of humidity, age (young and old), urban heat island effects in densely populated and low-vegetation areas, as well as a relative wealth index. The Lagos Resilience document also identifies a range of vulnerabilities across sectors that impact on the city's capacity to deal with climate shocks.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	There is little evidence of projected heat risk at a local scale. What is referenced includes an IPCC report estimating increases in mean surface temperature under different RCPs for Nigeria as well as estimates of heat stress assuming population increases and urban slum expansion under excessive growth scenarios.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated heat adaptation plan at either the city or national level. While some of the goals in the resilience plan for Lagos would work to reduce heat exposure they are not targeted at heat reduction and there is no evidence of heat as a priority risk. There is a state level climate adaptation plan that identifies extreme heat as a risk and includes actions to reduce exposure.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	The Lagos resilience plan details timeframes as short, medium, and long term goals (>4 years). The goals are detailed and explicit however they do not address heat but rather general capacity strengthening to combat shocks (of which climate change is identified). The Lagos state CAP does identify specific heat adaptation goals but these are all >5 year timelines, no range.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The Nigeria adaptation plan identified stakeholder engagement and lists community-based adaptation as a potential tool for implementation but there are no details. The Lagos resilience plan details several stakeholder engagement activities during the development phase including strategy development workshops aimed at identifying shocks and refining the initiatives. Some of the actions detail a community-led approach to implementation but it is not specific. There is also mention of a Resilient Lagos Forum with a remit to contribute to the refinement of the plan.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Actions identified at the local scale for Lagos city do not specifically target heat reduction. Heat is not specifically identified as a hazard. The Lagos state CAP lists some actions related to heat e.g. planting more trees for shading and cooling, particularly near markets, as well as NBS.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Many of the actions identified by the resilience plan target vulnerability, particularly economic and built environment but they are not considered in relation to heat.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	While not resulting from an adaptation plan per say, there is evidence from a systematic review assessing Lagos' implementation of UN-Habitat's recommended urban planning responses to climate change. Actions related to green buildings, renewable energy generation, and urban greening schemes have been implemented.

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4. Adaptation strategy

Confidence score:	0

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	Costs and benefits for heat adaptation are not analysed

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No evidence of synergies and trade offs for heat adaptations. More general resilience goals do have synergies and co-benefits listed but not for heat.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Yes adaptation actions are assigned timelines (short, medium, and long), each goal/action also includes a breakdown of next steps ranging from 3 months to 1 year. However these are not specific to heat. The Lagos state CAP which does

Assessment score:	1
	detail some actions targeted at heat reduction also provides a sequential pathway for implementation and incorporates interim targets and review processes.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Potential M&E processes are identified, but are preliminary, the documents have planned the development of a framework to monitor progress through established data sets. The plans also include the dissemination of a biennial report containing both quantitative and qualitative assessment of progress. Finally the plan includes periodic review and iteration.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	There is no evidence of reduced heat risk post-implementation of adaptations.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no evidence of reduced maladaptation risk post-implementation of adaptations.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Governance for climate change adaptation is established (Lagos state CAP identifies heat specifically as a risk).

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	The national plan identifies a technical working group, various departments and affiliated research centres. The resilience plan also references several departments responsible for overseeing implementation of the actions, as well as potential partners including NGO's, research institutes, city-level boards etc but these do not specifically address heat.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	The Lagos state CAP identifies potential internal and external sources of funding but there is no evidence that these have been secured. The national plan also mentions barriers to financing resulting from the low provision of climate funding in national budget lines.

References

Lagos State Government. (2020). *Lagos Resilience Strategy* [Report]. Lagos State Resilience Office. https://lasbca.lagosstate.gov.ng/wp-content/uploads/2021/05/Lagos_Resilience_Strategy.pdf

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Lusaka, Zambia

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Lusaka, Zambia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	High temperatures and heat hazards have been identified as one of the main hazards affecting several sectors, making it a priority when drafting climate change-related policies and adaptation strategies (National Adaptation Plan for Zambia, 2023). However, most emphasis is on agriculture and droughts rather than the effects of extreme heat.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The vulnerability elements are clearly stated and described in the National Adaptation Plan (Table 5).

1.3 Are future heat risks projected?

Assessment score:	0
Rationale:	There is no evidence of projected heat risks in Zambia. The emphasis is on enhancing urban resilience to extreme heat, elucidating strategies tailored to the current country's socio-economic, geographical and climatic characteristics (Mpezeni and Shi, 2025). Not future risks are clearly projected.

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated heat adaptation plan. Zambia has put more emphasis on droughts and floods as priority areas of interest, classifying heat as a medium hazard, with slow progress towards a specific heat adaptation plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	The adaptation actions and goals are generic, with no specified timeframes (National Adaptation Plan for Zambia, 2023).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Only the target groups and communities are identified. There is no clearly stated evidence of engagement mechanisms.

3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	The actions to address the heat hazards are identified by sector, province and agro-ecological region (National Adaptation Plan of Zambia, Table 5).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Only actions to address heat hazards are identified; there is no clear evidence of addressing the drivers of heat exposure and the vulnerabilities.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is an implementation plan, but only a few measures have been taken to implement the identified actions in dealing with extreme heat. For example, the Disaster Management and Mitigation Unit in Zambia has played a pivotal role in addressing challenges posed by extreme heat. Government of Zambia (2021) notes that the DMMU has effectively communicated heat risks to communities, enabling them to prepare and take necessary precautions. However, there is no evidence of other actions such as the provision of climate-smart cooling facilities and increased investments in the development of new climate-resilient infrastructure, inter alia.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	There is no evidence of the analysed costs and benefits of the heat adaptation options. Adaptation actions or options are just mentioned with no clear analysis of their pros and cons.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	There is no evidence of assessed and documented synergies and trade-offs

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	The National Adaptation Plan of Zambia (2023) has not prioritised heat adaptation, hence the dearth of planned adaptation options in an organised approach.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	There is a monitoring and evaluation plan for the adaptation strategies; however, there is no evidence of the stated adaptation options being monitored and evaluated.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence of heat reduction was found.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no stated evidence of maladaptation risk.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	The available governance structures are for the broad climate change adaptation, and not specific to heat-related events.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	The Disaster Management and Mitigation Unit is in place and accessible, but no heat-relevant expertise has been documented to exist and assist these communities in adapting to extreme heat events.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	There is no dedicated and sustainable heat adaptation funding for Zambia. For example, the Climate Investment Fund (CIS) endorsed a $34.65 million investment plan to harness the transformative potential for lasting climate-positive change in Zambia. This is meant to boost a low-carbon climate-resilient economy, agricultural productivity and forest protection. There is no mention of specific heat adaptation funding initiatives.

References

Happy Mpezeni, & Shi, Y. (2025). Enhancing urban resilience to extreme heat in Zambia: Strategies and interventions in infrastructure planning. *International Journal of Social Sciences and Public Administration, 6*(1), 203–224. https://doi.org/10.62051/ijsspa.v6n1.25

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https://www.cif.org/news/climate-investment-funds-endorses-over-34-million-nature-based-solutions-zambia

Scoring sheet

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City case study:	Lusaka, Zambia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	There is substantial reference to extreme heat events and rising temperatures in literature. There is also reference to the Urban Heat Island (UHI) Effect. Assessments are largely done in the context of specific project and in the larger context of climate change. Differentiation for different contexts and scales in Lusaka is limited.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Detail is there for selected neighborhoods in dedicated studies (eg Chibinga et al). Yet the level of detail varies strongly over the city. Vulnerability factors are mostly identified for a number of climate related hazard, and not necessarily for heat only. Various drivers, such as socioeconomic, planning, environmental, are identified.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	future heat risks are projected, in particular anticipated increases in temperature and the frequency and intensity of heat-related events. Projections are at a course scale and can be both quantitative and qualitative. Vuln and exposure projections are often qualitative. Eg the NAP highlights that temperatures in Zambia are projected to

Assessment score:	2
	increase by 1.9°C by 2050 and 2.3°C by 2100. It also discusses projected diurnal temperature ranges for 2021-2050 and 2071-2100, with socio-economic impacts. More qualitative / contextual approaches are also used in the context for projects, eg the FRACTAL project utilized Climate Risk Narratives—descriptions of Lusaka under different scientifically plausible "future climate conditions".

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	I could not find a dedicated heat adaptation plan for Lusaka. Heat risks are addressed within broader climate change adaptation frameworks and through general urban planning efforts. There is dedicated research at national or neighbourhood level such as: Enhancing Urban Resilience to Extreme Heat in Zambia: Strategies and Interventions in Infrastructure Planning

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	there is no single, dedicated heat adaptation plan specifically for Lusaka, heat risks are addressed within broader climate change adaptation frameworks and through general urban planning efforts. From these documents one can stitch together a range of short- to long-term goals. This set would not be comprehensive.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	there are various stakeholder and community engagement mechanisms in place for although their effectiveness and consistency have been reported to vary. These are also not dedicated to heat adaptation specifically. Activities are often in the context of timebound projects / research.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes a range of actions has been identified. Future hazards are considered, yet with very limited consideration of city details.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions addressing the drivers of heat exposure and vulnerability have been identified across various sources (plans, research (eg Mpezeni, H., & Shi)). These often lack detail.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	actions are reported to be implemented in Lusaka, although efforts are often fragmented and face many challenges. These actions span policy, urban planning, green infrastructure, early warning systems, community engagement, and infrastructure development.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	The analysis of costs and benefits for heat adaptation options is acknowledged in the NAP as crucial, yet i could find very little evidence in documents.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Less between heat adaptation options. I can find evidence of tensions between green spaces and city planning /development, even though the value of green spaces is recognised for moderating heat. Similar it is recognised that “Lusaka's affluent, vegetated neighbourhoods show lower heat vulnerability, while unplanned settlements with minimal vegetation show higher vulnerability”

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Short and longer term measures are identified, yet no pathways planning. Selected projects / papers recognise the value of pathways approaches,

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	While Zambia has established a NAP which includes a MEL Framework for adaptation actions at national and sub-national levels, i could not find evidence of consistent formal monitoring and evaluation of heat adaptation actions in Lusaka. Taylor et al write that within city planning, there are signs of inconsistency and lingering confusion as to how identified climate risks translate into priority actions and relevant outcomes to be monitored. For example, the single indicator assigned to the climate change adaptation and mitigation programme is the number of trees planted.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Literature indicates that heat adaptation measures are still at a low level or have limited city-wide impact. There is recognition that neighbourhoods with extensive vegetation cover, such as Kabulonga and Tukunka, already exhibit lower heat vulnerability due to sparse built-up areas and extensive greenery.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	The risk of maladaptation is recognised, yet not elaborated much. Tradeoffs between green spaces and urban planning are reported.

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	A foundation of governance structures exists or is in the process of being developed in Lusaka, although implementation and effectiveness face substantial challenges. Structures are not specific for heat adaptation

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Quite a lot of studies, projects and recognition in recent MSc Theses. Expertise primarily through academic institutions, government units, and various collaborative initiatives.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Dedicated and sustainable heat adaptation funding is largely absent and (heat) adaptation funding faces substantial challenges.

References

Happy Mpezeni, & Shi, Y. (2025). Enhancing urban resilience to extreme heat in Zambia: Strategies and interventions in infrastructure planning. *International Journal of Social Sciences and Public Administration, 6*(1), 203–224. https://doi.org/10.62051/ijsspa.v6n1.25

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Windhoek, Namibia

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Windhoek, Namibia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Current heat hazards in Namibia are broadly acknowledged through references to hot and dry climatic conditions, environmental vulnerabilities such as water scarcity, desert landscapes, and informal housing (specifically in Windhoek), as well as regional trends of long-term warming (1 - 1.2°C increase over the past 50 years), and regional IPCC evidence of more frequent hot days and nights in the southern African region. Heat stress was also acknowledged as a chronic environmental risk for informal settlements. However, there is limited evidence of: specific recent heat events (e.g., heatwaves); detailed characterisation of seasonal peak temperatures; population exposure; data on heat-related health impacts; or exceedances of thermal comfort indicators. While general heat risks are identified, particularly at the country-level, concrete evidence of acute or recent heat hazards or a local definition of hazardous high heat remains lacking for Windhoek.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, the current drivers of heat exposure and vulnerability are well documented. These include Namibia's climatic and geographic conditions (hot and arid climate), desert landscapes, and patterns of rural-to-urban migration. Changes in land use, particularly the decline in bushlands and the expansion of informal settlements, are also noted as contributing factors. Informal settlements are characterised by insecure land tenure, habitation in marginal or high-risk areas, and inadequate

Assessment score:	3
	access to basic public services such as energy and sanitation. In addition, socioeconomic vulnerabilities such as poverty, inequality, extant burden of disease (HIV and potentially water-borne disease due to defecation practices along river slopes), and low levels of education further reduce adaptive capacity and limit access to resources for cooling, thereby increasing population vulnerability to extreme heat. Vulnerability and risk assessment for human settlements in Namibia was tabulated. Limited adaptation capacity was formally assessed under future climate projections (Adaptation at Scale in Semi-Arid Regions (ASSAR) project).

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat hazards in Namibia are clearly projected and supported by credible sources and climate models, including the Intergovernmental Panel on Climate Change (IPCC, 2018) and using the HadGEM2-CCLM4 model, allowing for detailed, location-specific projections through regional downscaling (assumed). Projections are provided for short-, medium-, and long-term timeframes (2035, 2065, and 2100), with estimated temperature increases, decreases in precipitation, and a rise in the frequency and intensity of heatwaves. Projections for central Namibia, where Windhoek is located, indicate the greatest temperature increases (rises of up to 4°C by the 2040s). Specifically, heat stress (number of days of exposure) is projected to increase under different GHG emission scenarios. There is also an acknowledgement that without action increasing climate variability will threaten, among other things, health. There is limited evidence of other models or projections focused on exposure, population demographics, or epidemiology that consider impacts.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is no dedicated heat adaptation plan for Windhoek or Namibia as a whole. However, heat is indirectly addressed within broader climate change adaptation frameworks. National-level strategies including the National Climate Change Policy and the National Climate Change Strategy and Action Plan acknowledge rising temperatures as part of broader climate risks. As well as the need for action - both mitigation and adaptation - against increasing climate variability which will threaten the achievement of the development goals. The City of Windhoek is currently developing its first city-specific Integrated Climate Change Strategy and Action Plan (ICCSAP) for 2019–2026. While this plan outlines key adaptation areas including water security and efficiency, biodiversity and ecosystem services, human settlements, healthy communities, and disaster preparedness, there is no explicit reference to extreme heat. However, it can be assumed that heat adaptation would be addressed within these target areas, particularly under human settlements and

Assessment score:	1
	healthy communities which are closely linked to heat exposure vulnerability and impacts respectively. The most comprehensive consideration of heat adaptation appears in the health sector. Increased temperatures are recognised as a chronic environmental risk in informal settlements. Adaptation actions in the health sector that may address heat include training health professionals, enhancing climate-related awareness, and climate-proofing the public health system.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	The ICCSAP climate response plan was due to be launched in 2019 with planned actions (including adaptation) until 2026 suggesting initial goal setting for addressing climate risks at the city-level. Namibia has planned a number of adaptation actions for the short term (2020–2025) and medium term (2020–2030). However there is no evidence of heat specific adaptation goals or associated timelines.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The development of the ICCSAP entails the co-production of knowledge for urban resilience. City decision-makers, community representatives (youth and informal settlements), and climate and social science researchers were brought together to participate in learning labs aimed at enhancing climate communication and bridging science and policy. Other evidence suggests that the guiding principles of climate policies in Namibia include stakeholder engagement and feedback. A NGO forum is also established to facilitate the participation of civil society in policy development.

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3. Adaptation Actions

Confidence score:	1

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Actions addressing heat hazards are recommended but there is no evidence that these have actually been incorporated into a plan e.g. growing non-invasive dryland-adapted tree species to provide shade and cooling, integrating water management and informal settlement upgrading programmes to pipe purified water through settlements, and restoring green spaces (these are specific to Windhoek). Stronger evidence for adaptation efforts that may reduce heat hazards are listed under the health sector including capacity strengthening, training, mainstreaming of climate-related awareness, and the development of climate-centred adaptation strategies, while these are more general they can be assumed to apply to heat. Other more general adaptation actions such as improved information flow and communication, water conservation, and infrastructure development are included

Assessment score:	2
	which may alter heat exposure but are non-specific.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Broader climate adaptation actions such as the diversification of crops, wetland management, infrastructure development, operation and maintenance, and supporting community-based adaptation are likely to reduce heat exposure and vulnerability, even if not specifically identified for heat. It is stated that areas related to water resources management and infrastructure are getting less attention in current programming (these are potentially critical adaptation points for heat). More focus on general development plans and programmes for settlement upgrading are identified, including building standards. What is lacking is adaptation measures for acute heat exposure, urban heat exposure, or informal housing characteristics (typically built outside of regulatory standards). There is evidence for specific projects that are working to decrease climate vulnerabilities (e.g Scaling Up Community Resilience to Climate Variability and Climate Change in Northern Namibia, with a Special Focus on Women and Children). Again much of this evidence is for the country, not specifically Windhoek or even urban areas.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	The documents refer to adaptation programmes and projects that are currently underway as well as those that have been recently completed. It is not clear which specific actions are being implemented and which if any of these are specially addressing heat. There is also evidence that the CoW Parks Division is already implementing innovative green infrastructure systems which could be expanded to benefit informal settlements, but is mentioned more generally.

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4. Adaptation strategy

Confidence score:	0

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	National reports have estimated GDP losses due to climate change impacts. The importance of a well-developed financing strategy is identified and there is a detailed cost estimated analysis for adaptation actions across priority sectors, some which will address heat exposure (e.g water resources, forestry) for the period of 2021-2030. However there is no evidence of the costs to implement heat adaptation actions specifically or a discussion of the financial benefits of reducing exposure. The development of an early warning system is estimated at USD 30,250,000 the co-benefits of which are stated as protecting human lives and to ‘save money in the

Assessment score:	0
	long run'. A number of co-benefits for implementing ecosystem based adaptations are listed but these are not tied to any financing. This is essential in understanding both the feasibility of the adaptation actions but also the value to the communities. Evidence-based research on the costs and benefits of climate change adaptation are identified specifically as a need.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Co-benefits of adaptation actions (some of which would directly address heat exposure) are clearly outlined. Such as planting trees in settlements for shade and air purification as well synergies between sectors that can enhance heat adaption actions (localized semi-purification facility for water from the Goreangab dam could be integrated into the upgrading programme of the CoW's Human Settlements Division, with water subsequently channeled through pipes for a street trees programme in the informal settlements). These are mostly considered as positive side effects rather than systematically assessed. Some adverse outcomes are mentioned in relation to greenspaces such as the current practice of harvesting wood/grass from riverbeds resulting in land degradation; increased risk of criminal activity, drowning, and mosquito activity. There is a big gap in the assessment of trade-offs related to energy or land costs or a direct comparison between different heat adaptation actions.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	There is no evidence that heat adaptation options are planned in a sequenced, pathway-based approach. The documents do indicate adaptation actions planned for short-term (2020-2025) and medium-term (2020-2030) across various sectors (some which will target heat exposure but these are not given in detail or with specific reference to heat. General development plans are planned in stages with specific timelines but a specific sequencing pathway is not identified for heat adaptation.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	Namibia's National-level climate policy provides a strategy for the development, implementation, and monitoring and evaluation of climate change mitigation and adaptation activities in Namibia. There also appears to be institutional management, coordination and reporting arrangements in place. Namibia is currently developing a

Assessment score:	0
	robust transparency reporting system on its NDC, which will also act as the monitoring and evaluation (M&E) instrument. However there is no list of indicators for heat exposure or a systematic framework for conducting M&E for heat adaptation. Monitoring, evaluation and reporting of the processes and impacts of adaptation actions to track the implementation of adaptation activities and the achievement of goals is identified as a critical need. The primary limitation appears to be from a lack of funding and technical capacity.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	An insufficient evidence base on the benefits of adaptation versus costs is highlighted as a gap in the implementation of adaptation actions. While rising temperatures and water insecurity are regularly referred to as risks and a range of adaptation actions are listed, there is limited evidence for the assessment of these at either a national level or within donor-funded projects.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no specific evidence of reducing maladaptation risk. There is some general consideration of potential maladaptation, particularly trade-offs associated with urban greening initiatives such as increased criminal activity, snakes, and risk of drowning following the rehabilitation of riverbeds which emerged from FGD with informal settlement dwellers in Windhoek. However careful consideration of these in adaptation planning is missing, as is empirical evidence for risk reduction in previously implemented adaptation actions.

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6. Heat governance

Confidence score:	0

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	At the city-level general governance related to environmental management and planning - parks, health, environment - is listed (particular activities for heat adaptation would likely fall under here). There is also a multi-sectoral national Committee on Climate Change which is responsible for the implementation and coordination of cross-sectional adaptation activities. While there are broader governance structures in place for adaptation which could focus on heat, there is no evidence for specific heat governance.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	The documents highlight the need for an updated technical needs assessment as well as inadequate human and research capacity as a barrier for adaptation actions. Many of the adaptation plans listed include capacity building and training as objectives, including those focused on cost/benefit analysis, formulating climate change indicators, and identifying and using tools for data. There does appear to be strong research partnerships that may enhance availability of technical expertise or skills transfer. Particular governmental services such as the meteorological service are presumed to be available for the development of say early heat warning systems.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	Funding in Namibia is generally allocated across broad priority sectors rather than targeted specifically at heat exposure or adaptation. While there is some evidence of estimated funding for sector-specific activities that could contribute to reducing heat risk, these are not explicitly identified as heat-related. National adaptation actions rely heavily on international development partners and climate finance mechanisms such as the Adaptation Fund and Green Climate Fund. The government has not allocated specific budgetary resources to its National Climate Change Policy, and domestic contributions cover only a small portion of the required funds. Most climate-related projects, including those with potential heat co-benefits, are funded through international donors and remain project-based. Although there is interest from local financial institutions in climate-smart investments, there is no evidence of dedicated, sustained funding specifically for heat adaptation. The document does not mention any dedicated funding streams for heat adaptation.

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Scaling Up Community Resilience to Climate Variability and Climate Change in Northern Namibia, with a Special Focus on Women and Children. https://www.thegef.org/projects-operations/projects/5343

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Windhoek, Namibia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	Scoring depends a lot on the sources. Recognition of heat stress in planning documents is (very) poor. However, documents like the Nat Adaptation plan are already a bit older. The Strategic Plan 2022-2027 of the city does not mention heat once. For another research (on African urban area resilience) we have Windhoek as a case study and went for a consultation workshop earlier this year. From the consultations I can conclude that city officials and town planners are aware and have also identified different types of heat stress / hazards. They may or may not use the term ‘heat’ (Eg they may state: ‘it is getting warmer as well - getting very hot’) Another dimension is if I include recognition of increasing temperature (not explicitly called heat). Temperature trends are well documented in literature and also in planning documents.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	The evidence is rather scattered. There is no dedicated assessment. Often good exposure and vuln factors are identified for climate change more in general, including heat. There is no comprehensive overview of different affected groups or neighbourhoods. Informal settlements do get some special attention though, recognising that e.g. rapid proliferation of informal settlements due to urbanisation is a driver of

Assessment score:	2
	vulnerability as well as inadequate housing (materials). Other groups are recognised as particularly vulnerable, yet not specifically for heat or for Windhook. At the national level there is recognition of elderly and people living with HIV/AIDS as particularly susceptible to heat-related illnesses, exacerbating existing health vulnerabilities.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Very limited and at the national / regional level rather than sub-urban level. Most details are expected temperature increases. There are qualitative statements on more frequent extreme heat events. Planning documents (eg National Climate Change Strategy & Action Plan) often make reference to international sources rather than national or urban studies. E.g. “Areas in the south-western region (of Africa), especially in South Africa and parts of Namibia and Botswana, are expected to experience the largest increases in temperature (with climate change). The western part of southern Africa is projected to become drier, with increasing drought frequency and number of heatwaves towards the end of the 21st century.” (Intergovernmental Panel on Climate Change, 2018). Selected impacts are projected in relation to broad qualitative trends [e.g.: Increase in temperature will lead to heat-related illness and put to risk the already vulnerable groups such as the old, already sick people (e.g. with HIV/AIDS) and children.]

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	I could not find evidence of such, neither do sources indicate the existence of a dedicated heat adaptation plan as a standalone document. Instead, heat-related adaptation measures are integrated into broader climate change, disaster risk management, and urban development strategies. Note: i do not know whether this is necessarily bad if climate adaptation and resilience strategies are comprehensive instead.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	One would have to stitch this together from different documents. Eg City of Windhoek's Strategic Plan (2022-2027) has a vision to be a "Sustainable and Caring City by 2027," which encompasses ensuring a safe, healthy environment and protecting current and future resources. These serve as overarching long-term goals

Assessment score:	1
	for climate resilience, which implicitly includes heat management. The Integrated Climate Change Strategy and Action Plan (ICCSAP) supposedly has more medium and short actions (i could not find the document itself unfortunately). Specific projects (eg in informal settlements, such as https://una.city/nbs/windhoek/climate-resilient-community-onyika-settlement) that are more short term implemented mention heat among other objectives.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Good quality engagement processes are in place, yet are typically associated with a specific project. Eg https://www.fractal.org.za/windhoek/ These are also not dedicated to heat, but rather within broader climate change adaptation and resilience planning. The City of Windhoek has a DRM system with a dedicated DRM committee that includes stakeholders such as representatives from power, water, universities, and the Namibia Chamber of Industries.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Actions addressing heat hazards are identified for Windhoek, primarily through climate change adaptation strategies (a set of climate issues, incl heat), green infrastructure, and urban planning. An example is a tree planting initiative which suggests providing shade and cooling in the face of increasing temperatures.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Very few direct connections are made. These are actions in the context of resilience initiatives directed at informal settlements, that recognise that residents are especially vulnerable and refer to heat among other stresses in planning actions to address these residents' needs.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Incidental and as part of projects. Notably, there are signs of maladaptation when residents are relocated from flood-prone areas, the new structures provided often offer little protection against extreme heat, highlighting a gap in heat-specific

Assessment score:	1
	housing solutions for vulnerable populations.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Not provided in planning documents. At best for specific projects. Namibia's Climate Change Adaptation Communication identifies an "insufficient evidence base on the benefits of adaptation versus costs" as a barrier to implementing adaptation actions across the country.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Not explicitly assessed though they exist. Our consultations of community representatives identified trade-offs in the City of Windhoek's resilience approach. When residents are relocated from flood-prone informal settlements to safer areas, the new structures provided are often made of pole and zinc. These materials offer little protection from extreme heat, leaving these residents vulnerable to heatwaves, even though their flood risk has been addressed. This points to a gap where an adaptation measure for one hazard (flooding) inadvertently exacerbates vulnerability to another (heat).

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No evidence (there is some sequenced approach in the Drought Response Plan of 2015). This is not surprising given no future scenarios are presented in Windhoek's planning.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	While Namibia and the City of Windhoek have established policy frameworks that

Assessment score:	0
	mandate monitoring and evaluation (M&E) of actions (general, incl elements that are relevant for heat), the sources i used indicate that the practical implementation of M&E, particularly for heat adaptation actions, is often lacking, incomplete, ad hoc or in isolation.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	Very scattered in project specific publications. Where there is monitoring results show little effect.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Very little formal evidence. Also little recognition in policy documents. Some recognition and recommendations in literature.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Less specific for heat. Governance structures are established for DRM, adaptation and related domains. Also more sectoral, eg national health adaptation strategies are planned to address climate-related health risks incl heat impacts. As part of projects, temporary governance structures may be initiated. (again, i do not know whether this is bad and should score low in a benchmark)

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Some technical expertise is available (especially on temperature change). However its accessibility, integration, and effectiveness are hampered by governance and data-related challenges.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Dedicated and sustainable funding specifically for heat adaptation is largely absent and faces substantial challenges in Windhoek (and Namibia). Funding for climate

Assessment score:	1
	change adaptation is often project-based and donor-driven, lacking a coordinated and consistent system for tracking progress [Namibia's Climate Change Adaptation Communication]. Notably we learned in interviews that Namibia's classification as an upper-middle-income country limits its access to international/multilateral funds. The country receives only a fraction of climate funding compared to neighbouring countries (this information would have to be triangulated).

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Our fieldnotes from consultations on the Case study: Windhoek (unpublished)

Ahmedabad, India

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Ahmedabad, India
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Quite detailed and impressive, but the relations between chronic and extreme aren't so clear.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Acknowledgement of worsening conditions, and at least appeal to scenario analyses of business as usual and then other pathways

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Extremely thorough. Probably because the 2010 heat wave triggered a serious attempt as far back as 2013 and it's been worked on since then presumably by a cross section of society

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Some short term goals distinguished from longer term intent, but these could have been more carefully delineated

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Definitely exist, but am unsure about the extent of participation that has been elicited by the intended mechanisms

---

3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	I'd give it a 4 but future changes on how to address multiple dimensions of hazards aren't quite identified

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	I'd give it a 4 but future changes on how to address multiple dimensions of hazards aren't quite identified

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	Yes there seem to be identified entities responsible, and there is evidence of implementation and even some attempt to quantify results, which is fantastic (if unusual!)

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	Yes, but i saw less attention to costs than i did to some measure of benefits. Even on benefits though, it could be improved. Perhaps i just am not informed fully so my degree of confidence for this section is lower.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Perhaps there are discussions in passing, but it is not the central thrust of anything of which i'm aware

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Sequenced temporally, yes to some extent; but driven by an analysis of pathways and such, probably not.

5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	4
Rationale:	Clear accountability

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Yes, though it's based on a few studies, there might be more of which i'm unaware

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No discussion seen

6. Heat governance

Confidence score:	4

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	Clear accountability

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	Yes, am personally aware of incredible expertise in engineering, the built environment, and the natural environment due to Ahmedabad's long tradition of publicly funded research institutions

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Of this sub-section, i am not quite so sure. There is funding because things have been implemented, but its magnitude, and sustainability are unclear to me.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Ahmedabad, India
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	The sources provide a detailed and multi-dimensional identification of heat hazards, distinguishing between chronic heat stress and acute heat shocks along with other multihazard like air pollution, urban flooding. It also provides specific vulnerable urban areas, population groups and neighbourhood level actions. Data is collected from secondary, IMD, Gujarat SAPCC and METAR system along with hospital reports , FGD and interviews.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The sources comprehensively identified heat exposure and vulnerability. The vulnerable population - elderly, children, women, differently abled, uneducated and low income groups, residents of migrant slums, outdoor workers, neonates are considered vulnerable. Along with vulnerable group detail analysis of risk drivers were identified - compromised safe water access, high ambient temperature, low prevalence of air conditioning, prolonged exposure, poor underlying health condition and lack of access to coping mechanism are identified.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	The projections focus on the local scale for Ahmedabad, extending to the near and mid-term periods (up to 2070). The projections are based on climate scenarios (RCP 2.6, RCP 4.5, RCP 8.5 scenarios) from the Gujarat State Action Plan on Climate Change (SAPCC) (2021). Data from historical weather , future climate projection and vulnerability data are used from IMD but general forecast of increase in heat is not mentioned.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	It has the first heat action plan (HAP) in south asia. The plan objective is to alert the population most a t risk of heat related illness. The AMC has established a probabilistic forecast and early warning system to alert residents of predicted extreme temperatures. Heat alerts are issued based on temperature thresholds using a color-coded system: Yellow Alert (41.1°C - 43°C), Orange Alert (43.1°C - 44.9°C), and Red Alert (≥ 45°C). Although a dedicated role - appointed AMC Nodal Officer the budget is set to be plan to build upon existing capacities thus no clear budget targets for heat but target for all adaptation action is mentioned.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The plan has short term, mid term to long term goals along with strategies to achieve that but detailed measurement and assessment is missing, there are some interconnectedness between plans and sectors mentioned.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Moderate level of consultation was observed, FGD with various departments and groups, survey with heat vulnerable population was mentioned but no regular consultation with community found but some level of engagement with other stakeholder was mentioned.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple actions are identified from short term to long term in Heat Action Plan (HAP). Actions divided into pre, during and post heat seasons are also mentioned. Climate Resilient City Action Plan (CRCAP) looks after future scenarios but not HAP.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Although actions to address drivers of heat exposure and vulnerability are identified and presented the consideration for root cause and future scenarios are not well mentioned.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Some emergency response and long term cool roof programs have been implemented in the region. Some mandatory and some voluntary actions are also placed and implemented for a varied range of risk considered but maladaptation risk was missing.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	While HAP was designed to be financially manageable by "building upon existing capacities" no cost-benefit analysis was presented. In CRCAP some level of adaptation cost is mentioned but not explicitly for heat some non economic benefits are mentioned but not linked as cost and benefit analysis.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	While formal "trade-off analyses" for all options are not presented, the plans do consider practical limitations and contextual factors that influence the feasibility, synergy and trade offs are considered for local context.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	HAP has pre, during and post phase thus support sequenced activity while CRCAP has long term plan and pathway defined for net-zero and contribution of heat adaptation mentioned but no separate pathway based approach described.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	CRCAP includes a dedicated "Summary of Actions on Monitoring & Tracking Progress." This specifies that a "Climate Core Team" is responsible for tracking the progress of key sectoral actions and their performance. This team also conducts periodic reviews and submits progress reports to national and international platforms. Whereas HAP is explicitly designed with evaluation as a core objective, aiming to "provide a framework for the implementation, coordination, and evaluation of extreme heat response activities in Ahmedabad. Systematic post-season evaluation for HAP is also considered. A formal impact evaluations study was also conducted.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The evidence of number of death avoided and decline of death in hottest days are mentioned with some evidence on cool roof program but no detail of all interventions and does not sufficiently consider effectiveness, measurability, sustainability, and consensus

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	The maladaptation is not considered while designing both HAP and CRCAP.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	AMC appointed AMC nodal officer for ensuring implementation of HAP. Defined roles and standard SOPs are developed and integrated, where a detailed checklist and responsibilities are outlined. CRCAP also mention operational framework and function of Climate core team. Although integration is mentioned there are fewer evidence of institutionalisation, authority and connectivity.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The technical team is mentioned while developing the plan and role in SOP but the accessibility couldn't be accessed from the literature. Although they have a high level committee and accessibility in required time can be considered but no distinct establishment of technical expertise and their role in decision making was not found.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	While the initial Heat Action Plan leveraged external support and existing departmental budgets, the city's comprehensive Climate Resilient City Action Plan proposes formalizing dedicated internal budgetary provisions and actively pursuing diverse, innovative climate finance mechanisms to ensure sustainable funding for heat adaptation and broader climate resilience efforts.

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ICLEI South Asia. (2023, July 6). *Adapting to multiple climate risks: Climate resilience and capacity building action plan (CRCAP)* [Executive summary]. https://southasia.iclei.org/wp-content/uploads/2024/01/AMC-CRCAP-EXEC-SUMMARY_06JULY2023_compressed.pdf

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Amman, Jordan

Scoring sheet

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City case study:	Amman, Jordan
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current heat hazards are explicitly identified for Amman, including acute heat shocks (heatwaves) with documented historical events (e.g., heatwaves exceeding 40°C in 2000, 2010, and 2020) and discussion of their impacts on human health, water and electricity demand, infrastructure, and public services. Heat is also framed within a broader multi-hazard context, and its interaction with urbanization and the urban heat island effect is described. The analysis includes district-level vulnerability mapping, identifying districts with higher vulnerability to heatwaves. However, while the hazards are addressed at a local and district scale with some depth, the documentation does not consistently reach neighborhood-level detail across all dimensions nor demonstrate advanced data integration specific to heat alone (Halaseh, 2024; Greater Amman Municipality, 2024).

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Current drivers of heat exposure and vulnerability in Amman are comprehensively identified across people, infrastructure, and urban systems, with clear local relevance. The documents explicitly identify drivers such as high urbanization rates, limited green spaces, urban heat island effect, population density, presence of vulnerable groups (women, elderly, people with disabilities, refugees), aging and impaired water and electricity networks, and car-dependent urban form. District-level analysis links these drivers to heightened heat vulnerability, noting how

Assessment score:	4
	factors such as overcrowding, poor living conditions in refugee-hosting districts, limited vegetation cover, and stressed infrastructure exacerbate exposure and sensitivity to heatwaves. The analysis draws on evidence-based vulnerability assessments and spatial mapping at the district scale, demonstrating integration of multiple data sources and consideration of underlying risk factors and root causes (Halaseh, 2024; Greater Amman Municipality, 2024)

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Future heat risks for Amman are explicitly projected using climate models, scenarios, and quantified trends, with clear local relevance. The documents describe projected increases in average, maximum, and minimum temperatures, a higher frequency and intensity of heatwaves, and the likelihood of extreme temperature thresholds being exceeded under different climate scenarios. Projections are based on downscaled climate modeling and are linked to future impacts on people, infrastructure, health, water and electricity demand, and urban systems. In addition, district-level risk and vulnerability assessments indicate that the likelihood and impacts of extreme heat are expected to increase in the future, demonstrating both temporal (future-oriented) and spatial specificity rather than general national-level statements (Halaseh, 2024; Greater Amman Municipality, 2024; Ministry of Environment Jordan, 2021)

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is no standalone or dedicated heat-specific adaptation plan for Amman. Heat is addressed within broader climate adaptation and climate action plans, rather than through a plan focused exclusively on heat. The *Amman Climate Action Plan (2024)* includes heat-related risks and adaptation strategies (e.g. urban heat island mitigation), but these are embedded within a multi-hazard, multi-sector climate action framework, not a dedicated heat plan. Similarly, at the national level, the *National Climate Change Health Strategy of Jordan* includes a chapter on heatwaves, but it is part of a broader health adaptation strategy covering multiple climate-sensitive health risks rather than a heat-only plan (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023)

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	A clear range of short-, medium-, and long-term goals is explicitly defined in the

Assessment score:	4
	documents. The *Amman Climate Action Plan (2024)* specifies adaptation strategies with associated timeframes, distinguishing between short-term (ST), medium-term (MT), and long-term (LT) implementation horizons for actions relevant to heat, such as mitigating the urban heat island effect and improving green and blue infrastructure. In addition, the *National Climate Change Health Strategy of Jordan (2024–2033)* sets a 10-year planning horizon with phased interventions addressing heatwaves, indicating temporal sequencing of goals and actions over time. This demonstrates an explicit and documented temporal range of goals rather than a single time horizon (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023)

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Formal stakeholder and community engagement mechanisms are clearly documented and embedded in the planning processes. The *Amman Climate Action Plan (2024)* describes structured stakeholder engagement during plan formulation, including inception workshops, prioritisation workshops, technical committee meetings, and engagement with municipal departments, national institutions, international organizations, and development partners. Community engagement is evidenced through parallel initiatives (e.g. neighborhood-level consultations, workshops with residents including women, youth, elderly, refugees, and people with disabilities) whose outputs were used to inform the plan. At the national level, the *National Climate Change Health Strategy of Jordan* documents a participatory development process, including multi-stakeholder consultations, workshops, and coordination between ministries, health institutions, and international partners. These mechanisms are clearly described, recurring, and institutionalized rather than ad hoc (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023).

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Actions that explicitly address heat hazards are clearly identified in the documents. The *Amman Climate Action Plan (2024)* includes defined adaptation strategies and actions that directly target extreme heat and the urban heat island effect, such as blue and green infrastructure interventions, improving the quality and coverage of green spaces, and integrating heat considerations into urban planning and disaster risk reduction with specified timeframes. In addition, the *National Climate Change Health Strategy of Jordan* identifies heatwave-specific actions, including strengthening heat-related surveillance, early warning systems, preparedness, and health-sector response to heat-related illnesses. These actions are explicitly framed as responses to heat hazards rather than general adaptation measures (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Actions explicitly targeting drivers of heat exposure and vulnerability are identified in the documents. The *Amman Climate Action Plan (2024)* includes actions that address key drivers such as limited green space, urban heat island effects, high impervious surface coverage, and stressed urban infrastructure, through measures including expansion and improvement of green and blue infrastructure, integration of climate considerations into land-use and urban planning, and improvements to water efficiency and urban services that reduce heat sensitivity. The *National Climate Change Health Strategy of Jordan* identifies actions addressing population-level vulnerability drivers, including health system preparedness, surveillance, early warning systems, and protection of vulnerable groups exposed to heatwaves. These actions are explicitly linked to reducing exposure, sensitivity, and vulnerability drivers rather than only responding to heat impacts (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023)

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	The documents indicate that heat-related actions are embedded within official strategies and planning frameworks and are linked to municipal budgeting and responsibility structures, but they do not provide clear evidence that these actions are actively being implemented on the ground. The *Amman Climate Action Plan (2024)* states that adaptation actions are integrated into the GAM Strategy 2022–2026, assigns responsibilities to specific municipal units, and notes that actions are budgeted within planning cycles. However, the documents do not document completed actions, implementation progress, measurable outputs, or citywide execution of heat-specific measures. As such, the evidence supports planning and preparedness for implementation rather than confirmed implementation (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023)

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4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	The documents provide limited analysis of costs and benefits related to heat adaptation options. The *Amman Climate Action Plan (2024)* discusses adaptation strategies relevant to heat (e.g. blue and green infrastructure, urban greening) and includes qualitative discussion of co-benefits (such as health, environmental, and SDG linkages), but it does not present quantified cost–benefit analyses or economic evaluations specific to heat adaptation options. While some strategies reference targets and implementation timeframes, explicit comparison of costs versus benefits for heat-focused measures is not systematically documented. Other documents

Assessment score:	2
	(e.g. national strategies and vulnerability assessments) focus on risks, vulnerabilities, and policy direction rather than economic appraisal of heat adaptation options (Greater Amman Municipality, 2024).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The documents include limited, mostly qualitative discussion of synergies, but do not systematically assess trade-offs between heat adaptation options. The *Amman Climate Action Plan (2024)* highlights co-benefits and synergies of adaptation actions relevant to heat—such as links between urban greening, improved green spaces, public health, environmental quality, and SDGs—and discusses integration of adaptation with mitigation and sustainable urban development. However, the plan does not explicitly analyze trade-offs (e.g., competing land uses, costs versus benefits across sectors, or potential negative impacts of heat adaptation measures), nor does it compare alternative heat adaptation options against one another. Other documents focus on vulnerability, health impacts, or policy alignment rather than assessing synergies and trade-offs among heat adaptation choices (Greater Amman Municipality, 2024)

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The documents show some temporal structuring of heat-related adaptation actions, but they do not present a clear pathway-based approach that explicitly sequences options based on decision points, thresholds, or evolving risk conditions. The *Amman Climate Action Plan (2024)* assigns short-term (ST), medium-term (MT), and long-term (LT)timeframes to adaptation strategies relevant to heat (e.g. mitigating the urban heat island effect through blue and green infrastructure), indicating basic sequencing over time. However, the plan does not articulate adaptive pathways, alternative routes, trigger points, or staged decision-making that would allow heat adaptation options to evolve in response to future uncertainty or changing conditions. Other documents focus on risk assessment and strategic intent rather than pathway-based planning (Greater Amman Municipality, 2024)

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5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	There is evidence of general monitoring and evaluation frameworks for climate action, including commitments to periodic review, assigned institutional responsibilities, and the use of indicator systems to track city performance.

Assessment score:	2
	However, there is no explicit evidence of systematic monitoring or evaluation of heat adaptation actions specifically, such as heat-related indicators, reported results, or evaluation findings. The available information supports the existence of M&E arrangements in principle, but does not demonstrate active or heat-specific monitoring and evaluation in practice (Greater Amman Municipality, 2024).

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is very limited evidence of actual reduction in heat risk. While some actions relevant to heat (such as urban greening and green infrastructure interventions) are referenced, there is no documented evidence showing that heat exposure, heat-related vulnerability, or heat impacts have been reduced. No measurable outcomes, trend data, before–after comparisons, or indicators demonstrating reduced heat risk are presented. The available information points to activities and initiatives with potential relevance to heat, but does not demonstrate verified or monitored reductions in heat risk (Greater Amman Municipality, 2024).

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	There is little explicit evidence that maladaptation risks are being actively identified, assessed, or reduced in relation to heat adaptation. While adaptation actions are framed alongside broader sustainability goals and co-benefits, there is no clear evidence of systematic consideration of potential negative or unintended consequences of heat adaptation measures (e.g. increased resource use, inequitable outcomes, or shifting risk to other sectors or populations). No monitoring results, safeguards, or evaluations are presented that demonstrate efforts to avoid or reduce maladaptation risks associated with heat-related actions (Greater Amman Municipality, 2024).

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	There is clear evidence of established governance structures that cover heat within broader climate and resilience governance arrangements. Institutional roles and responsibilities for climate action and resilience are defined, including dedicated municipal units responsible for climate action, coordination across sectors, and alignment with national climate and health governance structures. Heat-related risks are addressed within these existing governance frameworks rather than through a standalone heat authority. While governance structures are clearly established and

Assessment score:	3
	operational at the city and national interface, they are not exclusively heat-specific, which limits the score from the highest level (Greater Amman Municipality, 2024; Ministry of Health Jordan, 2023).

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	There is evidence that technical expertise relevant to heat and climate risks is in place and accessible through institutional arrangements, including specialized municipal units, technical departments, and collaboration with national institutions and international partners. Technical expertise is demonstrated through the use of risk assessments, vulnerability mapping, climate analysis, health surveillance systems, and technical tools that inform planning and decision-making related to heat. However, the available information does not demonstrate that dedicated, heat-specific technical expertise is systematically available or accessible across all sectors or to communities, nor does it document capacity levels or coverage in practice. The evidence supports the presence of technical capacity within broader climate, resilience, and health systems, but not comprehensive heat-specific technical accessibility (Greater Amman Municipality, 2024; Halaseh, 2024).

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	There is evidence of general funding arrangements for climate adaptation actions that include measures relevant to heat, such as integration into municipal strategies, planning cycles, and budgeting frameworks. Heat-related actions are embedded within broader climate and resilience programs and are linked to existing municipal and sectoral budgets. However, there is no explicit evidence of dedicated, ring-fenced, or long-term funding specifically for heat adaptation, nor clear indication of sustained financing mechanisms focused on heat risks alone (Greater Amman Municipality, 2024).

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Amman, Jordan
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Climate Action Plan and the vulnerability assessment identify the current hazards of heatwaves in Amman. Includes district level analysis/maps of current heat hazards. Also discusses multiple sectoral impacts in addition to human health such as agriculture and forestry.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Climate Action Plan discusses drivers of exposure and vulnerability such as age, workplace, and income, with some details on neighborhood differences.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Climate Action Plan includes temperature projections from two climate scenarios, and number of heat wave days projections from one climate scenario. Trends in other drivers of vulnerability are not projected.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	There is not a separate heat adaptation plan (yet), but the Climate Action Plan includes clear sections on heat with formal goals and frameworks for heat adaptation strategy.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	There is not a clear description of goals, but the stated strategies and actions have short- to medium-term targets (p54 Climate Action Plan). They seem consistent with local context and cross multiple sectors, with some discussion of interconnections.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Extensive stakeholder engagement went into producing the Climate Action Plan, but the description for community engagement going forward for heat actions specifically is vague and not yet developed.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Strategy 6 on p54-55 of CAP. These actions mostly focus on green infrastructure and mediating the urban heat island effect (thereby addressing the hazard of chronic and acute heat).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Strategy 6 on p54-55 of CAP. Actions for addressing drivers of exposure and vulnerability are more limited.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	This is somewhat hard to assess from the Climate Action Plan, but parts of the Strategy 6 are listed as already implemented, and it appears that the others are actively underway by the listed responsible agencies.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	Economic costs are fairly detailed (p54); and social, economic, and institutional co-benefits are also listed (p55) although these are broader and more vague than just pertaining to the heat actions.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies between blue and green infrastructure for cooling, flooding, and carbon sequestration are discussed (p54). But there is a lack of detailed assessment of competing options for heat action and trade-offs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There are monitoring and evaluation mechanisms in place for updating and iterating the plans, but there are no specific descriptions of the actions being planned in a sequenced, pathway-based approach.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluating mechanisms described on p75 of CAP.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	I could not find locally relevant evidence of reducing heat risk, beyond citing general literature on the effectiveness of different chosen actions.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I could not find discussion or evidence of reducing maladaptation risk in these documents.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Partially implemented– there are not entirely new heat roles or offices created, but a clear delineation of responsibilities to existing agencies and parties for the stated strategies and actions (p53, 72).

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Some technical expertise infrastructure is in place from the C40 cities initiative, as well as through stakeholder engagement with relevant partners for different actions, but there is not a super clear integration of technical expertise for heat actions going forward.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Funding has been allocated within different parts of the municipal budget for the stated actions that are part of the heat strategy (p53-54).

References

Greater Amman Municipality & United Nations Development Programme. (2024). *Amman climate action plan* [Climate action plan]. https://www.undp.org/sites/g/files/zskgke326/files/2024-09/amman_climate_action_plan_sep24.pdf

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Bangkok, Thailand

Scoring sheet

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City case study:	Bangkok, Thailand
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Strong analytical evidence exists on heat hazards, such as UHI mapping, mortality estimates (heat-related deaths: 421-1174 deaths/year), affected industries. But these assessments are from World Bank's work but not institutionalized within city systems.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Exposure and vulnerability drivers such as insufficient green space and poor living conditions are well documented, but formalized assessment systems are lacking.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future risk projections are technically strong, led by World Bank, including number of hot days in the future, extreme temperatures, and death risks.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	Bangkok Climate Change Master Plan 2013-2023 have indicated heat-related measures: heat insulation, shading, greening, etc. But Bangkok lacks a standalone, systematical heat action plan. The heat management framework is still in developing.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	I didn't see clear short-, medium- or long-term heat adaptation targets in the references, especially at the city level.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Stakeholder engagement occurred during report preparation, but no institutionalized, ongoing participation mechanism is described.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Although Bangkok has started actions like cooling shelters, heat alerts, green corridors and insulation retrofits, these efforts are still patchy and not scaled across whole city. No coordinated strategy to connect them.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Bangkok does take actions that touch key vulnerability factors—such as worker heat standards, green-space expansion, and limited improvements for high-risk groups. However, these measures operate independently rather than as part of a citywide vulnerability-reduction strategy.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Implementation is happening, but I don't see clear data on scale, coverage or follow-up evaluation.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	The reports give detailed numbers on how expensive heat impacts are, but they don't really analyze the benefits or costs of different adaptation options. There's no comparisons like "green roofs vs shading" or "cooling centers vs AC efficiency improvements."

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	There are mentions of important tensions such as more cooling leading to more energy demand, but these points are not explored in a structured way. No systematic assessment across sectors such as transport, energy, land use, or health.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Bangkok has a conceptual framework of "place-people-institutions), but no actual roadmap with timelines, phasing or some step-by-step plan.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	There's only an M&E framework at the national level, no clear sign that Bangkok has adapted it for heat-specific monitoring. No indicators, no reporting cycle, no responsible agency.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	I didn't find any evidence that heat-risk is going down.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	The documents acknowledge that increased AC use could worsen energy burdens and emissions, but beyond naming the issue, there's no structured plan to prevent maladaptation. So the city is aware of the risk but not actively managing it.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Bangkok has a multi-agency heat management framework, which shows growing institutional awareness. But without a dedicated office, legal mandate, or permanent coordination mechanism, governance is still in an early stage.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Yes, Bangkok has its UHI mapping, WRF modeling, mortality risk estimations, productivity loss modeling, which means that it has strong technical support. But, these were mainly conducted by World Bank, with external partners.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding is available through pilot projects and international support, but no dedicated, long-term funding support mechanism.

References

World Bank. (2025). *Shaping a cooler Bangkok: Tackling urban heat for a more livable city* [Report]. World Bank Group. https://documents1.worldbank.org/curated/en/099032525024532810/pdf/P181082-9cc5dd2a-bc60-49ed-a145-c3a8621dc1f4.pdf

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The Resilience Hub. (n.d.). *Hot cities, chilled economies: Bangkok*. One Billion Resilient. https://onebillionresilient.org/hot-cities-chilled-economies-bangkok/

Arifwidodo, S. D., & Chandrasiri, O. (2020). Urban heat stress and human health in Bangkok, Thailand. *Environmental Research, 185*, 109398. https://doi.org/10.1016/j.envres.2020.109398

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Scoring sheet

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City case study:	Bangkok, Thailand
Expert evaluator:	2

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Since 1996, I have joined a monitoring project with Chulalongkorn Univ.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Since 1996, I have joined a monitoring project with Chulalongkorn Univ.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Documents sent have been published by the government sector.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	They look to read relevant documents of Japan etc. but we could not clearly find some original issues in Bangkok.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	They look to read relevant documents of Japan etc. but we could not clearly find some original issues in Bangkok.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Now at the dissemination process of basic knowledge.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	We could not clearly find some original issues in Bangkok.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	We could not clearly find some original issues in Bangkok.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Now at the dissemination process of basic knowledge.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	No descriptions.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	No descriptions.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	No descriptions.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Not implemented enough yet.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Not implemented enough yet.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Not implemented enough yet.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Now at the dissemination process of basic knowledge.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Now at the dissemination process of basic knowledge.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	No descriptions.

References

World Bank. (2025). *Shaping a cooler Bangkok: Tackling urban heat for a more livable city* [Report]. World Bank Group. https://documents1.worldbank.org/curated/en/099032525024532810/pdf/P181082-9cc5dd2a-bc60-49ed-a145-c3a8621dc1f4.pdf

Ministry of Natural Resources and Environment. (2024). *Thailand national adaptation plan (NAP)* [National adaptation plan]. https://unfccc.int/sites/default/files/resource/NAP_THAILAND_2024.pdf

The Resilience Hub. (n.d.). *Hot cities, chilled economies: Bangkok*. One Billion Resilient. https://onebillionresilient.org/hot-cities-chilled-economies-bangkok/

Arifwidodo, S. D., & Chandrasiri, O. (2020). Urban heat stress and human health in Bangkok, Thailand. *Environmental Research, 185*, 109398. https://doi.org/10.1016/j.envres.2020.109398

Ministry of Natural Resources and Environment. (2024). *Thailand national adaptation plan (NAP)* [National adaptation plan]. https://unfccc.int/sites/default/files/resource/NAP_THAILAND_2024.pdf

Beijing, China

Scoring sheet

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City case study:	Beijing, China
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Beijing has clearly identified the current heat hazard, including human health, city infrastructure and operation, and disasters. Besides, China has the heat health hazard alarming product nationwide with the precise of street level (around 5km×5km), which could provide the detailed complex health risk prediction at the neighborhood level. However, the compounding hazards was not fully considered.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Children, older adults, pregnant women, individuals with chronic diseases , and outdoor workers are identified as heat-vulnerable populations; high-density built-up areas, old residential communities and squatter areas, schools, and hospitals are identified as vulnerable areas. The drivers of heat exposure mainly include urbanization and heat island.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Future heat risks have been projected by lots of scholars using CMIP6 model future scenarios analysis.

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Beijing has already issued lots of policy documents on heat adaptation, such as *Emergency Plan for High Temperature Weather in Beijing*, *Beijing's Implementation Plan for Healthy Adaptation to Climate Change (2025-2030)*. Besides, there are also national policies and guidelines for heat adaptation as support.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	The goals are not heat-specific but climate-related. Short-term goal is to set up related policy system and working organization, long-term goal is enhanced climate-health early warning capacity, well-established climate-health adaptation and assessment system. But these goals are not in-detailed, and also lack local contextual.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The stakeholder and community engagement mechanism is mentioned and under constructed.

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Engineered solutions include cooling carriages in subways, air conditioners at stations, increased frequency of water spraying to lower the road surface temperature. Behavioral solutions: strict mandatory rest for construction sites during the midday heat period. Nature-based solutions: sponge cities, urban air corridors, green space optimization.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions were taken to optimize energy structure and usage through renovation of heating pipeline network, development and utilization of renewable energy and waste heat resources. The construction of sponge cities has promoted the development and layout optimization of green spaces such as pocket parks and rooftop greening.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	These identified actions have been implemented in Beijing, but there's still lack of quantitative evaluation on their effects (such as health benefits, cooling efficiency, economic effects etc.).

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Lots of adaptation options are recommended by government as best solutions, but the cost-benefit comparison is mainly about economic dimension.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The heat adaptation plan mentions that the consideration of synergy effects and trade-offs needs to be evaluated, but it is still in its early stages and no in-depth assessment has been conducted yet.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	4
Rationale:	The climate change health adaptation plans for the nationwide and Beijing have both set phased goals: establish a monitoring system by 2025 → improve the assessment system by 2030.

---

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Beijing starts to build a policy system related to climate change and health, and strengthen the construction of a monitoring system for climate-sensitive diseases from 2025.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	There's local evidence on urban green space cooling efficiency (Xu, et al, 2023; Su et al., 2022). However, the evidence on reducing heat-related health risk and economic loss is still lack.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Sponge cities design has considered both heat risk and flood risk, to partially reduce the maladaptation risk. However, this has not been considered systematically through other heat adaptation actions and is lack of evidence with local contextual.

---

6. Heat governance

Confidence score:	4

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	The *Emergency Plan for High Temperatures in Beijing* clearly states that during the hot weather period, a temporary emergency command center for dealing with high temperatures will be established to coordinate and direct the city's response to high temperature conditions. This command center will be composed of multiple relevant departments such as the Emergency Management Bureau, the Meteorological Bureau, the Health Commission, and the Transportation Commission.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Beijing has strong technical expertise at the research and municipal levels (e.g. climate modeling, heat-health early warning system), but uneven grassroots implementation limits full effectiveness.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The funding for heat adaptation is currently mainly dependent on local government allocations, and the participation of social funds is insufficient.

References

Center for Security and Emerging Technology. (2022, August). *National climate change adaptation strategy 2035* [Translation of China's strategy]. Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0453_climate_strategy_2035_EN.pdf

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Scoring sheet

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City case study:	Beijing, China
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	**Scope:** Exposure and vulnerability drivers are clearly stated for people and infrastructure, with less emphasis on ecosystems. **Scale:** Some local differentiation—e.g., vulnerable districts (Fengtai, Tongzhou), but neighborhood resolution still lacking. **Dimensions:** Underlying risk factors (e.g., aging demographics, inequality) are acknowledged. Discuss data tools and mapping tools.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	**Scope:** Drivers of hazards, exposure, and vulnerability are discussed. **Scale:** Some local scale projections exist **Dimensions:** Discuss cascading effects and underlying risk factors such as age. Only academic studies discuss vulnerability drivers in more depth (Su et al., 2022)

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Scope: Future hazards, exposure, and vulnerability are discussed. Scale: Local scale projections exist, but not at the neighborhood scale. Dimensions: Use climate scenarios with some socioeconomic trend references. Some discussion of interconnected risks (e.g., blackouts during heat events), but limited quantification discussion

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Scope: Heat is discussed as part of the formal climate adaptation plan and there is strong policy language Scale: Mainly at the city level, with some district level, none at the neighborhood level

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Scope: there are both short-term and long term goals Scale: Minimal discussion of neighborhood-level implementation Dimension: Vague measurable indicators

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Little evidence of that

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Scope: span across engineering, nature-based, and behavioral solutions. Scale: Some neighborhood-level actions

Assessment score:	3
	Dimensions: Various types of action address both current hazards and future changes such as green space, energy efficiency retrofit, and cool roofs, shade expansion

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Scope: actions target both exposure factors and vulnerable groups, such as the elderly and outside workers Dimension: Not a ton addressing root cause

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Large infrastructure projects are being implemented along with early warning systems

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Only qualitative discussion

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Discuss synergies between different sectors and actions. No trade-off assessed.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Scope: The adaptation action plan outline short, mid, and long term objectives with a clear multi-decade structure Dimension: no mentioning of mechanisms for updating goals and in-depth planning

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	There are general climate and meteorology monitoring systems setup that may feed into adaptation actions, but they are not heat specific

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	There isn't any evidence yet

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	There is an acknowledgment of maladaptation risks, but no detail discussion of screening criteria or preventative measures

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	There is no dedicated office for heat management, but there is strong cross-departmental coordination and clear delineation of roles

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There are technical expertise and continuing capacity building, but may lack local context

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	No heat-specific funding

References

Center for Security and Emerging Technology. (2022, August). *National climate change adaptation strategy 2035* [Translation of China's strategy]. Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0453_climate_strategy_2035_EN.pdf

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https://www.jfdaily.com/sgh/detail?id=1608103

Chongqing, China

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Chongqing, China
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Scope: Chongqing recognizes extreme heat as a significant hazard driven by our changing climate. Climate adaptation plan and other planning documents discuss the direct impact on human health. It discusses the potential for warmer summers. Scale: Some neighborhood-level understanding, not a lot. A lot of emphasis on urban centers and older neighborhoods. Dimensions: Discusses the interactions between human health, the ecosystem, food security, and economic development. Not a ton of standard date sets and tools, nor discussion of compounding risks (sources: Chongqing Climate Adaptation Plan, 2025, CCICED, 2024)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Scope: It contains a wide scope of both acute and chronic heat stresses. Discuss urban infrastructure, hotter days, and health vulnerabilities. Scale: Mainly discussed at the urban center level Dimension: Limited data and quantitative vulnerability mapping.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Scope: Projection of future heat days exists, but is very simple in scope. Scale: No neighborhood impact Dimension: No use of scenarios

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Scope: Heat is addressed and has its own section in the climate adaptation plan. Scale: There are local scale policies, but not super specific Dimension: Contains dedicated roles for different goals and presents measurable goals with timelines for some. No budget and not super local.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Scope Scale Dimensions: Discuss short-term goals such as water recycling of 15% and tree planting goals of 2 million mu (1 mu = 667 sq meter). Vague long-term goals. (source: Chongqing Climate Adaptation Plan, 2025). Development goals and rationale for “**urban ventilation channel”** as a way to address urban heat island

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Scope: Stakeholder and community engagement are mentioned, but do not address how to implement Scale: There are volunteers on the ground. Though it is unclear if there are coordinated city efforts Dimension: No co-production efforts

中心城区开展精细风热气候环境评估，构建城市通风廊道系统，缓解中心城区城市热岛效应。增量地区加强沿江立体开发建设管控，构建城市级通风廊道系统，禁止“两江四岸”区域高强度开发，不在城市通风廊道上新建高层建筑群，街区盛行风上游建筑间口率不宜大于 60%，实现热岛比例指数较2020年降低5%以上，针对两江干流，严格实施规划退距，确保长江、嘉陵江主通风廊道畅通

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	**Scope**: Mainly acute heat shocks. Not a ton is addressing the chronic heat stress. A wide range of multiple actions **Scale**: Actions are implemented citywide but are designed for neighborhood-level implementation, such as transit lounge cooling shelters, district-level urban forestry campaigns, and targeted school/workplace response protocols. **Dimension**: Launched a neighborhood-level high-temperature health risk platform as of July 2025 (source: Platform coming online). Using converted air-raid tunnels as a cooling center (https://www.chinadaily.com.cn/a/202207/16/WS62d1fccfa310fd2b29e6ca75.html). Transit stations provide free cooling. Different schools and communities seem to have good warning system to citizens about dangers of hot days. Decentralized volunteers to provide cooling goods and services to vulnerable populations So it spans over physical infrastructure change, behavioral response, and nature-based solutions. Chronic heat stress is addressed at the surface level by thinking about zoning and planning.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	**Scope:** Chongqing is targeting several drivers of exposure and vulnerability, such as the built environment (high-density, poorly ventilated areas targeted for ventilation corridor preservation) and social vulnerability（e.g. measures for outdoor workers, students (flexible school schedules), and elderly residents (door-to-door hydration checks)) **Scale:** These actions are locally implemented, often at the street or district level, through community centers, union booths, and neighborhood cooling support. **Dimensions:** The actions span physical (urban design, vegetation), institutional (labor protections), and social (community outreach). However, they do not fully address underlying structural inequalities such as household access to cooling, income-based inequality, and migrant workers. Additionally, evidence of long-term strategies to address root causes (e.g., housing quality, energy affordability) remains limited.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	**Scope:** It seems like multiple actions across different types of interventions are implemented. **Scale:** Actions are happening at the neighborhood level and different sectors **Dimension:** Specific implementation is visible: open-space expansion (e.g., “新增城市开敞空间1000余亩”), and the completion of pilot sponge-city zones (海绵城市). Consider maladaptation by building out public spaces for neighborhood-level cooling

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	I could not find a quantitative cost-benefit analysis anywhere. Just a conceptual mention of economic risks and benefits

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	**Scope:** Planning documents acknowledge interactions across adaption measures and discussed balancing mitigation and adaptation, integrating land-use etc. **Scale:** Scale mainly at city and district level **Dimension:** No quantitative trade-off analysis

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Scope: Sets adaptation milestones: major actions by 2025 and further progression by 2030, aligned with its national adaptation strategy extending to 2035. Scale: Dimension: No evidence of adaptive pathway logic.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Only preliminary monitoring exists. No mention of neighborhood evaluation.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Seems like anecdotal evidence and qualitative reporting of reducing heat risk

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No explicit evidence

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Part of climate adaptation planning. **Dimensions:** Institutions are formalized through multi-agency mandates, with authority to coordinate across sectors. A dedicated “Heat Office” or Chief Heat Officer role is not evident.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	**Scope:** Expertise spans climate science, urban planning, public health, and emergency response. **Scale:** Mainly at city level **Dimensions:** Technical teams are integrated into decision-making; some capacity-building activities are indicated, but long-term training and institutional knowledge transfer are still emerging.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	**Scope:** Funding exists within broader adaptation allocations, not isolated for heat adaptation. **Scale:** Financing is drawn from municipal/general budgets, with pilot local investments. **Dimensions:** Depth and long-term sustainability are limited; no guaranteed multi-year funding streams exclusively for heat adaptation are identified.

References

Center for Security and Emerging Technology. (2022, August). *National climate change adaptation strategy 2035* [Translation of China’s strategy]. Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0453_climate_strategy_2035_EN.pdf

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Scoring sheet

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City case study:	Chongqing, China
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	In the case of Chongqing, unique orography (mountainous basin) is one of the drivers.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Some papers have been published but the priority of social topics is not the highest.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	It sounds general in the south west region, not specified in Chongqing.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	It sounds general in the south west region, not specified in Chongqing.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	It sounds general in the south west region, not specified in Chongqing.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Not enough. Staying in an academic research stage.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Not enough. Staying in an academic research stage.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Not enough. Staying in an academic research stage.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Not enough. Staying in an academic research stage.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Not enough. Staying in an academic research stage.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Not enough. Staying in an academic research stage.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s. But staying in an academic research stage.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s. But staying in an academic research stage.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s. But staying in an academic research stage.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Research projects of Chongqing Univ. has been started in the early 2000s.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Not so difficult for Chongqing.

References

Center for Security and Emerging Technology. (2022, August). *National climate change adaptation strategy 2035* [Translation of China's strategy]. Georgetown University. https://cset.georgetown.edu/wp-content/uploads/t0453_climate_strategy_2035_EN.pdf

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He, B. J., Zhao, D., Dong, X., Xiong, K., Feng, C., Qi, Q., Darko, A., Sharifi, A., & Pathak, M. (2022). Perception, physiological and psychological impacts, adaptive awareness and knowledge, and climate justice under urban heat: A study in extremely hot-humid Chongqing, China. *Sustainable Cities and Society, 79*, Article 103685. https://doi.org/10.1016/j.scs.2022.103685

Colombo, Sri Lanka

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Colombo, Sri Lanka
Expert evaluator:	1

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Identification of current heat hazards- yes including both chronic heat stress (e.g., long-term rising temperatures, progressively warmer summers) -yes and acute heat shocks (e.g., short-term extreme heat events, heatwaves), - yes and their direct impacts across aspects of human health, human activity, infrastructure, and more- yes Focus on the assessment at the local scale, with an emphasis on- no, all assessments in formalized documents and/or adopted by government are at the national level, not Colombo, some in the presentation. neighborhood-level understanding Depth of information on heat hazards, including complex risk perspectives (e.g., cross-hazard interactions, compounding hazards, and cascading impacts) and data integration (e.g., types and sources of data, resolution of data, use of data tools)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Locally, in Columbo, there is a strong focus on social vulnerability and heat exposure. Perera and Perera do a good job of identifying the social aspects of heat exposure. The Vulnerability Assessment of Households in Colombo to Heat Stress (2023) is also an in-depth analysis of social vulnerability to heat. Physical Vulnerability to heat is somewhat lacking. The National level plans offer

Assessment score:	3
	aggregate information, but do a better job of analyzing physical vulnerability. The National Adaptation Plan discusses the vulnerability of different sectors with increasing heat risks (see appendices).

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Projection of daily max temperatures under different emissions scenarios found in the Climate Risk Profile. Includes information on chronic heat stress Focus on relevant and useful local-scale information- no Colombo scale information available Projections lack depth and interconnections across sectors. heat to energy and consumption connections made, but not to physical or natural environment. Integration of diverse data sources (e.g., types and sources of data, data resolution, and use of analytical tools)- not found.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	No dedicated heat adaptation plan found, however, meetings and presentations with relevant governance bodies (Municipal Council) appear to have been organized in 2020 and 2022. No implementation of the proposals found

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The National Adaptation Plan has short-term (<5 years), medium-term (5–10 years), and long-term (>10 years) goals and strategies. However, they are not Colombo specific. Focus on local-scale action lacking. Measurability of actions unclear.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	0
Rationale:	Not found

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Identification of multiple actions (e.g., engineered solutions, behavioral interventions, nature-based solutions) - yes found in the appendices in the National Adaptation plan; policies in the Food Security, Human Settlement, Agriculture, Energy/Transportation sectors. addressing chronic heat stress (e.g., long-term rising temperatures, progressively warmer summers) and acute heat shocks (e.g., short-term extreme heat events, heatwaves), along with their direct impacts- in the national adaptation plan, found

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Different documents are addressing heat in different ways- all internally consistent, but not consistent across documents. For example, the National Adaptation Plan seeks to develop new varieties of cultivars that are heat resilient, but there are no policies to protect agricultural workers from heat- a central argument of the Climate Profile and the peer-reviewed literature (Abeysekara et al., 2023; Wijeratne et al., 2023)

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	The National Adaptation Plan and Plan of Action outlined during the Colombo Council Meeting both contain detailed implementation metrics and are highly likely to be implemented. However, evidence of implementation- that is news articles or website tracking the implementation of the National Adaptation Plan, specific to heat resilience could not be found online.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	The National Adaptation plan recognized the cost of not adapting to climate, but not at the local scale. The plan has developed multiple heat adaptation options, but their associated costs and benefits, including both economic and non-economic aspects (e.g., health, quality of life) have not been analyzed or reported.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Assessment of multiple heat adaptation options (e.g., strategies, actions) and their synergies (i.e., beneficial interactions) and trade-offs (i.e., conflicting interactions) across different timeframes- not found Depth of assessment, including science-based evaluations and consideration of synergies and trade-off s across short-term (<5 years), medium-term (5–10 years), and long-term (>10 years) timeframes- not found

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There are timeframes associated with all adaptation policies in the NAP, but these strategies/policies have not been sequenced based on a contingency plan. Moreover adaptation is not explicitly integrated into local growth and development pathways.

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5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	It appears Sri Lanka is in the process of developing a system for monitoring climate action progress as per a presentation by Ranaweera, The Director of the Policy Planning and Monitoring)- however this information could not be further verified. Beyond this presentation, establishment of regular monitoring and evaluation processes for adaptation actions (e.g., engineered solutions, behavioral interventions, nature-based solutions)- not found

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	None found. In fact research suggests heat risks are persistent and expanding around Colombo (Sumaiya et al., 2025; Chathuranga & Jayaratne, 2022)

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not found

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Established Meteorology Office sends out heat warnings, but not heat specific office as such.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The NAP, Climate Profile, World Bank, and other NPO and University-prepared reports show abundance of expertise.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	None found.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Colombo, Sri Lanka
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Yes, both chronic and acute heat hazards are identified. Some neighborhood level data is presented but this does not cover all the neighborhoods of the city. Day and night data is presented, along with implications of month changes in heat stress.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, different drivers of current exposure and vulnerability are identified. These are categorized into climatic and urbanization related groups. It covers people as well as infrastructure impacted. Neighborhood level information is missing though.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	This provided but more at the national level, local relevance is scant. Most of the figures provided are at the national level. Some of the city level drivers of future heat risks such as migration are identified in some documents.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	Based on these references, there is no dedicated heat adaptation plan for Colombo though the need for this is stressed. Plan making seems to be underway.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	This is slightly tricky to score as while there is no dedicated heat action plan for the city, different documents recommend a host of short to long term goals. It is difficult to ascertain how many of these are taking shape or approved, and how many are recommended only. Neighborhood level details are sporadic.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	There are project specific engagement mechanisms in place but a permanent engagement mechanism embedded in urban governance of Colombo seems to be missing. Efforts seem piecemeal and ad-hoc with limited/low participation from pilot neighborhoods only. NAP proposes a mechanism in this regard.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes a range of actions are recommended addressing both acute and chronic heat stress. Some actions also seem to be cognizant of future stress and consider multiple actors and sectors.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, such drivers across systems are identified but without very explicit focus on future risks or differentiation at the local level. A range of actors is considered.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Yes, but in a disjoint and project specific manner. There seems to be consideration of neighborhood level impacts in implementation. However, these seem more incremental (and ad-hoc) in nature and while some can be verified others are from the national level and tricky to verify right away.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Project specific costs are presented in some documents but they lack detail and relevance. These are primarily economic only.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Yes, larger level trade-offs and synergies are identified – at times pertaining to specific action, however, much of this seems to be coming from the national level and lacks relevance and localized details.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	This is difficult to score as while NAP has a clear pathways approach, it is at a national level and should not be read as a Colombo specific document. Another document (MoM from 2022 – “Integrating Heat Stress Management into Climate Policies and Guidelines for Gender-Sensitive Heat Action Plans in Sri Lanka”) contains details but are tricky to be verified. It can be scored 2 but I would go for 1.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Again, NAP proposed a national level MEL but this should not be construed as

Assessment score:	1
	Colombo specific. Limited data on if anything specific in this regard, though some projects do mention baseline and related activities. It is difficult to say it is not being done entirely hence scoring 1.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No such explicit information was found, with evidence pointing to the contrary.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No such explicit information was found, however, some documents do mention possible maladaptation.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Yes to a great extent including integrated heat alert system, changes in Disaster management act, dedicated personnel and institutional integration. However, how effectively these are working is tricky to verify. This can be a 2 but giving the range of activities and initiative, I score it 3

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Yes, various agencies and actors seem to have such expertise in place. However, if such expertise is being utilized in an integrated manner is tricky to ascertain. Such expertise seems to be siloed and ad-hoc.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No dedicated funding for heat adaptation in Colombo seems to be available. Some estimates in this regard are provided in certain documents.

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Centre for Sustainability, Sri Lanka. (2025). *Heat stress and outdoor workers in Colombo* [Report]. https://www.csf-asia.org/wp-content/uploads/2025/07/Heat-stress-and-outdoor-workers-in-Colombo_June-2025.pdf

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Dhaka, Bangladesh

Scoring sheet

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City case study:	Dhaka, Bangladesh
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards are identified across both chronic heat stress and acute heat shocks, particularly heatwaves. Prior incidents of heat stress and heatwaves are documented for 2003, 2005, and 2023. City-level average temperatures and 30-year warming trends are also noted. In addition, mean temperature patterns are assessed at a highly local scale, including neighborhoods and wards, using land surface temperature (LST) derived from Landsat 8 imagery. There is some mention of interaction with heat and water stress, though the analysis could be strengthened by adding more discussion of cross-hazard interactions and compound or cascading risks.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Key drivers of heat exposure and vulnerability are identified. Urban heat island effects are noted across the city, increasing heat exposure. The assessment also addresses differential vulnerability among groups such as residents of slums and informal housing, outdoor workers, and women and girls. Vulnerabilities in critical infrastructure and services are highlighted as well, including solid waste management, health, energy, and transportation systems. Some system-level vulnerabilities are assessed at the ward level, though they are not always explicitly linked to heat impacts. Adaptive capacity is included as an additional dimension, reflecting how different groups can cope with and respond to rising heat. The

Assessment score:	3
	analysis could be strengthened by examining the root causes of vulnerability and providing more localized, neighborhood-level detail on vulnerable people, infrastructure, and ecosystems.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat risks are projected using national and regional scenarios, including SSP1-2.6 and SSP5-8.5, which indicate rising temperatures and increasing heat risk. A ThinkHazard! assessment for the city also suggests that heat stress conditions are expected to occur roughly once every five years. The analysis notes that key drivers of exposure and vulnerability may shift over time due to rapid urban development, population growth, and migration into the city. However, locally specific, city-scale projections and neighborhood-level detail on future heat risk remain limited.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Dhaka North and Dhaka South each have dedicated climate action plans, but these are broad strategies that combine mitigation and adaptation and include relatively limited detail on heat-specific actions. The plans mention developing a heat action plan by 2030, though it is unclear what progress has been made or the plan's current status.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There are some heat-related goals spanning the short and long term. These include producing a heat action plan by 2030 and establishing a heat early-warning system by 2050, alongside a handful of heat-specific actions tied to adaptation. However, the goals are not described in much detail and provide limited local context. They also lack clarity on measurability, assessment approaches, and how progress will be tracked.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Some engagement mechanisms appear to be in place, though their ongoing use and continuity are limited or unclear. In developing the city's climate action plans,

Assessment score:	2
	the process reportedly included regular consultations, workshops, and meetings with stakeholders from different organizations and community groups. However, it is difficult to determine whether these engagement efforts continued beyond the plans' initial development or how directly they connect to heat adaptation specifically.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Heat-related actions addressing heat hazards are identified, largely focused on preventing and reducing heat stress. These include measures such as cool roofs for slum housing, green roofs for residential buildings, expanding urban green space, and establishing cooling centers. Although framed as responses to heat stress, many of these actions would also help during acute heat shocks, including heatwaves. Targets are set for implementation between 2030 and 2050, but key details on local context, feasibility, and how these measures should evolve under future conditions are limited.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Heat-related actions are identified, largely focused on reducing vulnerability among high-risk populations and lowering exposure through expanded vegetation. Examples include cool roofs for people living in informal housing or slums, and increasing green space and vegetation cover. Targets are set for implementation between 2030 and 2050, but key details are limited, including how actions align with local drivers of exposure and vulnerability, feasibility considerations, and how measures should adapt under future conditions.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Some identified actions appear to be underway, particularly cool roofs, with some evidence of verification. However, few actions are verified across the full range of heat-related risks, and there is limited consideration of potential maladaptation.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	Costs and benefits are discussed at a broad level for climate action, but not for heat-specific adaptation options. The climate action plans note, for example, that climate action can strengthen city resilience and reduce losses in labor productivity. However, they do not explicitly analyze the costs, benefits, or trade-offs of specific heat adaptation measures.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Synergies are discussed broadly for climate action, but not in relation to heat adaptation options specifically. The climate action plans note that climate action can deliver co-benefits such as improved air quality, better access to energy and water, and a stronger local economy. However, they do not assess the co-benefits or trade-offs among specific heat adaptation measures.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Heat adaptation options, such as cool roofs, have targets for scaling implementation between 2030 and 2050. However, these actions are not consistently organized into an integrated, pathway-based approach.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	A monitoring and evaluation framework, led by the Climate Core Team, is described, including frequent data collection, internal and external reporting, periodic implementation reviews, and processes for updating and revising plans. Some heat adaptation actions also have defined targets, such as achieving cool roofs on 50% of existing buildings by 2030. However, the monitoring and evaluation is focused on broad climate action and the extent to which these procedures are being implemented in practice is limited or unclear.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	There is limited evidence in the scientific literature on the impacts of heat adaptation

Assessment score:	2
	measures such as cool roofs. The available evidence is primarily based on modeling rather than direct observation, but it suggests that cool roofs could reduce urban temperatures. Overall, the evidence base could be strengthened by assessing a wider range of interventions and considering multiple dimensions of heat risk and vulnerability.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no mention of, or evidence for, efforts to identify and reduce maladaptation risk.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Heat governance structures appear to be partially established or emerging. Dhaka North has established a dedicated Chief Heat Officer. However, it is unclear whether this role is sustained over time or what authority it holds. Dhaka South does not explicitly identify an equivalent heat-dedicated role. Both Dhaka North and Dhaka South describe climate governance structures through their Climate Core Teams, but these structures are focused on broad climate action and not explicitly on heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Some technical expertise appears to be in place and accessible. The city has technical partnerships with C40 and ICLEI and notes participation from academic institutions, government departments, and other organizations. The climate action plans also describe internal capacity-building efforts, including initiatives to train local leaders and community members to support climate action. There could be more comprehensive implementation including variety and depth of expertise.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding approaches are identified, including budgeting for climate action through the annual budget and other resources, as well as potential external funding opportunities. However, it is unclear whether dedicated funding has been secured or implemented for heat adaptation efforts specifically.

References

Dhaka North City Corporation. (2024, June 26). *Climate Action Plan for Dhaka North City Corporation* [PDF]. Dhaka North City Corporation & ICLEI. https://www.sanirepo.com/view-full-pdf/226

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Scoring sheet

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City case study:	Dhaka, Bangladesh
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	Heat stress is identified and described along with a heat map, but no description of chronic or acute heat stress is discussed. Also, no depth and dimension of the discussion.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Current drivers of heat exposure and vulnerability are mentioned, focused on climatic change, urban heat island effect, socioeconomic and occupational factors and inadequate infrastructure and services. Studies are more focused on informal workers.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	RCPs models are used to predict future risk potential along with the sectors influenced by heat in future is projected but have very little information and fail to consider multiple dimensions.

---

2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	The DNCC and DSCC climate action plan targets to develop a heat action plan for the city by 2030. Some measures are mentioned in the plan, but no details are mentioned along with the plan of implementation.

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	No short-term goals and long-term goals are planned; only mentioned developing a plan by 2030.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The consultation was done while developing DNCC and DSCC CAPs both formal and in-formal meeting and workshop are mentioned and public awareness campaign are discussed.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	Cool roof building is planned to be 100% by 2030 and other infrastructure related plan to be 20-30% by 2030 so no concrete action for acute or chronic heat differentiated. Some individual action is recommended but multiple dimensions are missing.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Action identified to address mostly infrastructure related actions. Not explicitly discuss about multiple drivers and vulnerability.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Actions such as cool roof mentioned to be limited adoption while some efforts are suggested to be supported by donor agency. The targets are set at 2030 and mostly have limited information of implementation.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	Cost benefit of heat adaptation not analysed. Overall climate adaptation measures benefits are mentioned which include reduce productivity.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Although some co-benefits of integrating climate action emphasise on adaptation measures supporting sustainable development goal specific discussion of heat adaptation is missing.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Different climate scenarios are mentioned but heat adaptation's sequenced and pathway based approach is missing.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Both CAPs have M&E frameworks based on C40's MER adaptation framework. Have a climate core team monitoring. Have heat sector KPIs, also have internal and external reporting mechanisms. But implementation of these intervention is not explicitly mentioned along with course correction issue.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence of reduced heat risk mentioned in sources. Action plan target for future - 2030.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No mention of maladaptation but some understanding of maladaptation risk particularly socioeconomic impact in labour discussed but not clearly discussing maladaptation risk or practices.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Climate core team established, proposed high level CAP Advisory committee but no separate heat adaptation structure mentioned.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Some level of technical expertise identified in the climate core team and nodal ministry but also acknowledge limitation particularly concerning localised data , specific sectoral technical skills and public education.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No funding in place. CAP mentioned proposed funding for adaptation actions. It mentioned that Dhaka is actively building a framework for dedicated heat adaptation funding, integrating it into municipal budgets, and actively seeking external and innovative financing.

References

Dhaka North City Corporation. (2024, June 26). *Climate Action Plan for Dhaka North City Corporation* [PDF]. Dhaka North City Corporation & ICLEI. https://www.sanirepo.com/view-full-pdf/226

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Dubai, UAE

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Dubai, UAE
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Heat stress is treated overwhelmingly as an economic issue. The concern is production and worker health. There is little evident consideration of the impacts of heat outside the workplace. Inside the workplace the heat hazards are well-identified.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Heat drivers are considered in working environments.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	The outlook of heat risks is clearly “higher” but without specificity about place, types of infrastructure, types of buildings, neighborhoods, etc.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a plan for dealing with higher heat, but it is almost exclusively for managing worker safety through monitoring, process, clothing, breaks and rest, etc.

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	No specific goals are set, nor are particular

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	0
Rationale:	There is no mention of community engagement and the communication is top-down to corporations/managers not to individuals.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	There is a list of actions, but there is little consideration of their limits or viability.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	The large driver of change–warming atmosphere–is identified, and the limits that the human body faces are also identified, but drivers like kinds of infrastructure or industrial facilities are not addressed. They are clearly left to the private sector to manage.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	No evidence, although some implementation is very likely.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	There is no mention of costs or tradeoffs. The plan is purely in terms of extreme heat risks.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Very few strategies are discussed other than work protocols.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	All actions are left up to the private sector.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	There are references to monitoring and reporting, but there is no evidence of a formal process, and documents that are now 5-7 years old do not appear to have been updated.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	There is no direct evidence in the documents presented.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no mention of maladaptation risk.

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	All heat plans appear to be suggestive, not governed or regulated.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	There is climate and health expertise in the government, and UAE is part of some international groups that share information.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	There is no formal budget for adaptation and actions appear to be left entirely to the private sector.

References

United Arab Emirates Ministry of Climate Change and Environment. (2017). *National climate change plan of the United Arab Emirates 2017–2050* [National climate change plan]. https://moccae.gov.ae/assets/download/d3d90eba/National%20Climate%20Change%20Plan.pdf.aspx

Dubai Municipality. (2021). *Technical guidelines for management of heat stress at work* [Guidelines]. https://www.dm.gov.ae/wp-content/uploads/2022/08/DM-HSD-GU38-MHSW2_Technical-Guidelines-for-Management-of-Heat-Stress-at-....pdf

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Scoring sheet

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City case study:	Dubai, UAE
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	WIthin the documents reviewed, heat is acknowledged as a health concern but little detail on chronic vs. acute risks, heatwaves, or geographic heterogeneity is discussed.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Partially - worker vulnerability is emphasized.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	At a national scale.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Heat is a pillar of national adaptation plan, but city-specific heat adaptation plan was not found.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Within the national adaptional plan there are a range of goals for adaption broadly.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Engagement is mentioned aspirationally in the national adaptation plan.

---

3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Urban microclimate cooling initiatives are under way.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Worker protection measures and requirements are in place

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Some evidence of implementation.

---

4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No evidence found

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No evidence found

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No evidence found

---

5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	No evidence found

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Some evidence of urban cooling actions.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No discussion of maladaptation found

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	No evidence found

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	No evidence found; establishment of a technical working group is a goal within national adaptation plan.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No evidence found.

References

United Arab Emirates Ministry of Climate Change and Environment. (2017). *National climate change plan of the United Arab Emirates 2017–2050* [National climate change plan]. https://moccae.gov.ae/assets/download/d3d90eba/National%20Climate%20Change%20Plan.pdf.aspx

Dubai Municipality. (2021). *Technical guidelines for management of heat stress at work* [Guidelines]. https://www.dm.gov.ae/wp-content/uploads/2022/08/DM-HSD-GU38-MHSW2_Technical-Guidelines-for-Management-of-Heat-Stress-at-....pdf

Osman, S. (2024, April 15). *Assessing climate adaptation plans in the Middle East and North Africa*. Carnegie Endowment for International Peace. https://carnegieendowment.org/research/2024/04/assessing-climate-adaptation-plans-in-the-middle-east-and-north-africa

Hong Kong, China

Scoring sheet

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City case study:	Hong Kong, China
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Evidence have quantified current heat-related risks in detail, including rising numbers of hot days and hot nights, and clear exposure-response curves between temperature and mortality/hospital admissions. Climate reports show long-term temperature anomalies and warming summers trend. But these evidence are mainly from scientific assessment rather than city management.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Multiple sources highlight who is most exposed and vulnerable: people living in subdivided flats, the elderly, those with chronic illnesses, rural squatter dwellers, and outdoor workers are repeatedly mentioned, with concrete examples such as indoor night-time temperatures in small flats feeling like 44°C. Community dialogues and NGO reports describe financial constraints, lack of community facilities, and limited enforcement of occupational safety guidelines. However, these insights have not yet been pulled together into a formal, city-led vulnerability assessment framework with mapped priority areas.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Official climate documents project substantial warming in Hong Kong by the end of the century, with annual mean temperature increases of 3-6°C under high-emission scenarios. Projections show that future heat risks are recognized and quantified, but they are not yet accompanied by a dedicated, forward-looking heat-health risk analysis that links scenarios to specific vulnerable groups and planned responses.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	Hong Kong's Climate Action Plan 2030+ and 2050 include adaptation and resilience chapters, where extreme heat and urban ventilation are mentioned as issues within a broader climate adaptation framework. The city also operates a formal Very Hot Weather Warning (VHWW) system with associated health advice and departmental guidance. At the same time, recent analysis notes that the 2050 plan focuses more on engineering projects and flood management, and that heat response remains a patchwork across agencies rather than a dedicated, citywide heat health action plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	The climate action plans commit to strengthening adaptation and resilience up to 2050 and to reviewing strategies roughly every five years. However, they do not spell out specific short-, medium-, and long-term targets for heat, such as reductions in heat-related mortality or coverage of cooling facilities.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	On the planning side, the government funds climate-related community projects through schemes like the Environment and Conservation Fund, and the Observatory runs regular talks and exhibitions on climate change. Civil society initiatives, such as Paris Watch dialogues, bring welfare groups and NGOs into conversations about heat impacts on disadvantaged communities. The current material does not show there is a formal, recurring mechanism specifically for involving communities and stakeholders in heat adaptation planning at the city level.

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Hong Kong operates a long-standing Very Hot Weather Warning system that combines meteorological variables and, since 2014, an impact-based component using excess hospitalization. Under VHWW, departments may open temporary shelters, issue repeated announcements, and disseminate health advice. These measures show a relatively mature warning-and-shelter system, though citywide, tiered heat response (including coordinated hospital surge planning and urban cooling infrastructure) is not fully documented.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Existing actions do attempt to reach vulnerable groups: air-conditioned community centers are opened for temporary respite during very hot days, especially for residents in cramped, poorly ventilated flats. These measures therefore address some drivers of exposure and vulnerability, but they are not yet part of a structured, citywide vulnerability reduction programme.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	The VHWW system has been in place for years, with 38 warnings issued in 2016 alone. Cooling shelters are clearly counted and tracked, with 19 centres open for 66 nights during a recent summer. Temperature–health studies and monitoring of help-seeking and hospital admissions show that the health sector is observing heat impacts in practice. Even though there is no consolidated implementation report for all measures, the evidence indicates that key actions are actively operating.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	The reports describe climate impacts and the need to strengthen infrastructure and urban fabric, but they do not lay out cost–benefit or cost–effectiveness comparisons for specific heat adaptation options such as green infrastructure, building retrofits, or expanded cooling networks. Heat-related actions are framed more as general directions than as choices evaluated through economic analysis.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The adaptation and ecosystems sections describe multiple co-benefits of nature-based and blue–green infrastructure, including cooling, biodiversity, and improved amenity. They also note that integrating ecological elements into drainage works can simultaneously manage floods and enhance the environment. These are examples of synergies, but they are discussed qualitatively; there is no systematic framework for assessing cross-sector trade-offs and synergies specifically for heat across energy, housing, transport, and health.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Hong Kong 2030+ and the climate action plans outline a broad vision for a smart, green, and resilient city and refer to strengthening adaptation up to 2030 and 2050, including elements that relate indirectly to heat. However, there is no explicit, stepwise roadmap for heat adaptation with concrete milestones and timed actions. Extreme heat is included as part of a wider resilience agenda rather than being given its own pathway.

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5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The city has strong meteorological and health monitoring. The climate plans state that policies will be updated in light of new climate science and local projections. But there still lacks a dedicated monitoring-and-evaluation system for heat adaptation actions.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	Available evidence points to rising, not declining, heat risks: hot nights have increased roughly 38-fold over the past century, and between 2014 and 2023 an estimated 1,455 people died from heat-related causes. No data are presented showing a sustained reduction in heat-related risks attributable to adaptation measures.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	The climate and ecosystems sections emphasize measures like blue–green infrastructure, urban forestry, and better ventilation, which move beyond pure air-conditioning as a cooling strategy. There is, however, no explicit, systematic assessment of maladaptation risks in heat policies or a dedicated mechanism to address them.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Hong Kong has a formal climate governance structure, including an Office of Climate Change and Carbon Neutrality, steering committees, and interdepartmental task forces, as well as an emergency preparedness task force for multi-hazard situations. The documents do not identify a single lead agency dedicated specifically to coordinating heat governance.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The Hong Kong Observatory provides long-term climate monitoring and projections as the government's climate science authority. Local universities have produced detailed epidemiological evidence linking temperature to mortality, hospital admissions, and health service use. Planning authorities have also developed the Urban Climatic Planning Recommendation Map and ventilation assessment tools to inform urban design. Overall, technical and data capacity for heat-related analysis appears strong, though the balance between in-house government capacity and external academic support is not fully described.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The climate plans refer to increasing investments in adaptation-related infrastructure, including blue–green drainage, coastal protection, slope stabilization, and urban forestry. The Environment and Conservation Fund finances climate-related community projects, and power companies offer some targeted bill subsidies. But the long-term financing mechanism specifically for heat and health adaptation, such as a ring-fenced heat resilience fund, is still lacking/unclear.

References

Council for Sustainable Development, Government of the Hong Kong Special Administrative Region. (n.d.). *Hong Kong's Climate Action Plan 2050* [Leaflet]. https://cnsd.gov.hk/wp-content/uploads/pdf/CAP2050_leaflet_en.pdf

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PreventionWeb. (n.d.). *Hong Kong's July heatwaves highlight the city's lack of holistic climate governance*. PreventionWeb. https://www.preventionweb.net/news/hong-kongs-july-heatwaves-highlight-citys-lack-holistic-climate-governance

Earth.Org. (n.d.). *"I can't sleep": Hong Kong's rising nighttime heat exposes inequalities*. Earth.Org. https://earth.org/i-cant-sleep-hong-kongs-rising-nighttime-heat-exposes-inequalities/

Scoring sheet

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City case study:	Hong Kong, China
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Prof. Dr. Edward Ng etc. have published many relevant articles.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Prof. Dr. Edward Ng etc. have published many relevant articles.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Prof. Dr. Edward Ng etc. have published many relevant articles.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Documents sent have been published by the government sector.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Documents sent have been published by the government sector.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Documents sent have been published by the government sector.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Some information is demographically shown.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Enough information has not been shown yet.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Some information is demographically shown.

---

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Prof. Dr. Edward Ng etc. have introduced many relevant information.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Prof. Dr. Edward Ng etc. have published many relevant articles.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Some information is demographically shown.

References

Council for Sustainable Development, Government of the Hong Kong Special Administrative Region. (n.d.). *Hong Kong's Climate Action Plan 2050* [Leaflet]. https://cnsd.gov.hk/wp-content/uploads/pdf/CAP2050_leaflet_en.pdf

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Chan, G. (n.d.). *Heat action and innovation in Hong Kong: 1st Global Forum for Heat and Health, Hong Kong SAR* [Conference presentation]. Collaborating Centre for Oxford University and CUHK for Disaster and Medical Humanitarian Response (CCOUC), The Chinese University of Hong Kong. https://heathealth.info/wp-content/uploads/Gloria-GHHIN.pdf

PreventionWeb. (n.d.). *Hong Kong's July heatwaves highlight the city's lack of holistic climate governance*. PreventionWeb. https://www.preventionweb.net/news/hong-kongs-july-heatwaves-highlight-citys-lack-holistic-climate-governance

Earth.Org. (n.d.). *"I can't sleep": Hong Kong's rising nighttime heat exposes inequalities*. Earth.Org. https://earth.org/i-cant-sleep-hong-kongs-rising-nighttime-heat-exposes-inequalities/

Jakarta, Indonesia

Scoring sheet

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City case study:	Jakarta, Indonesia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	1

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	In the Jakarta Climate Action Plan 2021-2050, heat hazards are only vaguely identified, mostly attributed to either climate change or the Urban Heat Island (UHI) Effect. Human activity, especially Jakarta's traffic, is not mentioned at all. In contrast, Indonesia's National Adaptation Plan 2026-2030 provides a very detailed assessment of current heat hazards on multiple sectors (health, agriculture, etc.). It seems that the document for Jakarta was written at a time when considerations of heat hazard impacts were only emerging in a few local government organisations. This has changed in the past 5 years, and it seems the local Climate Action Plan requires updating to reflect better the current state of knowledge and available adaptation strategies.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	0
Rationale:	Not in the documents shared with me.

1.3 Are future heat risks projected?

Assessment score:	0
Rationale:	Only Indonesia's National Adaptation Plan 2026-2030 contains detailed information

Assessment score:	0
	about future heat risks. None of the ‘local’ documents provided contained this information.

---

2. Adaptation plan

Confidence score:	0

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	A heat adaptation plan for Jakarta does not exist. The request for proposals for a Heat Adaptation Plan does not include the development of such a plan, rather seeks work to better understand and manage the impacts of heat on public health. This is a very narrow focus that ignores the impacts of heat on services, systems, infrastructure and nature. The request for proposals closed in late September 2025, indicating that, if reasonable proposals were submitted, a heat-health adaptation plan could inform government procedures and strategies as early as 2027. The Resilient Jakarta Strategy Brief (date likely 2018 or 2019) does not even mention heat a single time.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Goals mentioned in the Jakarta Climate Action Plan are vague and not specifically address the multifaceted impacts of heat. One example is that the plan identifies that improving public transport will help reduce heat, but it is unclear what the government is planning to do to improve public transport.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	0
Rationale:	No such mechanisms or activities of the local government of Jakarta related to heat preparedness of the community are mentioned in any documents. The Request for Proposal is asking to develop engagement and outreach activities (Component 6, p.13), but at the time of this review, it is unclear how these activities will be structured and implemented. As written in the text by James Balzer and also demonstrated by the additional resources I reviewed on the internet, community actions that aim to provide adaptation and mitigation of extreme heat do exist. Yet, these actions are ‘bottom-up’, driven by individuals and citizens, not systematically organised and administered by local or provincial government organisations.

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3. Adaptation Actions

Confidence score:	0

3.1 Are actions addressing heat hazards identified?

Assessment score:	0
Rationale:	Not specifically. For example, the Jakarta Climate Action Plan lists many actions that should be taken to adapt and mitigate the impacts of climate change, but none of the actions are specific enough to be considered relevant for reducing heat hazards. For example, Action 2.1 (p. 52) identifies that land-use planning controls are important tools to reduce the UHI Effect, but no specific actions are provided that would lead to its reduction. Green infrastructure is mentioned, but it is not specified how green infrastructure should be implemented to reduce heat hazards. The simple concept around stresses and shocks of climate change is mentioned in the Resilient Jakarta Strategy Paper, but not unpack what specifically this concept will mean for heat and what actions are needed to address the subsequent impacts.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	0
Rationale:	Please see my answer in 3.1.

3.3 Are identified actions being implemented?

Assessment score:	0
Rationale:	Please see my answer in 3.1.

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Some benefits of climate adaptation are named in the Climate Action Plan for Jakarta. However, they do not relate to heat adaptation directly. No CBA is included in any existing documents or even in the Request for Proposal Heat Resilience. It seems that the economic impacts of heat on Jakarta remain largely undescribed.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Synergies and trade-offs are not assessed.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	As heat adaptation actions are lacking, there is no sequenced, pathway-based approach for Jakarta.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	No monitoring or evaluation processes were identified.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence is identified.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence is identified.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	No heat governance structures were identified at the local and provincial levels.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Some technical expertise is available, demonstrated by the Request for Proposal for the Jakarta Heat Resilience and Health Initiative - someone must have authored it. Also, the Indonesian National Adaptation Plan clearly demonstrates that technical expertise does exist, just not at the local and provincial government levels. The text

Assessment score:	2
	written by James Balzer further highlights that local initiatives and networks exist that demand heat mitigation action from the government. The existence of sound local expertise of heat adaptation and avoidance is captured in the work published by Salsabila and colleagues (2023). As shown in the C40 Cities video from Jakarta, academics are also studying the impacts of heat on the local population and offer science-based solutions (coating a roof with high-reflectivity paint). However, there are no documents available that outline the level of technical expertise at the local government level.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Yes, as demonstrated by the Request for Proposal for the Jakarta Heat Resilience and Health Initiative, which has a maximum cost cap at US$100,000. For a city of 10 million people, this amount of investment into heat adaptation in a city that suffers from extreme heat regularly seems farcical.

References

Jakarta Provincial Government. (2021). *Towards climate resilience and carbon neutrality: Jakarta Climate Action Plan 2021–2050* [Climate action plan].

Republic of Indonesia, Ministry of Environment and Forestry. (2025). *Indonesia National Adaptation Plan (NAP) 2025* [National adaptation plan]. https://unfccc.int/sites/default/files/resource/NAP_Indonesia_2025.pd

Puspa, D. (2024). *Seeing the forest beyond the trees: Extreme heat governance in Jakarta*. illuminem. https://illuminem.com/illuminemvoices/seeing-the-forest-beyond-the-trees-extreme-heat-governance-in-jakarta

Jakarta Provincial Government. (2017). *Jakarta resilience strategy* [City resilience strategy]. Resilient Cities Network. https://resilientcitiesnetwork.org/downloadable_resources/Network/Jakarta-Resilience-Strategy-English.pdf

C40 Cities Climate Leadership Group. (2025). *Request for proposal (RfP): Jakarta heat resilience and health initiative* [Request for proposal]. https://www.c40.org/wp-content/uploads/2025/09/RfP_RF_Jakarta.pdf

https://en.tempo.co/read/2057882/jakarta-moves-to-mitigate-extreme-heat

https://www.c40.org/case-studies/transforming-cities-jakarta/

https://www.climateworkscentre.org/our-work/our-work-in-indonesia/

Salsabila et al. 2023, Habitat International (https://doi.org/10.1016/j.habitatint.2023.102924)

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Jakarta, Indonesia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	C40 has only just released RfP for the ‘Jakarta Heat Resilience and Health Initiative’ which will identify and map many of these hazards. Currently, the climate plan and resilience plan place heat hazards amongst general climate change and natural hazards, with little specific heat identification. Recognition of poor housing quality and vulnerable community groups is a start.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Again, this needs to be evidenced by upcoming C40 and Rockefeller RfP work. The stakeholder survey confirms this.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Not yet. The Jakarta Climate Action Plan (2021-2050) focuses on reducing vulnerability to extreme heat as part of broader climate adaptation efforts. The 2021 plan encourages data-driven decision-making and future projections by integrating meteorological and health data but there is little evidence of this having been done yet.

2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Not yet, but this has commenced through C40 and Rockefeller initiative

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Not yet. Not completed.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The C40 group excels at establishing NGO involvement and community groups.

3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Green roofs and white roofs is one initiative that Indonesia has commenced for low quality, vulnerable housing but this is pilot-level. THe C40 planned project does not contain actions to address heat hazards - rather early warning systems, and mapping as well as training health professionals. THe stakeholder survey supports the interpretation that heat hazards and especially drivers are not well integrated into policy or action.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	As above, but this does not address drivers.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Not yet.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	THis has not been broached in any policy or project documents available

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Not yet, but the C40 project may lead to a start along this pathway.

---

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	No actions commenced at scale to monitor

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	No evidence of reduced heat risk demonstrated yet, other than white roofs program

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	None

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	No, but they are being discussed and this was raised in the stakeholder survey as needed

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	May need regional expertise to supplement that within Indonesia/Jakarta.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There is no long-term, sustainable funding demonstrated other than reference to action will be funded by Indonesian government.

References

Jakarta Provincial Government. (2021). *Towards climate resilience and carbon neutrality: Jakarta Climate Action Plan 2021–2050* [Climate action plan].

Republic of Indonesia, Ministry of Environment and Forestry. (2025). *Indonesia National Adaptation Plan (NAP) 2025* [National adaptation plan]. https://unfccc.int/sites/default/files/resource/NAP_Indonesia_2025.pd

Puspa, D. (2024). *Seeing the forest beyond the trees: Extreme heat governance in Jakarta*. illuminem. https://illuminem.com/illuminemvoices/seeing-the-forest-beyond-the-trees-extreme-heat-governance-in-jakarta

Jakarta Provincial Government. (2017). *Jakarta resilience strategy* [City resilience strategy]. Resilient Cities Network. https://resilientcitiesnetwork.org/downloadable_resources/Network/Jakarta-Resilience-Strategy-English.pdf

C40 Cities Climate Leadership Group. (2025). *Request for proposal (RfP): Jakarta heat resilience and health initiative* [Request for proposal]. https://www.c40.org/wp-content/uploads/2025/09/RfP_RF_Jakarta.pdf

Jodhpur, India

Scoring sheet

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City case study:	Jodhpur, India
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards are identified across both rising temperatures and chronic heat stress, as well as acute heat shocks such as heatwaves. The heat action plan notes increasing annual and maximum temperatures in the city and describes heat impacts on health, the economy, and local ecology. The analysis could be strengthened with more neighborhood-level assessment, more advanced integration of relevant datasets, and deeper consideration of cross-hazard and compound risks.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Current drivers of heat exposure and vulnerability are identified in detail. The assessment considers factors such as population density, slum households, illiteracy rates, sites of labor chowks, land use, access to parks, and more. It also discusses underlying drivers and draws on multiple data sources, including Landsat imagery, census data, and surveys. In addition, the adaptive capacity of vulnerable groups is assessed, and exposure, sensitivity, and adaptive capacity are mapped at both neighborhood and ward levels.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat risks are projected, including forecasts of maximum temperatures and heatwaves. The analysis could be strengthened by projecting how key drivers of exposure and vulnerability may change over time and by providing more local, neighborhood-level projections.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	There is a dedicated local heat adaptation plan with assessments, coordination and response plans, and strategies and actions. There could be more details regarding budget and funding.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	There is a range of short- to long-term goals, though timelines for launching or achieving them are sometimes unclear. Stakeholder workshops also identified short-, medium-, and long-term heat adaptation strategies at the city level. Overall, goals and strategies are locally tailored, but they could be strengthened by clearer metrics and assessment approaches, as well as a more explicit articulation of how different goals and strategies connect to one another.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Stakeholder and community engagement mechanisms are in place, particularly through stakeholder workshops that supported and informed the heat action plan. Participants included government officials, academic and research institutions, and community members. Workshop inputs helped shape heat adaptation goals and strategies, as well as the city's standard operating procedures for heat-related efforts. The heat action plan also notes ongoing communication and consultation with stakeholders on the early warning system and public education related to the plan.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Multiple actions to address heat hazards are identified, including early warning systems, cooling centers, and cool roofs. Some actions are prioritized for specific wards. The plan also considers future conditions through measures such as water harvesting to support some of these actions.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Multiple actions are identified to address drivers of heat exposure and vulnerability, including heat awareness campaigns, cool roofs, adjusting work hours, providing water for workers during heat waves, and reforestation. Some actions are prioritized for specific wards. The plan also considers future conditions through measures such as water harvesting to support some of these actions.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Multiple actions are being implemented, with verified evidence for measures such as early warning systems, cool roof pilots, heat awareness and education campaigns, and cooling stations. However, the set of identified actions does not appear to include consideration of maladaptation risks.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Costs and benefits are discussed in broad terms, for example describing cool roofs as a low-cost option and noting benefits such as lower temperatures and improved thermal comfort. However, there is no comprehensive cost–benefit analysis across heat adaptation options, even though impacts of some implemented actions are described.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Some synergies and trade-offs are noted, such as cool roofs reducing air-conditioning demand and potentially lowering air pollution through energy savings. However, these discussions are limited and lack detail, local context, and consideration of multiple dimensions of risk and impact.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Heat adaptation options are organized in a sequenced, seasonal approach, with structured actions for the pre-heat period, the heat season, and the post-heat period. The plan also describes a scaling pathway, where actions are piloted first and then expanded across the city, including potential integration into building codes and regulations. Continuous improvement is noted as well. The approach could be strengthened with more comprehensive pathway-based planning that builds in greater flexibility and iteration over time.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Adaptation actions are monitored and evaluated, particularly after the heat season, through post-summer reviews across local government departments and implemented actions. Key monitoring indicators include heat-related illnesses and fatalities, and the plan also references mechanisms for continuous improvement. The framework could be strengthened with clearer, more detailed targets and greater specificity on what course-correction procedures involve in practice.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	There is strong, well-established evidence that several heat adaptation actions reduce heat risk, including cool roofs, cooling centers, and heat awareness and education campaigns. While many of these efforts are still pilots, reported outcomes include measured temperature reductions, improved thermal comfort, and the number of people reached or trained. The evidence base could be strengthened by tracking sustained impacts over time and assessing additional dimensions of risk and wellbeing.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no mention of, or evidence for, efforts to identify and reduce maladaptation risk.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	There are formal and interconnected heat governance structures in place at the local level. A dedicated Heat Action Plan Nodal Officer coordinates and manages implementation of heat adaptation efforts. Oversight is provided by the Heat Wave Plan Implementation Committee, which includes government officials, relevant departments, and other stakeholders. The plan also outlines inter-agency coordination arrangements to align government actors around the goals and strategies in the heat action plan.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	A wide breadth of technical expertise is available through stakeholders and collaborators. This includes contributions from forecasting agencies, research institutions, and hospital and public health networks with heat-relevant expertise. The plan also proposes trainings for health officials to strengthen their capacity to respond to heat-related emergencies. However, it is unclear how well-integrated or consistently accessible this technical expertise is in practice.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Funding appears to be available, as several heat adaptation actions are being implemented and piloted. However, it is unclear whether this funding is dedicated specifically to heat adaptation or sustainable over time.

References

Natural Resources Defense Council, & Jodhpur Municipal Corporation. (2023). *Jodhpur heat action plan 2023* [Heat action plan]. https://www.nrdc.org/sites/default/files/2023-05/jodhpur-heat-action-plan-2023.pdf

Connective Cities. (2024). *Jodhpur Heat Action Plan* [Presentation]. https://community.connective-cities.net/system/files/2024-12/Jodhpur%20Heat%20Action%20Plan.pdf

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Madapala, J., & Kanji, R. (2024). *Transformative adaptation: The case of Jodhpur, India*.

Scoring sheet

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City case study:	Jodhpur, India
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Yes, the HAP (Heat Action Plan) has detailed localized information in this regard and the neighborhood level across the city – with several systems and actors being covered. It also considers acute and chronic heat stress.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes detailed localized information from across the city is presented. This covers a range of sectors and systems and various identifiable data sources.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes this is extensively covered across systems and sectors, however, the interconnectedness of different risks can gain more information in my opinion. A difficult 3, could be 4.

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Yes, the only part missing is dedicated funding and implementation across the city. The plan is prepared for the city and covers all neighborhoods but remedial actions are implemented on pilot basis only.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Yes, the interconnectedness part is tricky to assess as some interventions were done on pilot basis and some connections are implied (or recommended), otherwise, quite detailed.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Yes, the HAP seems to have had an iterative community and stakeholder engagement including co-creation and decision making. There are committees and coordination groups which seem to have regular functioning mechanisms in place.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes, a range of actions are identified which address both chronic and acute heat stress across systems and actors. Future projections are used to recommend such actions. However, as piloting of some of these measures was in selected neighborhoods only, it is ranked 3.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	While a range of actions is identified, some of these seem more blanket in scope (for example leveraging federal housing schemes to reduce vulnerability PMAY-G) which lack localized context. Of course that is a big ask. At the city level this is well done with detail.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Yes, there are multiple verifiable sources mentioned and documentary evidence of implementation of some parts of HAP provided. Maladaptation has been identified as well but these pertain to previous work/project, not the potential maladaptation due to ongoing work.

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4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	Yes, but mostly for pilot projects or from previous experiences in other parts of India. Reports acknowledge difficulty in doing so. Nonetheless, strong quantitative evidence across the city has been provided. This is a good data set from a pilot perspective but as it does not cover the entire city (which can be too expensive), it is ranked 3.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	Detailed work on this front as well. This uses a scientific approach which covers multiple sectors and systems.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Yes, the only part tricky to ascertain is how much of this detail exists for each neighborhood (ward in this case). While the data is localized, ward specific planning could not be found.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Yes, through multiple channels and through periodic review. However, a

Assessment score:	3
	localized/neighborhood specific tailoring of MEL is not apparent – as different neighborhoods have different root causes, corresponding customization could not be found.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Yes, for tangible actions such as cool roofs and cooling stations, concrete quantitative data is provided. For more qualitative measures that have different scales and timelines (such as awareness, capacity building etc.) this is difficult to measure.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Yes but most of this seems to be vis-à-vis past experiences. Limited data in this regard is available.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Yes, such structures seem to have been established across scales with nodal officers in place. Strong inter agency collaboration is emphasized. Multiple SOPs (standard operating procedures) seem to be in place, however, actual integration and institutionalization is tricky to verify from the documents.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Yes, multiple actors (across scales including at the local level) seem to have just expertise in place, however, if such expertise is collectively used for addressing heat stress, it is tricky to measure.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	This is identified but not established.

References

Natural Resources Defense Council, & Jodhpur Municipal Corporation. (2023). *Jodhpur heat action plan 2023* [Heat action plan]. https://www.nrdc.org/sites/default/files/2023-05/jodhpur-heat-action-plan-2023.pdf

Connective Cities. (2024). *Jodhpur Heat Action Plan* [Presentation]. https://community.connective-cities.net/system/files/2024-12/Jodhpur%20Heat%20Action%20Plan.pdf

Kanji, R., Madapala, J., & Sil, S. (2024). Culture for climate action in Jodhpur: Reversing the trajectory from fragility to resilience. *Journal of Cultural Heritage Management and Sustainable Development, 14*(5), 787–792. https://doi.org/10.1108/JCHMSD-04-2024-0076

Sharma, D. (2025). Climate change adaptation policy and institutional framework in arid Jodhpur district of Rajasthan. *International Journal of Research Publication and Reviews, 6*(7), 758–764. https://doi.org/10.5281/zenodo.15826509

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Karachi, Pakistan

Scoring sheet

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City case study:	Karachi, Pakistan
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards are comprehensively identified across both chronic rising temperatures and acute heat waves. Local data is included on rising temperatures in the city, and there is mention of heat interactions with water availability. There is data integrated from Berkeley Earth. However, there could be more detailed and integrated risk analysis of current heat hazards, especially at the neighborhood level.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Drivers of heat exposure and vulnerability are comprehensively identified. A range of drivers is noted, including population density, limited green space and shade, the urban heat island effect, poor housing conditions, inadequate ventilation, and lack of access to cooling. The city includes neighborhood-level maps of a heat vulnerability index and access to parks and open grounds. Quantified data is available for many drivers, such as the percentage of households living in their own homes, access to daily urban recreation space, and the unserved population. Multiple data sources are incorporated, including the Pakistan Social and Living Standards Measurement and city- and neighborhood-level population census data from the Pakistan Bureau of Statistics.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks are projected using multiple data sources, including the IPCC and the World Bank. Projections of temperature increases and the number of hot days are provided across different SSP scenarios. Projected changes in drivers of heat exposure and vulnerability, such as population growth rates, are also noted. However, the analysis could include greater depth and a wider range of scenarios, especially to capture a broader set of heat risks.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	There is a dedicated heat adaptation plan in the form of a city-specific heat wave management plan that covers both planning and response. The plan is tailored to the city's local context, including the departments involved, goals and strategies, and the implementation process. There is evidence that measures from the plan are being implemented. However, there could be clearer evidence of budget or funding, and more attention to chronic heat conditions, not only acute events.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There are a range of goals across both the broader city-specific climate action plan and the more targeted heat wave management plan. Most goals are short- to medium-term, spanning roughly 1 to 10 years. The goals are detailed with local and neighborhood context, clear metrics, and definitions of success. However, there is a lack of heat-specific goals that extend beyond 10 years, although some longer-term goals related to flood resilience may also influence heat outcomes.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Stakeholder and community engagement mechanisms are highlighted in depth, especially in the development of the city-specific climate action plan. The process included multiple consultations (150+), stages of engagement, and input from academia, business, non-profit organizations, and government departments. However, a separate article noted that these consultations were not as transformational or inclusive as they could have been, and instead were focused on a more limited group.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple actions to address heat hazards are identified, including expanding urban green space through native tree shade, planting trees in public parks and at bus stops, providing clean drinking water facilities, procuring efficient electric fans for distribution, and heat wave emergency response measures such as emergency notifications and cooling stations. These measures address both chronic heat stress and acute heat shocks. However, there is not comprehensive consideration of how these actions may need to change as future heat conditions evolve.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Multiple actions addressing drivers of heat exposure and vulnerability are identified, including increasing heat wave awareness among vulnerable populations, keeping night shelters open for migratory populations during heat waves, distributing fans to off-grid and low-income areas, and other measures targeting the most heat-exposed and vulnerable parts of the city. However, there is not comprehensive consideration of how these actions may need to change as future heat conditions evolve.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Multiple actions are being implemented. There is evidence of a range of heat wave-related measures in place, including cold water stalls, heat emergency alerts and notifications, and Heat Stroke Centers. There is also evidence of tree planting and the expansion of green spaces across the city. However, maladaptation risks are not explicitly considered in the actions outlined in the plans.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Costs and benefits are not comprehensively identified or addressed. There are no explicit costs listed for heat adaptation options. Some benefits are noted, such as reducing electricity consumption, lowering greenhouse gas emissions, and enhancing biodiversity. Overall, the discussion of costs and benefits is limited in detail and relevance, does not consider maladaptation risks, and does not draw on a wider range of economic and non-economic analysis.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Synergies and trade-offs are noted at a high-level in terms of heat resilience but not explicitly assessed, detailed, or relevant to the local context.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Heat adaptation options are planned in a structured, sequenced way, with prioritized strategies and layered actions across the short to medium term. There are mechanisms for reviewing and monitoring options, with the potential to scale them if they are successful. However, details are limited, and the flexibility and iterative nature of the plan, and its associated strategies and actions, are not well defined.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring and evaluation of heat adaptation actions are outlined, including evaluation questions, measurement indicators, success metrics, and course correction mechanisms. A proposed Climate Monitoring and Evaluation Department is also described, which would lead monitoring and evaluation for actions implemented through the climate action plan. However, the extent to which these monitoring and evaluation processes are being implemented is unclear.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	There is country-level evidence of heat risk reduction, including metrics related to population exposure, impacts on agriculture, and other measures. However, there is less explicit evidence of heat risk reduction at the local or city level.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no explicit evidence of efforts to reduce or manage maladaptation risk.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	There are clear guidelines for heat governance and management across government bodies. For broader heat adaptation, there is a proposal to establish more integrated and dedicated climate change roles or bodies at the city or provincial level, including a proposed Directorate of Environment and Climate Change. For heat wave management, the Heat Emergency Coordinating Committee and an Emergency Response Coordinator have been established. Overall, heat governance structures are not fully implemented, but they are partially in place and, in some areas, already supported by existing government bodies.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	There is technical expertise in place to support heat adaptation efforts, including support from organizations such as the Pakistan Meteorological Department and C40 Cities. Capacity building and staff training programs are also noted for some projects and initiatives. However, it is also noted that the climate action workforce is mainly administrative and lacks technical expertise.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding needs and potential sources are identified, but funding does not appear to be established or sustainable over the long term.

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Commissioner Office Karachi, Government of Sindh, & Climate and Development Knowledge Network. (2017). *Karachi heatwave management plan: A guide to planning and response* [Heatwave management plan]. https://heathealth.info/wp-content/uploads/HeatwaveManagementPlan.pdf

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Karachi, Pakistan
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards, including both chronic heat stress (long-term rising temperatures) and acute heat shocks (extreme heat events/heatwaves), are identified as critical risks facing Karachi. Heat vulnerability is spatially mapped for Karachi, including analysis at the Union Council level. However, the description does not explicitly guarantee the required comprehensive identification and advanced data integration.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Drivers are comprehensively identified, addressing people, infrastructure, and ecosystems. The plan addresses root causes, such as the lack of affordable housing and poor planning, which lead to settlements around vulnerable areas. Multiple reliable data sources, including the Karachi Population Census (2023) and the Pakistan Social and Living Standards Measurement (PSLM) surveys, support the assessment.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks are comprehensively projected using multiple detailed scenarios at

Assessment score:	3
	a relevant local scale. The Karachi Climate Action Plan (KCAP) utilises multiple climate models, projecting that mean temperatures could rise between 1.1°C (SSP1-2.6) and 4.6°C (SSP5-8.5) by the end of the century. Karachi is projected to fall under the "extreme heat and extreme population class" for the 2080-2099 period. This detailed scenario mapping covers future hazards and exposure trends.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	A comprehensive, locally relevant heat adaptation strategy exists through both the dedicated Karachi Heatwave Management Plan (KHMP, 2017) and the overarching KCAP, along with national heatwave guidelines of Pakistan. The city explicitly states that it does not anticipate significant new resources becoming available for heatwave management. The original heat plan focuses on utilising existing assets; the broader climate plan sets forth a proposal for establishing a new, dedicated, sustainable budget mechanism to fund adaptation initiatives

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Comprehensive goals exist across the full range of short-term (e.g., Target 8.1 by 2025: limiting fan procurement to efficient models), medium-term (e.g., Target 4.1 by 2030: increasing mangrove cover by 500 hectares), and long-term (e.g., Target 3.1 by 2035: restoring riverbeds) timeframes. These local goals are connected to the comprehensive risk assessments (CCRA) and strategies, supported by Key Performance Indicators (KPIs) within the Monitoring, Evaluation, and Reporting (MER) framework, ensuring measurability.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Engagement mechanisms are comprehensive and reflect a high depth of participation. Over 150 consultation meetings and sessions were held during the KCAP development process, involving diverse stakeholders, including hard-to-reach community members such as children, the elderly, and climate migrants. Although another article mentioned, “It seemed like their involvement was more about fulfilling the procedural requirement of consultations rather than incorporating their feedback and responses into the plan.CAC's ongoing efforts to Remaining involved has highlighted the need for more transparent and meaningful engagement. Announcements are often made to a limited group, later referring to them as multistakeholder meetings and consultations to fulfil procedural

Assessment score:	3
	requirements.”

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple actions are comprehensively identified, addressing both chronic heat stress (long-term) and acute heat shocks (short-term). Actions addressing chronic heat stress and future changes include increasing urban green space (e.g., planting 10,000 trees, urban roof gardens), improving building design (retrofitting government facilities), and promoting energy-efficient cooling solutions. Acute shock actions are mandated in the KHMP, detailing procedures for cooling centres, public messaging, and emergency health response during heat alerts. Little consideration is given to future heat, but drainage management of anticipated water is discussed.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions comprehensively address drivers of exposure and vulnerability, including socioeconomic, infrastructural, and ecosystem drivers. Actions target vulnerable populations, Informal Settlements and Poor Housing. Consideration of root causes is evident in pilot projects focusing on upgrading informal settlements (Katchi Abadis). Future prediction of flood risk and coastal risk, but not heat-focused future change.

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	Multiple actions are implemented with verified evidence. Ongoing implementation includes major climate-related infrastructure projects (BRT Green and Orange lines operational). The KHMP outlines established protocols for activating emergency responses annually, providing verified evidence of action implementation. The methodology for the KCAP fully considers potential maladaptation risks by incorporating the C40 AMIA Tool to map trade-offs and risks during strategy development.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Costs and benefits for multiple options are comprehensively analysed, addressing economic and non-economic factors, alongside maladaptation risks, but not for the heat adaptation plan, but for the climate action plan. Maladaptation risks are explicitly identified for assessment using the C40 AMIA Tool.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies and trade-offs are comprehensively analysed. The planning approach mandates the use of the C40 AMIA Tool to systematically map synergy and trade-off potential across different sectors and timeframes in the climate action plan, but not explicitly in the heat action plan.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Adaptation options are comprehensively planned through a sequenced, iterative approach. The KCAP defines its overall strategy using "Pathways" modelling (BAU, Existing & Planned, Ambitious scenarios) to guide long-term targets. Adaptation goals are explicitly segmented into short-term, medium-term, and long-term targets, establishing a clear sequence of objectives.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluation processes are comprehensively implemented. A formal MER system, overseen by a dedicated Climate MER Department, is established for local context implementation. Measurability and target setting are addressed through detailed Key Performance Indicators (KPIs) that cover every adaptation goal (e.g., the number of parks with flood mitigation features and the hectares of mangrove cover increased). Course correction mechanisms are defined through a feedback loop where evaluation findings are presented to the Climate Change Board (CCB) for strategic decisions and policy adjustments.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Heat Wave Guidelines 2024 (Pakistan), which compares the impact on vulnerable districts between pre-guidelines and post-guidelines implementation. The guidelines quantitatively project substantial reductions in key sectors, including vulnerable population exposure, livestock losses, and agricultural (crop) production losses. The detailed projections of expected effectiveness rely heavily on ex-ante projections rather than comprehensively established observed data of risk reduction.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	The plan uses the C40 AMIA Tool to systematically map trade-off potential and mal-investment risk during the planning phase, serving as a pre-emptive measure against increasing other climate risks. However, comprehensive, established evidence that maladaptation risks have been successfully mitigated over time is not yet documented, as well as use of the term directly is not found in the documents.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Heat governance structures are comprehensively implemented at the local level. The KHMP established the institutional framework, led by the Commissioner's Office, with the appointment of an Emergency Response Coordinator (ERC). A Heat Emergency Coordinating Committee (HECC) ensures high connectivity, with members spanning 13 key agencies, including utilities (K-Electric, KWSB), emergency response (Police, Edhi, Chippa), and government (PMD, Health Department). The ERC operates at a senior level (Additional Commissioner) with sufficient authority to mobilise resources and oversee plan implementation.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Technical expertise is available and integrated via coordination bodies like the HECC, which includes technical partners such as the Pakistan Meteorological Department (PMD) and the Medical and Health Department. Capacity-building initiatives are mandated, including training for outdoor labourers and technical assistance to NGOs. However, the KCAP identifies a significant capacity gap within the city's administration, noting that the Directorate of Climate Change has a "predominantly administrative workforce lacking the necessary technical expertise"

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Dedicated funding is not currently secured for long-term sustainability. The Karachi Heatwave Management Plan explicitly states that the city does not anticipate significant new resources for management, relying instead on leveraging existing resources. While the KCAP proposes a financial framework—including developing a dedicated budget head (0.1% of KMC budget) and leveraging grants and carbon markets—this funding is still in the proposal stage, meaning it is only partially established and does not yet meet the requirement of being secured for long-term sustainability

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References

National Disaster Management Authority. (2024). *National guidelines on heatwave risk management in Pakistan* [Guidelines]. https://www.ndma.gov.pk/storage/guidelines/April2024/Zp0ylx4ksogDptXteEYS.pdf

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Government of Pakistan, Ministry of Climate Change. (2016). *National adaptation plan of Pakistan* [National adaptation plan]. https://unfccc.int/sites/default/files/resource/National_Adaptation_Plan_Pakistan.pdf

Kolkata, India

Scoring sheet

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City case study:	Kolkata, India
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Identification of heat vulnerability in Kolkata and the data used to justify it. The heat hazard context for the wider West Bengal region is also mentioned, encompassing both chronic heat stress and acute heat stress, as well as direct impacts across various sectors.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Drivers are comprehensively identified, addressing people, infrastructure, and ecosystems at the neighbourhood level, with detailed analysis of risk drivers and reliable data sources cited. The root cause identified is the loss of blue-green infrastructure, specifically the East Kolkata Wetlands (EKW) and other water bodies, which reduces the city's natural cooling capacity, thereby exacerbating heat retention.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Heat risks are comprehensively projected, addressing most or all future hazards, exposure, and vulnerability trends in detail at a relevant local scale, with a variety of

Assessment score:	3
	detailed scenarios and advanced data integration. The number of days with temperatures exceeding 35°C is projected to increase significantly across all timeframes (2021-2040, 2041-2060, 2081-2100).

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	Dedicated heat adaptation plan exists with sufficient detail and relevance to the local context, and includes some concrete goals, priorities, commitments, or evidence of formal adoption or implementation mechanisms in West Bengal level. The K-CAP mandates the preparation and immediate implementation of a Kolkata Heat Action Plan (K-HAP) (Recommendation 44) to be prepared by 2026.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	A dedicated heat adaptation plan exists with sufficient detail and relevance to the local context, including concrete goals, priorities, and commitments. The short-term goal is to develop K-HAP, focusing on cooling policy, early warning system, worker protection and incentivising resilience. The medium-term focus is on reducing vulnerability in slums, specifically addressing the Slum Heat Island (SHI) phenomenon and infrastructure transformation, as 100% of new buildings must be green buildings.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The plan involves an Expert Committee and proposes wide consultation at various societal and stakeholder levels to garner feedback and finalise the plan. Engagement modes are comprehensive, including citizen engagement, institutional engagement, and the use of a dedicated bilingual website for communication and consultation.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Action for acute shock - early warning system and behaviour change for outdoor workers mentioned. Chronic stress actions include greening the slum area, Control air conditioning temperature policy (22-24°C).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Multiple drivers, ranging from people/socioeconomic factors to infrastructure and density, as well as ecosystem and land cover, are mentioned while partially addressing the root cause and future changes.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Some actions, such as greenery planting, electric vehicles, and waste management, have been mentioned, but the major HAC is due to be published in 2026, so the implementation of these is not yet measurable.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Only mention once at cost savings, waste logistics can reduce transportation distance by up to 36.8%, cost savings by up to 13.35%, and time savings by up to 28.22%.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No discussion of synergies and trade-offs are not assessed or described.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	The K-CAP utilises a clear structure with 60 recommendations across 16 sectors, ranked using a Matrix Analysis. Nearly all recommendations have specific sequenced timeframes (e.g., 2026, 2030, 2050). If further, do not account for multiple dimensions.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Air pollution monitoring plan, water level monitoring, fuel performance and waste monitoring. Extensive monitoring of temperature and humidity for HAP. Implementation is not discussed.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The effort to control vector-borne diseases is an act of climate adaptation and has led to a significant decline in dengue and malaria cases in recent years. Furthermore, the city received a financial award for the reduction of air pollution.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	A direct description of maladaptation is not mentioned in the documents.

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	The Kolkata Climate Action Plan (K-CAP) Expert Committee is formally established by a KMC order and includes the Mayor as Chairman. This body integrates heat adaptation within a multi-sectoral framework (Energy, Health, DRR, Water, etc.). Mentioned but not sufficiently addressed.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The K-CAP Expert Committee consists of a wide variety of domain experts, including a Climate Scientist, Public Health Expert, Urban Environment Expert, Water Expert, and Transport Expert.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	While the K-CAP acknowledges the necessity of funding, the Economic Support Plan (ESP) is not yet finalized. The plan outlines several options (Green Bonds, Carbon Tax, leveraging international finance like the Green Climate Fund, using CSR funds), emphasizing the need for long-term sustainability.

References

Kolkata Municipal Corporation, & C40 Cities Climate Leadership Group. (2025). *Kolkata Climate Action Plan (KCAP)* [Climate action plan]. https://www.kolkataclimateactionplan.in/wp-content/uploads/2025/10/KCAP-Edited-Final-Report.pdf

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Scoring sheet

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For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Kolkata, India
Expert evaluator:	2

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Identification of current heat hazards- yes, including both chronic heat stress (e.g., long-term rising temperatures, progressively warmer summers) - yes and acute heat shocks (e.g., short-term extreme heat events, heatwaves), and their direct impacts across aspects of human health, human activity, infrastructure, and more Focus on the assessment at the local scale, with an emphasis on- yes in the CAP. neighborhood-level understanding- ward level maps in the CAP Depth of information on heat hazards, including complex risk perspectives (e.g., cross-hazard interactions, compounding hazards, and cascading impacts), data integration (e.g., types and sources of data, resolution of data, use of data tools)- some discussion of the interlinkages between heat waves, air pollution, and water needs, but overall missing discussion on multi-hazard interactions or complex data integration.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Identification of current drivers within human or natural systems that increase heat exposure - yes, “Kolkata’s dense concrete infrastructure, with 58% urban population projected by 2025, traps heat. Asphalt roads, high-rises, and reduced green cover (only 15% of city area) elevate temperatures by 4–7°C compared to rural areas…..Solid waste accumulation and open burning (contributing to 4,000–4,500

Assessment score:	3
	MT/day waste) release heat and pollutants, worsening UHI and air quality" (CAP, p. 40) Focus on the assessment at the local scale- yes Depth of information on heat hazards, including complex risk perspectives (e.g., cross-hazard interactions, compounding hazards, and cascading impacts) and data integration (e.g., types and sources of data, resolution of data, use of data tools)- it appears hazard interactions were considered "Climate-driven monsoon delays or erratic rainfall, as seen in recent years, prolong dry, hot periods, increasing heatwave duration and intensity" (CAP, p. 40)- however data reliability is difficult to check.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Projection of future heat risks (e.g., climate models and projections), including hazards (i.e., chronic heat stress and acute heat shocks), exposure, and vulnerability trends Focus on relevant and useful local-scale information- CAP includes a detailed table with multiple heat-related metrics Depth and variety of projections, including the use of multiple climate, environmental, and socioeconomic scenarios- multiple GHG scenarios considered. their interconnections (i.e., how heat risks link or affect one another), - socio-economic and environmental scenario interconnections are limited- slums at high heat risks mapped and the integration of diverse data sources (e.g., types and sources of data, data resolution, and use of analytical tools)- data sources unclear. IMPORTANT TO NOTE: CAP information does not make it into the Heat Strategy.

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Development of a dedicated and formal document, policy, or framework for heat adaptation- yes, the Heat and CAP Focus on local-scale policies- yes Implementation of the plan - CAP currently in stakeholder engagement, but has a financing section, suggesting strong likelihood of implementation (given previous studies).

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Development of heat adaptation-related goals across short-term (<5 years), medium-term (5–10 years), and long-term (>10 years) timeframes- Timelines are

Assessment score:	3
	mentioned along with policy recommendations in the CAP, with a prioritization list on p. 63 (rationale for prioritization unknown).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Development of communication and engagement mechanisms (e.g., town halls, community workshops, departmental meetings) for stakeholders and community members in heat adaptation efforts- For the CAP, it appears this is the stakeholder engagement version. However, they do appear to have a plan for disseminating information and gauging preferences from a list of 60 policies (CAP, p. 13). No stakeholder engagement found for the Heat Plan. Depth of participation, emphasizing participatory and empowering approaches (e.g., consultation, collaboration, co-production with diverse community groups) in heat adaptation planning (Singh 2024, Luber & McGeehin 2008)- Not found.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Identification of multiple actions (e.g., engineered solutions, behavioral interventions, nature-based solutions)- yes, including engineered recommendations such as “IT and AI based waste management” and “prevention of biomass burning”, procedural recommendations such as “preparing a heat action plan”, behavioral interventions such as “encouraging good ventilation practices in slums to avoid slum heat island impact”. addressing chronic heat stress (e.g., long-term rising temperatures, progressively warmer summers) and acute heat shocks (e.g., short-term extreme heat events, heatwaves), along with their direct impacts- yes addressing chronic through “conservation of EKW/East Kolkata Wetlands”, and acute heat shocks through information dissemination as seen in the Heat Action Roadmap.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, see examples above. Several strategies in the Heat strategies and the CAP specifically address heat and take on a multi-sectoral approach to heat risk reduction/preparedness. However, root causes including sprawl, is not adequately addressed.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Evidence of implementation of some actions, especially early warning signs from the state meteorological departments- for example (https://www.facebook.com/photo?fbid=122186629922097857&set=pcb.122186630108097857) Evidence sparse on other actions.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Development of multiple heat adaptation options (e.g., strategies, actions) and their associated costs and benefits, including both economic and non-economic aspects (e.g., health, quality of life)- not found Focus on adaptation options, costs, and benefits relevant at the local scale, with potential insights from broader-scale studies- not found Depth and variety of cost-benefit analysis, including both economic and non-economic factors, with consideration of potential maladaptation risks (i.e., possible harms)- maladaptation discussions limited in the formal plans as well as in the news media.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Assessment of multiple heat adaptation options (e.g., strategies, actions) and their synergies (i.e., beneficial interactions) and trade-offs (i.e., conflicting interactions) across different timeframes- some synergy conversation found in terms of greening + sustainable solid waste + development management to reduce UHI Depth of assessment, including science-based evaluations and consideration of synergies and trade-offs across short-term (<5 years), medium-term (5–10 years), and long-term (>10 years) timeframes- no science based analysis.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Not found

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	Establishment of regular monitoring and evaluation processes for adaptation actions (e.g., engineered solutions, behavioral interventions, nature-based solutions) Depth of monitoring and evaluation, including measurability, target setting, and course correction mechanisms

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	Establishment of evidence (e.g., scientific literature, grey literature, measurements, local community insights) demonstrating how adaptation plans, strategies, and actions contribute to reducing observed heat impacts and anticipated heat risks- rising number of studies in Kolkata, but no synthesized/agreed upon evidence of heat reduction found. Depth of evidence, including effectiveness (i.e., relationship between response and risk reduction), measurability, sustainability (i.e., risk reduction is sustained over long-term) and consensus (i.e., level of agreement among different sources)

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Establishment of evidence (e.g., scientific literature, grey literature, measurements, local community insights) demonstrating that adaptation plans, strategies, and actions do not contribute to increasing heat risks or other climate risks (e.g., flooding, drought) Depth of evidence, including target setting (to reduce maladaptation risk), effectiveness (i.e., relationship between response and risk reduction), and consensus (i.e., level of agreement among different sources)

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	No establishment of heat-specific governance structures (e.g., Chief Heat Officer, Chief Resilience Offi cer, Chief Climate Offi cer). Although departments leading the charge have been identified in the Heat Action Strategy. It appears different departments are in charge of different stages of heat wave response. Low depth of the governance mechanism, including institutionalization (i.e., whether governance roles are formally established by law, appointment, or embedded in existing structures), authority (i.e., the level of decision-making power and

Assessment score:	1
	autonomy), and connectivity (i.e., the degree of integration with other governance structures)

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Yes, the list of individuals at the beginning of the CAP include experts who are world-renowned for their technical expertise and involvement in IPCC writing. Some gaps in capacity when it comes to integration of technical expertise into decision-making

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding identified in the CAP, awaiting stakeholder input/not put into action as far as I can tell.

References

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Kuwait City, Kuwait

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Kuwait City, Kuwait
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Kuwait has clearly and comprehensively identified current heat-related hazards in its national planning documents. The Kuwait National Adaptation Plan (NAP) 2019–2030 explicitly recognises both chronic heat stress (e.g., long-term rise in average daily temperatures) and acute heat events (e.g., heatwaves with record-breaking high temperatures). It discusses the seasonal patterns and geographical distribution of these heat hazards, with particular emphasis on urban areas and coastal regions. The Environmental Public Authority (EPA) Executive Brief reinforces this by noting increasing frequency and intensity of extreme heat events and their impacts on public health, ecosystems, and energy demand. Moreover, these documents highlight the intersections of heat with other stressors, such as water scarcity, infrastructure strain, and marine ecosystem degradation. In addition, scientific studies (e.g., Al-Ahmad et al., 2022) provide empirical evidence on current temperature extremes and observed heat-related mortality, strengthening the case that the risks are not only recognised but also measured and monitored using national datasets and climate projections. While the evidence is strong at the Kuwait City/local scale, it does sufficiently provide this assessment at the neighbourhood-level.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The Kuwait National Adaptation Plan (NAP) 2019–2030 does a reasonably good job of identifying the main drivers of heat exposure and vulnerability, although not in exhaustive detail. It recognises several key structural and environmental factors that increase the population's sensitivity to extreme heat, including rapid urbanisation, population growth, energy consumption patterns, and strained water and health infrastructure. The NAP also highlights vulnerable groups such as outdoor workers, low-income populations, and those with pre-existing health conditions, though this remains mostly at a general level. The EPA Executive Brief complements this by pointing to institutional and planning limitations that exacerbate climate vulnerability, including gaps in urban zoning and building standards. However, there is limited disaggregation of these drivers across social groups (e.g., migrants, women, elderly), and there is no spatial vulnerability mapping that shows how different areas within Kuwait City are more exposed due to socio-economic or infrastructural inequalities.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Kuwait has undertaken a thorough and data-driven approach to projecting future heat risks. The Kuwait National Adaptation Plan (NAP) 2019–2030 includes explicit references to future climate scenarios, drawing on global climate models (GCMs) and regionalised projections under both RCP 4.5 and RCP 8.5 pathways. These projections suggest a potential increase of up to 5.5°C in average temperatures by the end of the century, particularly during summer months. This is supported by peer-reviewed research, especially the study by Al-Ahmad et al. (2022), which goes further by linking these projected temperature increases to heat-related mortality. The study uses epidemiological models to estimate excess deaths under different warming scenarios, making the risk not only environmental but also quantifiable in terms of human health outcomes. The projections are multi-dimensional, covering not just health but also water demand, energy stress, urban heat island effects, and marine ecosystem degradation. Moreover, the studies include confidence intervals and clearly communicate the range of uncertainty, which demonstrates methodological rigour.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Kuwait does not have a standalone, dedicated heat adaptation plan focused solely on extreme heat events. However, heat-related risks and adaptation actions are explicitly embedded across several national documents, most notably in the Kuwait

Assessment score:	3
	National Adaptation Plan (NAP) 2019–2030, the Third National Communication to the UNFCCC, and sectoral briefs from the Environment Public Authority (EPA). The NAP identifies heat stress as a critical concern under health, infrastructure, and water sectors, and outlines several adaptation actions such as early warning systems, thermal comfort measures, and climate-resilient building designs. Similarly, the EPA's strategy emphasises heat-health risks and the need for cross-sectoral coordination. Academic literature further supports the urgency for targeted heat strategies (e.g., Alahmad et al., 2022; Brearley et al., 2025). Despite these efforts, there is no specific document that constitutes a dedicated "heat action plan", such as those found in cities like Ahmedabad or Los Angeles. Kuwait also lacks mechanisms such as the appointment of a Chief Heat Officer, city-level heat plans, or heat-specific contingency protocols. These gaps limit its ability to score the highest possible rating under the benchmark.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Kuwait's National Adaptation Plan (NAP) 2019–2030 outlines a range of short-, medium-, and long-term adaptation goals, many of which address heat-related risks either directly or indirectly. These include strengthening the health system, promoting urban heat resilience, enhancing climate data infrastructure, and supporting water efficiency, all framed within phased time horizons. For example: Short-term goals (0–5 years) include awareness campaigns, institutional capacity-building, and pilot projects on heat-resilient housing and urban greening. Medium-term goals (5–10 years) focus on strengthening early warning systems, integrating heat considerations into public health policy, and expanding climate-resilient infrastructure. Long-term goals (beyond 2030) relate to structural reforms, including updating building codes, investing in research and development, and mainstreaming adaptation across development planning. These timelines are presented in both narrative and tabular formats in the NAP, though they are not always aligned with sector-specific implementation plans. Additionally, city-level targets (e.g., for Kuwait City) are not distinctly articulated, and some measures remain broad or aspirational rather than SMART (specific, measurable, achievable, relevant, and time-bound). Peer-reviewed literature also acknowledges these phased intentions. For example, Alahmad et al. (2022) and Brearley et al. (2025) highlight the need for long-term transformation in housing, urban design, and workforce protection. While the overall direction is clear, more robust mechanisms for monitoring progress over time would strengthen the impact of these goals.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The Kuwait National Adaptation Plan (NAP) 2019–2030 and the EPA Executive Brief refer to multi-stakeholder engagement in adaptation planning, including participation from ministries (health, environment, water, housing), the private sector, and international development partners (e.g., UNDP, UNEP). These references suggest a basic structure for government-led stakeholder consultations, especially at the

Assessment score:	2
	national level. However, there is limited evidence of structured or recurring community-based engagement mechanisms, especially at the urban or neighbourhood scale. While the NAP mentions public awareness and participatory planning as guiding principles, there is no detailed documentation of local consultations, civil society involvement, or co-production of adaptation plans with vulnerable groups. Importantly, municipal-level engagement strategies for heat adaptation in Kuwait City are not clearly described or operationalised. The literature supports this gap: for instance, Alahmad et al. (2022) and Mehryar & Alsahli (2025) highlight the lack of representation of migrant workers, informal sector actors, and other socially vulnerable groups in adaptation policymaking, despite being among the most affected by heat extremes.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Kuwait has identified a number of adaptation actions that directly respond to heat-related hazards. The National Adaptation Plan (NAP) 2019–2030 outlines several measures focused on reducing heat exposure, especially in sectors like health, urban infrastructure, and energy. These include plans for urban greening, cool roofing and building retrofits, improved shading in public spaces, and early warning systems for extreme heat. The Environment Public Authority (EPA) Brief also mentions initiatives to enhance air quality monitoring, develop climate-resilient buildings, and expand renewable energy systems, all of which contribute to mitigating heat impacts. Specific interventions, like heat-resilient housing pilots and public awareness campaigns on heat-related illness, indicate that the government acknowledges heat hazards as a serious and growing risk. Academic sources such as Brearley et al. (2025) reinforce these efforts by examining practical building design strategies for Kuwait's hot-arid climate, including passive cooling techniques and thermal performance improvements. Similarly, Alahmad et al. (2022) point to efforts within the health sector to prepare for rising heat-related morbidity and mortality. However, while these actions are clearly identified in various documents, most of them are still in the planning or early implementation stages. There is also a lack of city-specific action plans tailored to Kuwait City's urban realities.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Kuwait has taken steps to address some of the underlying drivers of heat exposure and vulnerability, although these actions remain uneven across sectors and populations. The National Adaptation Plan (NAP) 2019–2030 identifies measures that target structural vulnerabilities, such as updating building codes, investing in energy-efficient housing, and promoting urban greening to counter the urban heat

Assessment score:	3
	island effect. The plan also calls for strengthening the health system's adaptive capacity, including better surveillance of heat-related illnesses and training health workers to respond to heat stress. The government has also recognised the need to protect outdoor labourers, a group particularly exposed due to long working hours under extreme temperatures. Regulations limiting outdoor work during peak summer hours are one example, though enforcement has been inconsistent. Academic studies highlight this vulnerability: Alahmad et al. (2020) found that non-Kuwaiti male workers face two to three times higher mortality risks during extreme heat events, underscoring the importance of labour protections. Similarly, Alahmad et al. (2022) emphasises the health risks faced by migrant populations, who make up nearly two-thirds of Kuwait's population. Beyond health and labour, the NAP also touches on water security and energy demand, both of which are critical indirect drivers of vulnerability. Initiatives such as water reuse systems, improved irrigation practices, and investment in renewable energy aim to reduce system fragility under heat stress. However, actions remain fragmented, and there is limited evidence of a comprehensive strategy that systematically links social vulnerability (e.g., poverty, migrant status, ageing populations) with targeted interventions.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	While Kuwait has outlined several adaptation actions in its NAP and EPA strategies, the evidence of systematic implementation remains limited. Some progress is visible, for example, heat-resilient housing pilots, water reuse initiatives, and public health awareness campaigns have been launched. Regulations restricting outdoor labour during peak heat hours are another step towards reducing exposure. However, these efforts are often small-scale, fragmented, or inconsistently enforced, and there is no robust monitoring framework to track progress. Peer-reviewed studies (e.g., Brearley et al., 2025; Alahmad et al., 2020) highlight the continuing vulnerability of migrant workers and urban populations, showing that planned measures are not yet fully realised in practice. This indicates implementation has begun but is not yet comprehensive or institutionalised, justifying a mid-low score.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Kuwait's adaptation planning recognises that extreme heat has serious economic and social costs, particularly for public health, energy demand, and water use. The National Adaptation Plan (NAP) 2019–2030 mentions rising financial pressures from cooling needs and healthcare burdens, and academic research (e.g., Alahmad et al., 2022) quantifies mortality costs under different climate scenarios. These insights provide a starting point for understanding the economic case for adaptation.

Assessment score:	2
	However, there is no evidence of systematic cost–benefit analyses comparing adaptation options. For example, while interventions such as urban greening, cooling centres, and heat-resilient housing are proposed, their economic trade-offs, feasibility, or return on investment are not rigorously assessed. Similarly, non-economic benefits , such as improved wellbeing, reduced inequality, or ecosystem co-benefits, are largely absent from planning documents.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Kuwait's planning documents show very limited attention to the synergies and trade-offs that emerge between different adaptation options. The National Adaptation Plan (NAP) 2019–2030 lists actions across health, infrastructure, energy, and water but does not systematically analyse how these measures might complement or conflict with one another. For instance, while air-conditioning expansion can reduce immediate health risks, it simultaneously increases greenhouse gas emissions and energy demand, a clear trade-off that is not explored in official strategies. Academic work reinforces this gap. Brearley et al. (2025) highlight potential unintended consequences in housing retrofits if not carefully designed, and Alahmad et al. (2020, 2022) warn of risks where measures addressing heat stress may worsen other vulnerabilities, particularly for migrant workers and low-income households. Despite these insights, there is no institutional framework in Kuwait to compare adaptation pathways, balance co-benefits, or anticipate maladaptive outcomes.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Kuwait's National Adaptation Plan (NAP) 2019–2030 sets out phased actions, short-, medium-, and long-term measures across health, infrastructure, and water. This gives the impression of sequencing, but the framing is largely linear rather than a pathway-based approach that accounts for uncertainty, feedback loops, or the need to adjust strategies over time. For example, the NAP presents timelines for scaling up climate-resilient housing and improving early warning systems, but it does not define decision points, alternative scenarios, or iterative reviews that are central to adaptive pathways planning. Peer-reviewed studies, such as Mehryar & Alsahli (2025), emphasise the importance of moving from "reaction to resilience" through flexible, scenario-driven planning, but such approaches are not yet institutionalised in Kuwait.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The Kuwait National Adaptation Plan (NAP) 2019–2030 introduces a framework for tracking sectoral adaptation measures, including indicators for health, water, and infrastructure. For example, it refers to monitoring the development of early warning systems, implementation of climate-resilient building codes, and improvements in water reuse. These provisions demonstrate that Kuwait recognises the importance of monitoring and evaluation (M&E). However, the system is not yet fully operational or institutionalised. The NAP outlines general goals but does not provide detailed baselines, measurable indicators, or timelines for reviewing progress. Independent verification and regular public reporting mechanisms are also absent. Peer-reviewed research further confirms that adaptation efforts in Kuwait remain largely unmeasured, with little evidence of feedback loops to improve ongoing programmes.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is very limited evidence that Kuwait's adaptation actions have so far led to measurable reductions in heat-related risks. While the National Adaptation Plan (NAP) 2019–2030 identifies measures such as improved housing design, water reuse, and early warning systems, there are no published evaluations showing their impact on reducing heat exposure or health outcomes. On the contrary, peer-reviewed studies highlight persistent and in some cases increasing vulnerability. Alahmad et al. (2020) found that non-Kuwaiti male workers face two- to three-fold higher mortality risks during extreme heat events, while Alahmad et al. (2022) project that climate change will further increase heat-related mortality by up to 11.7% under high-emissions scenarios. These findings suggest that adaptation measures have not yet translated into observable reductions in mortality or exposure. Some small-scale interventions (e.g., housing pilots, labour restrictions on midday outdoor work) may have localised benefits, but these are not systematically monitored or documented in a way that demonstrates population-level risk reduction. As such, the evidence base remains weak, justifying a low score.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Kuwait's adaptation policies make little reference to monitoring or preventing maladaptation, and there is no systematic evidence that risks of unintended consequences are being addressed. The National Adaptation Plan (NAP) 2019–2030 mentions building climate resilience across sectors, but it does not include safeguards to ensure that measures do not worsen vulnerability or create new risks. Research highlights potential maladaptive pathways. For instance, reliance on air-conditioning expansion as a coping strategy reduces immediate heat stress but drives up energy demand and emissions, undermining long-term sustainability. Similarly, Brearley et al. (2025) warn that poorly designed housing retrofits in hot-arid regions can trap heat indoors, increasing health risks if not properly implemented. These examples underscore the importance of proactive maladaptation checks, which are currently lacking. At present, Kuwait has not institutionalised tools such as climate risk screening, cost–benefit analyses, or scenario testing that would help avoid maladaptation. This absence of monitoring and evaluation means maladaptive practices may persist unnoticed. The evidence gap justifies a low score.

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Kuwait has assigned general responsibility for climate adaptation to the Environment Public Authority (EPA), which coordinates with ministries of health, housing, water, and energy. The National Adaptation Plan (NAP) 2019–2030 also specifies roles for government entities and notes collaboration with international partners such as UNDP and UNEP. This demonstrates that a basic governance framework exists for adaptation, including heat-related risks. However, there are no dedicated heat governance structures in place. Kuwait City does not have a municipal-level heat action committee, Chief Heat Officer, or specialised inter-agency platform focused specifically on extreme heat management. Instead, responsibilities are dispersed across agencies, creating risks of overlap and weak accountability. Academic and policy reviews (e.g., Mehryar & Alsahli, 2025) note that Kuwait's approach remains largely top-down and sectoral, rather than integrated and city-focused.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Kuwait benefits from a relatively strong base of technical and scientific expertise on climate and heat risks. The Kuwait Institute for Scientific Research (KISR) and the Environment Public Authority (EPA) have developed capacity in climate modelling, environmental monitoring, and health impact assessments. For example, studies led by Alahmad et al. (2020; 2022) provide detailed analyses of temperature–mortality relationships, highlighting the availability of epidemiological and climate-health expertise in the country. International collaborations further strengthen this knowledge base. Kuwait has worked with UNDP, UNEP, and academic partners to prepare its NAP and UNFCCC communications, drawing on global best practices. Evidence from Brearley et al. (2025) also shows that technical research on heat-resilient housing is ongoing and accessible to policymakers. Despite these strengths, technical expertise is not always institutionalised into decision-making processes. Capacity is concentrated in a few national agencies and universities, and there are gaps in translating research into municipal-level planning or routine policy. Additionally, long-term investment in training, data-sharing, and integration of knowledge into governance structures remains limited.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Kuwait has mobilised some financial resources for adaptation, including heat-related measures, but there is no evidence of a dedicated and sustainable funding stream. The National Adaptation Plan (NAP) 2019–2030 highlights resource mobilisation as a priority, and projects have received support from international partners such as

Assessment score:	2
	UNDP and UNEP. This has helped fund pilot initiatives in areas like public awareness, early warning systems, and housing trials. However, domestic financing for heat adaptation is limited. Budget allocations remain embedded within broader environmental or infrastructure programmes rather than earmarked specifically for heat resilience. There is also little evidence that municipal budgets in Kuwait City allocate sustained resources for heat adaptation. Academic and policy commentary (e.g., Alsaad, 2021) further note that Kuwait's adaptation efforts are vulnerable to oil revenue fluctuations, which constrain long-term planning and sustainable financing.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Kuwait City, Kuwait
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	Heat hazard is addressed in national adaptation plan, but not in great detail at urban level and distinction between chronic and acute is not explicit.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Differential vulnerabilities across population and neighborhoods etc. are not discussed in national adaptation plan.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Heat risks are projected at national scale but do not distinguish between differential exposures and vulnerabilities within city.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Heat is one component of larger national adaptation plan

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Medium and long range goals are identified. Local context and measurability is not discussed.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Importance of engagement with stakeholders is acknowledged in several areas within the national adaptation plan. Specific methods for implementation are less clear.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Two primary actions include an early warning system and research and monitoring system.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Very little discussion of addressing vulnerability. Adjusting work hours is one example that is mentioned.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Status of proposed actions is unclear.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No discussion of relative costs and benefits of alternative actions.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No discussion of synergies and tradeoffs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Short medium and long-term goals are identified but their interrelatedness over time is not discussed

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The proposed monitoring network could be used to evaluate actions.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence could be found.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Maladaptation is not discussed.

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	Not discussed in national adaptation plan.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Some technical expertise leveraged to produce national level hazard projections. Proposed early warning and monitoring systems acknowledge importance of technical expertise.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	Financing is acknowledged as a limitation to adaptation. No dedicated heat adaptation funding is mentioned.

References

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Tokyo, Japan

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Tokyo, Japan
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Tokyo systematically identified chronic heat stress (such as the increasing summer temperatures year by year) and acute heat shock (such as extreme heat waves) through the “Heat Stress Countermeasure Guidelines” and the meteorological data system. It also integrated satellite remote sensing, ground monitoring stations, and health statistics, and incorporated the combined effect of heat waves and high humidity into the analysis, demonstrating a comprehensive assessment of complex risks.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Tokyo identified key drivers such as the urban heat island effect (high-density buildings, insufficient green spaces), the elderly population, and low air conditioner usage rates among low-income families. Additionally, the impact of socio-economic disparities on vulnerability was also incorporated into the analysis.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Based on the RCP2.6 and RCP8.5 scenarios, future heat risks were predicted,

Assessment score:	4
	including cases of heatstroke emergency treatment and the increase in nighttime high-temperature mortality rates. However, cross-risk linkage analysis (such as heat waves and energy demand) needs to be strengthened.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Tokyo has formulated the “Climate Adaptation Plan in Tokyo”, which includes a special section on heat adaptation and sets clear goals such as installing cooling roofs and expanding green spaces. The 2021 “Heatstroke Prevention Action” set a target of reducing the number of heatstroke deaths by half by 2030.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The targets cover short-term (such as the upgrade of the heat alarm system), medium-term (green coverage rate of 30% by 2030) and long-term (carbon neutrality by 2050), but some targets (such as cross-departmental collaboration strategies) lack quantitative indicators.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Engagement mechanism exists. However, the participation of vulnerable groups (such as elderly people living alone) is insufficient, and there are also a lack of cases of joint decision-making.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Tokyo has taken diverse actions address both current and future hazards , such as spray cooling stations, high-reflective pavement materials, and has also formulated standards for heat-resistant buildings.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Targeted actions like cooling centers for low-income communities, air conditioning subscription services, and health check-ups for the elderly, jointly address drivers of aging and poverty.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Implementation is evident at local and community level, but lacks independent verification and effectiveness evaluation.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	Cost-benefit analyses focus on economic aspects, such as Tokyo's assessment of the willingness to pay for avoiding heat fatigue in 2070. But the cost-benefit assessments always miss health metrics.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The synergistic effects of greening and flood control, as well as the issue of the intensified heat island effect due to air conditioning usage, were mentioned, but no systematic analysis was conducted of the conflicts in different time periods (such as short-term costs versus long-term benefits)

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Tokyo's adaptation path includes phased goals (such as reviews every five years).

---

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Cases of heatstroke and the area of green spaces were tracked, but the basis for the decision-making of the adjustment strategy was not made public. The effectiveness of the heat alert system was also insufficiently evaluated.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The mortality rate related to heat has decreased as reported in the reference, but this is most likely due to improvements in medical care or the widespread use of air conditioning, rather than simply due to adaptation measures.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	In the heat adaptation efforts in Tokyo, no systematic assessment has been conducted to evaluate the potential risks of adverse adaptation. The potential evidence suggests that the high energy consumption of air conditioning may exacerbate economic burdens and the heat island effect caused by human-generated heat, but this has not been systematically evaluated.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	The Tokyo Metropolitan Government established a climate adaptation department under the Environmental Bureau. The fire department, health department, and meteorological department jointly issued heat illness alert and shared data through the A-PLAT platform. The country has clearly required local governments to set up cooling centers, and Tokyo has achieved full coverage.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Tokyo has strong technical expertise at the research and municipal levels, but uneven grassroots implementation limits full effectiveness. Community workers lack the skills to assess climate health risks.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The funding for heat adaptation is currently mainly dependent on local government allocations, and the participation of social funds is insufficient. For example, the pilot program for air conditioning subscription services relies on annual budgets and is not included in the long-term fiscal planning.

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Scoring sheet

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City case study:	Tokyo, Japan
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Daily news in every media (July, 2025)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Many publications on UHI relevant issues in Tokyo.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Many reports from MoE, CCCA (NIES) etc.

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	CCCA shows some flameworks on evaluation but some is still vacant.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Current situations have been shown but setting goals is not easy.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	A mission of CCCA. Not yet completed.

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Since 1999, MoE, MLIT, JMA etc. have promoted so many actions.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Since 1999, MoE, MLIT, JMA etc. have promoted so many actions.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Actions by community or personal scales have a higher probability.

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4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	4
Rationale:	Since 1990s, they are popular research topics, in focusing on Tokyo.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	Not a few conflict has been found between different options.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	4
Rationale:	Now all kinds of physics on UHI issues are almost clear.

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5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Difficult. Spatial scale of actions is limited.

5.2 Is there evidence of reducing heat risk?

Assessment score:	4
Rationale:	Personal scale actions are successful now.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	3
Rationale:	Case of extending urban green etc. is difficult to validate.

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6. Heat governance

Confidence score:	4

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Around 2010, already established. But it looks like not perfect.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	So many experts in earth science and engineering.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Priorities for this issue are not so high. Mitigation is still more popular issue.

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Tokyo Metropolitan Government. (2021). *Tokyo Climate Change Adaptation Plan*. https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/asia-amp-indian-ocean/japan/Tokyo-Metropolitan-Gov.--2021.--Climate-Change-Adaptation-Plan.pdf

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Kim, Y., Oka, K., Kawazu, E. C., Ng, C. F. S., Seposo, X., Ueda, K., Hashizume, M., & Honda, Y. (2023). Enhancing health resilience in Japan in a changing climate. *The Lancet Regional Health – Western Pacific, 39*, 100846. https://doi.org/10.1016/j.lanwpc.2023.100846

Auckland, New Zealand

Scoring sheet

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City case study:	Auckland, New Zealand
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Current heat hazards are clearly established at both chronic and acute levels, with strong local detail. High-resolution mapping shows Auckland's city centre remaining up to 3 °C warmer at night than surrounding areas, and intra-city differences of a similar scale during peak days, with outputs validated against weather station data (Arup, 2024). Local reporting highlights hotspots, health risks for vulnerable groups, and targeted responses for neighbourhoods most affected (Auckland Council, 2024c). This combination of granular mapping, projections, and health dimensions at the neighbourhood scale meets the highest-score criteria.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Drivers of heat exposure and vulnerability are identified in detail across social, infrastructural, and environmental dimensions. High-resolution modeling shows how dense urban form, heat-retaining materials, and limited vegetation intensify temperatures at the neighborhood level, with clear disparities between greener and more built-up areas (Arup, 2024; Newton, 2025). Evidence also highlights how communities with low tree cover and limited cooling infrastructure face greater exposure, particularly in South Auckland (Newton, 2025; Auckland Council, 2024c). Alongside physical drivers, population-based vulnerabilities are noted, including age, health conditions, and socioeconomic disadvantage (Ministry of Health, 2024). Broader strategies emphasize the role of ecosystems and the need to maintain and

Assessment score:	4
	expand natural assets to reduce vulnerability (Auckland Council, 2020). Together, this shows a comprehensive understanding of drivers that include people, infrastructure, and ecosystems, and which is supported by strong evidence.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks are projected with strong local relevance but without the depth needed for a comprehensive score. Modeling at a fine neighborhood scale demonstrates how built form and land cover will continue to intensify the urban heat island, and projections show a sharp rise in hot days from about 20 annually to around 90 by the end of the century, pointing to both worsening chronic stress and more frequent acute events (Arup, 2024; Newton, 2025). Local plans also recognize that extreme heat will become more common and severe, while national frameworks highlight the resulting health risks. Together, this provides clear evidence of future hazards, exposure, and vulnerability at the city level. However, the projections rely mainly on single-scenario outputs and do not explore multiple socioeconomic futures or detailed interconnections across risks.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Auckland does not have a standalone, formally adopted heat adaptation plan. Instead, heat is addressed through a mix of broader climate and planning frameworks. The technical heat assessment outlines targeted actions such as increasing tree canopy, creating cooling infrastructure, and focusing investment on the hottest neighborhoods (Arup, 2024). Council communications highlight ongoing initiatives, including planting thousands of trees, using reflective materials in housing, and supporting community cooling projects (Auckland Council, 2024c). Further measures under consideration include blue-green infrastructure, rooftop gardens, and permeable pavements, with an emphasis on vulnerable areas like South Auckland (Newton, 2025). Long-term strategies also reinforce the importance of equity-focused adaptation and expanding the urban ngahere (forest) (Auckland Council, 2020). While these demonstrate concrete steps, they are not framed within a dedicated, heat-specific plan with defined goals, commitments, or governance.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Auckland's planning frameworks establish goals across short-, medium-, and long-term horizons, though not in a heat-specific way. The Long-term Plan

Assessment score:	2
	2024–2034 outlines a 10-year programme with funding and priorities for climate resilience (Auckland Council, 2024a; 2024b). The Auckland Plan 2050 provides a longer-term strategic vision that embeds environmental protection, equity, and resilience as enduring outcomes (Auckland Council, n.d.). The Monitoring Framework also tracks progress on climate and environmental indicators, ensuring continuity across timeframes (Auckland Council, 2023). While immediate measures such as tree planting and community cooling are described in technical and communication documents (Arup, 2024; Auckland Council, 2024c), and longer-term visions are present, none of these frameworks articulate a structured set of heat-specific goals.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Stakeholder and community engagement are clearly present in Auckland's climate and heat adaptation efforts. The climate plan was shaped through collaboration with mana whenua, local communities, and stakeholders, embedding equity and Te Tiriti o Waitangi principles into its foundation (Auckland Council, 2020). The Urban Heat Assessment was positioned as both a technical tool and a means of raising public awareness, helping residents understand risks and guiding community-level action (Arup, 2024). Council communications further encourage individuals to take practical steps such as tree planting and home cooling, showing active outreach (Auckland Council, 2024). At the national level, the Health National Adaptation Plan reinforces the importance of partnering with iwi, hapū, and hapori Māori to build resilience (Ministry of Health, 2024). Together, these mechanisms demonstrate meaningful consultation and involvement, but they fall short of co-production or shared authority in decision-making, which is why the score is 3.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Auckland's response to heat hazards includes a wide mix of actions spanning nature-based, behavioral, and engineered approaches. Current efforts emphasise tree planting in low-canopy areas, the creation of cooling infrastructure, improvements in housing design, and other community-level initiatives that directly target both chronic heat stress and acute shocks (Arup, 2024; Auckland Council, 2024c). Further measures such as rooftop gardens, permeable pavements, and blue-green infrastructure are being explored to help vulnerable neighborhoods, particularly in South Auckland (Newton, 2025; Auckland Council, 2024c). Broader strategies also associate these actions with long-term resilience goals, tying them to ecosystem protection and equity considerations (Auckland Council, 2020). National frameworks reinforce this by linking adaptation actions to health-system preparedness and climate risk management (Ministry of Health, 2024; Ministry for

Assessment score:	3
	the Environment, 2025). Taken together, even though these demonstrate a clear range of locally relevant actions addressing present and future heat risks, the planning does not yet integrate these into a comprehensive, long-term pathway.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions in Auckland address not only exposure to heat but also some of the underlying drivers of vulnerability. Green infrastructure programmes and regeneration projects target low-canopy neighborhoods, while trial measures such as rooftop gardens and permeable pavements are linked to inequities in areas like South Auckland (Auckland Council, 2024b; Newton, 2025). National health strategies highlight risks for older people, children, and socioeconomically disadvantaged groups (Ministry of Health, 2024). Beyond direct measures, the Development Strategy and Future Development Strategy embed structural approaches such as compact growth, sequencing of infrastructure, and ecosystem protection, which reduce long-term drivers of vulnerability (Auckland Council, 2018; Auckland Council, 2023). These measures cut across people, infrastructure, and ecosystems, with both immediate and structural actions represented. However, there is not a fully integrated, long-term strategy to address systemic inequities or ecosystem fragility specifically for heat.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	There is clear evidence that several heat adaptation actions are being implemented in Auckland. Large-scale tree planting is underway in low-canopy neighborhoods, with thousands of mature trees already planted and additional plantings integrated into regeneration projects such as Te Hā Noa and the Harbour Edge Stitch (Auckland Council, 2024c). The Urban Ngahere Strategy is confirmed as an ongoing programme to systematically expand canopy cover across the city (Auckland Council, 2020). Data from the Urban Heat Assessment is also being used to guide current investment priorities in high-heat areas (Arup, 2024). Other measures, such as blue-green infrastructure and permeable pavements, are described as being trialled or under consideration, suggesting that some are in early phases rather than fully established (Newton, 2025). Together, this shows verified implementation across multiple approaches, though not yet the entire range of identified actions.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	The benefits of Auckland's heat adaptation measures are well recognized, particularly in terms of reduced exposure, improved health, and strengthened community resilience. Tree planting, cooling infrastructure, housing improvements, and ecosystem-based interventions are consistently framed as providing co-benefits for wellbeing and equity (Auckland Council, 2024c; Newton, 2025; Auckland Council, 2020). High-resolution heat mapping is also being used to direct investment to priority areas, implying a basis for resource allocation (Arup, 2024). What is missing, however, is any structured analysis of costs alongside benefits and no discussion of maladaptation risks. As a result, the evidence demonstrates recognition of broad advantages but not systematic cost–benefit evaluation.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Auckland's adaptation documents highlight synergies between heat responses and broader wellbeing goals. Tree planting, housing improvements, and community cooling are described as reducing heat while also improving air quality, health, and equity outcomes (Auckland Council, 2020; Auckland Council, 2024c; Arup, 2024; Newton, 2025). These examples show how actions can deliver multiple benefits simultaneously. What is missing, however, is any systematic assessment of trade-offs, such as competing land uses, costs, or long-term maintenance, and no structured analysis across short-, medium-, and long-term timeframes.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Heat-related measures in Auckland are implemented as individual projects rather than through a sequenced pathway. Tree planting, regeneration initiatives, and neighbourhood cooling efforts are underway, and the climate plan sets broad resilience goals for future decades (Auckland Council, 2024c; Arup, 2024; Auckland Council, 2020). At the national level, adaptation frameworks such as the Health National Adaptation Plan (2024) and the National Adaptation Plan Addendum (2025) provide structured actions across short-, medium-, and long-term horizons. However, these national strategies are not translated into a locally defined pathway for Auckland that connects heat actions over time or establishes mechanisms for iteration and review.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring frameworks are in place at the climate and planning levels, but they are

Assessment score:	2
	not specific to heat. The Auckland Climate Plan commits to progress tracking and updates (Auckland Council, 2020). The Urban Heat Assessment provides detailed baseline mapping to guide interventions, though it is not structured as an ongoing monitoring system (Arup, 2024). More broadly, the Auckland Plan Monitoring Framework and Long-term Plan 2024–2034 establish systems for outcome tracking, sustainability reporting, and climate finance alignment (Auckland Council, 2023; Auckland Council, 2024a). These demonstrate that evaluation mechanisms exist and could indirectly support heat adaptation. However, without heat-specific indicators, targets, or course-correction mechanisms, monitoring remains partial, placing the score at 2.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	The reviewed sources describe actions intended to reduce heat risks, but they do not provide measurable evidence that these actions have reduced observed impacts. Tree planting, regeneration projects, and housing improvements are presented as initiatives to cool neighborhoods and build resilience, but their effectiveness in lowering temperatures or reducing health impacts has not been evaluated (Auckland Council, 2024c; Newton, 2025). The Urban Heat Assessment establishes a baseline for monitoring and identifies priority areas but does not document reductions in exposure or vulnerability (Arup, 2024). Broader frameworks, such as the Auckland Climate Plan and national adaptation strategies, note potential co-benefits but do not present evaluation results (Auckland Council, 2020; Ministry of Health, 2024; Ministry for the Environment, 2025).

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	None of the reviewed sources provide evidence that Auckland's heat adaptation actions have been evaluated for maladaptation risk. While projects such as tree planting, regeneration initiatives, and cooling infrastructure are presented as positive interventions (Auckland Council, 2024; Arup, 2024; Newton, 2025), there is no discussion of unintended consequences, such as increased water use, land-use conflicts, or maintenance burdens. Broader strategies, including the Auckland Climate Plan and national adaptation frameworks, also do not include mechanisms to assess or track maladaptation in relation to heat (Auckland Council, 2020; Ministry of Health, 2024; Ministry for the Environment, 2025).

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Auckland has governance roles that embed climate action, but there is no evidence of a dedicated heat governance structure. The Climate Plan establishes institutional responsibilities for delivering adaptation actions and references leadership through Auckland Council's Chief Sustainability Office (Auckland Council, 2020; Auckland Council, 2024). The Urban Heat Assessment was commissioned by the council and is intended to guide local action, showing integration of heat considerations into existing governance mechanisms (Arup, 2024). However, these structures operate under broader climate or sustainability portfolios, without a role or office dedicated solely to heat adaptation.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise on heat adaptation is evident but not shown to be fully embedded in Auckland's institutional systems. The Urban Heat Assessment was developed with input from external experts (see Arup) demonstrating strong project-based expertise (Arup, 2024). Local reporting highlights contributions from council staff such as the Chief Sustainability Officer and climate resilience advisors, showing that relevant knowledge exists within the administration (Auckland Council, 2024c; Newton, 2025). However, none of the sources confirm that Auckland has dedicated, long-term technical teams or formalised mechanisms for capacity-building and integration of expertise into decision-making.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Auckland has established sustainable finance mechanisms that support climate-related adaptation, though not heat-specific. The Long-term Plan 2024–2034 includes a Sustainable Finance Framework, incorporating green bonds and climate-aligned CAPEX reporting to ensure continuity of investment in resilience initiatives (Auckland Council, 2024b). These mechanisms demonstrate integration of climate financing into long-term budgets and confirm funding sustainability. However, none of the reviewed sources specify allocations dedicated solely to heat adaptation or evaluate whether available funding is sufficient for the scale of the challenge. Funding is therefore structured, long-term, and relevant but not explicitly focused on heat

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Ministry for the Environment. (2025). *New Zealand's first national adaptation plan: Table of actions (2025 addendum)*. https://environment.govt.nz/publications/new-zealands-first-national-adaptation-plan-table-of-actions-addendum-2025/

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Auckland, New Zealand
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	I do not get the sense that NZ and Auckland place heat hazards as highly as other CC hazards. There is little reference to ‘heat’ in the Auckland document. However, what it refreshing is that Auckland openly states at 3.5 deg C temp rise by 2100 is a real possibility

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, the drivers are recognised and mentioned in brief in national health plans and Auckland plan

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Yes - this is done clearly and well - 3.5 deg C increase by 2100

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	No specific heat adaptation plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Yes, NZ is openly taking a precautionary approach along something they call the ‘Dynamic Adaptation Policy Pathway’ which means gradually progressively setting goals and moving towards those, rather than responding to what may not happen - but rather simply building resilience into society.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Yes, the Auckland document on CC Adaptation is exhaustively considerate of various community differences and engagement/consultation. Perhaps too much, to the detriment of the clarity of the plan itself.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	At a national level there are many completed, active or discontinued actions listed - but only some relate to heat and at a short-term, ease of action level.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Yes, in so far as GHG emissions drive global warming and heat.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Little achieved so far as I can tell.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	See no evidence of this in Auckland or NZ

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	No - glib statements are made at a high level.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The Dynamic Adaptation Policy Pathway is stated but this seems to be more reactionary rather than sequential

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Yes, there is a great deal of weight placed on monitoring risks and indicators of response/adaptation.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	No

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	See no consideration of this

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Not heat structures alone - but CC adaptation or Health structures

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Yes, there are strong governance structures in place - not specific to heat, but KRA1 to KRA12 in the National Health Adaptation plan lean on health greatly

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	I could see no specific heat funding - this rolled into health and CC.

References

Auckland Council. (2020). *Te Tāruke-ā-Tāwhiri: Auckland's climate plan*. https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/Pages/te-taruke-a-tawhiri-ACP.aspx

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Newton, K. (2025, January 14). Research reveals potentially dangerous 'urban heat island' effect in central Auckland. *Radio New Zealand*.

https://www.rnz.co.nz/news/in-depth/538865/research-reveals-potentially-dangerous-urban-heat-island-effect-in-central-auckland

Melbourne, Australia

Scoring sheet

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City case study:	Melbourne, Australia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	CSIRO and state government reports cited

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes, recognition of transport, social housing and landscape context. Both plans focus on vulnerable communities (homeless and those in social housing)

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Yes, there are some limited projections of future heat. Both Plans suffer from bundling all climate change impacts and adaptations together.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is for vulnerable sections of society, otherwise it is bundled into Climate change adaptation.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Both plans have phased goals and actions to achieve adaptation over coming decades

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Both consider community and stakeholder engagements - the City of Melbourne does this VERY well.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Very few heat specific actions outlined for outdoor urban environment other than increased canopy cover (which is not being achieved in reality) and increased water retention. Building upgrades for energy efficiency for space cooling (and heating) are the most focussed.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Again - a focus on building leak and energy efficiency upgrades for the socially vulnerable and cool refuge for homeless and others well actioned.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Goals being set does not mean goals being met. Other than social housing upgrades (numbers completed and planned) the achievements on these actions are few.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	See no evidence of costing details. Other than the motherhood statement that from UN that costs of not acting will far outweigh the cost of acting now.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	I see no evidence of cost effectiveness, trade-offs assessment. But there is priority given to vulnerable communities so this is a simple cost-effectiveness measure - those most exposed to heat risk being prioritised.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	State government of victoria human health and climate change appears to be more sequential than the city of melbourne plan. But there is no detail to the sequence and priorities.

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	Both plans state that monitoring needs to be developed. This is vital and from these documents is still in the planning phase. The State government human health plan at least recognises and communicates the complexity of M&E for adaptation strategies.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	No, other than social housing that has been upgraded for energy efficiency - self-reported by residents.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	no

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Yes great lengths taken to describe the hierarchy and network of government agencies with responsibilities

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Not evident other than local and government employees - if they have technical expertise then yes, if not, then no.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Yes, this funding in both plans for certain actions such as greening, building upgrades. So yes.

References

City of Melbourne. (n.d.). *Climate change adaptation strategy*. https://www.melbourne.vic.gov.au/climate-change-adaptation-strategy

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Konrad, T. (2024, April 3). *When it gets too hot: How the City of Melbourne ensures vulnerable residents have refuge from extreme heat*. Eco-Business. https://www.eco-business.com/news/when-it-gets-too-hot-how-the-city-of-melbourne-ensures-vulnerable-residents-have-refuge-from-extreme-heat/

City of Melbourne. (n.d.). *Heat safe city overview*. Retrieved July 7, 2025, from https://participate.melbourne.vic.gov.au/heat-safe-city/heat-safe-city-overview

Department of Health, State Government of Victoria. (2022). *Health and human services climate change adaptation action plan 2022–2026* [PDF]. https://www.health.vic.gov.au/sites/default/files/2022-02/health-human-services-climate-change-adaptation-action-plan-2022-2026_0.pdf

Scoring sheet

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City case study:	Melbourne, Australia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Between different resources, the city and its agencies are comprehensive in their exposition of risks from direct to indirect risks. Melbourne is exposed to heat, flood, drought, and fire risk.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The causality of climate change is clearly identified. The role of different types of infrastructure and nature in exacerbating and mitigating heat risks is generally identified. In many cases, however, there isn't much specificity about what kinds of built environment, natural environment, or systems conditions create or exacerbate heat risks.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	The documents strongly indicate that the future will likely be hotter, but there isn't any quantification of future warming. Just "more"

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	The adaptation plan is comprehensive, and heat is prominent, but the plans for dealing with other hazards, especially flood and fire, are clearer and have more force. The overall emphasis on heat as a problem is limited, and there is little mention of humidity or wet-bulb temperature.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	There are short term goals, long term ambitions, and a commitment to frequent monitoring and reevaluation. The city government wants to lower the average temperature by 4°C (which seems to refer to high temperature on hot days).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	It's hard to tell from the documents. It's clear that there have been open meetings, but measures of attendance and participation are low. There is more focus on what the government itself can do. One note here: Melbourne isn't a very big city, with under 200,000 residents. This may mean that community information is relatively easy to collect compared with bigger cities.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Of the adaptation measures listed, the ones for heat are the least detailed, and the goals or metrics for these hazards are general and directional, not specific.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	There is little or no discussion of conditions inside buildings. The emphasis is entirely on tree canopy and roofs. There is also no mention of monitoring of heat conditions or heat and humidity exposure.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Other than tree planting, it's hard to tell. It's possible that they have determined that greening the city is the most effective way to address heat.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	I think so. There is little discussion of this, but there is consistent reference to where adaptation actions are found in the municipal and provincial budget. There is no mention of private sector costs and benefits.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Not found.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Not found.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	There is a lot of discussion of monitoring, but there isn't much evidence of it. There

Assessment score:	2
	was a one-year project that handed out “cool kits” and a website identifying less hot parts of the city, but there is little or no evident measurement of actual lived heat experience (e.g. within workplaces, schools, hospitals, etc.)

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Some new roofing and trees.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not found.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	There is a Chief Heat Officer position (currently filled by two people part time)

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There appears to be in both the government at a high level and in the health department specifically.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	Not found.

References

City of Melbourne. (n.d.). *Climate change adaptation strategy*.
https://www.melbourne.vic.gov.au/climate-change-adaptation-strategy

City of Melbourne. (2017). *Climate change adaptation strategy refresh 2017*. https://mvga-prod-files.s3.ap-southeast-4.amazonaws.com/public/2024-05/climate-change-adaptation-strategy-refresh-2017.pdf

City of Melbourne. (n.d.). *Heatwaves*. https://www.melbourne.vic.gov.au/heatwaves

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Hirji, Z., & Stringer, D. (2024, June 4). *Cities appoint heat officers to cope with record temperatures*. Bloomberg. https://www.bloomberg.com/news/features/2024-06-04/chief-heat-officers-are-writing-a-new-playbook-for-deadly-temperatures

Arsht-Rock. (2022, October 6). *Melbourne, Australia, Lord Mayor announces city's first-ever chief heat officers*. https://onebillionresilient.org/2022/10/06/melbourne-chief-heat-officers/

Konrad, T. (2024, April 3). *When it gets too hot: How the City of Melbourne ensures vulnerable residents have refuge from extreme heat*. Eco-Business. https://www.eco-business.com/news/when-it-gets-too-hot-how-the-city-of-melbourne-ensures-vulnerable-residents-have-refuge-from-extreme-heat/

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Sydney, Australia

Scoring sheet

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City case study:	Sydney, Australia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Over the past 10 years, extensive work has been done by myself, other Sydney-based academics, government organisations and NFPs to document the heat hazards experienced across Greater Sydney.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The drivers are well documented for people, infrastructure, services and natural systems. Recently, a new (based on 2022 data) Heat Vulnerability Index was released. The index “utilises indicators for exposure, sensitivity and adaptive capacity to calculate an overall heat vulnerability index. Expressed through the data, a vulnerability of 1 represents a combination of low exposure, low sensitivity and/or high adaptive capacity. A vulnerability of 5 represents high exposure, high sensitivity and/or low adaptive capacity. The calculation of HVI and the inputs to the exposure, sensitivity and adaptive capacity indicators are explained in the metadata. The HVI data is aggregated to the Australian Bureau of Statistics (ABS) Statistical Area Level 1 (SA1) polygon dataset to enable spatial analysis to support local policy and decision making. It can be used in conjunction with the NSW urban vegetation cover dataset for the same time period for broader analysis of the relationship of heat to green cover.” Check the index out at: https://datasets.seed.nsw.gov.au/dataset/2022-heat-vulnerability-index-for-the-greater-sydney-region

Assessment score:	4
	The index is also visualised (free access through the above web page).

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes, these risks are projected, yet any forecast is based on assumptions that may or may not turn out to be true. Solid model forecasts are publicly accessible in NarCLIM2.0 (New South Wales Government - see: https://www.climatechange.environment.nsw.gov.au/narclim).

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	In December 2024, the first Heat Smart City Plan was launched for Sydney. It is the work of the Greater Sydney Heat Taskforce, a volunteer group that brings more than 40 organisations together that all have an interest in heat - from research, to health services, community organisations, energy providers, to police and ambulance services.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	The Heat Smart City Plan lists 40 recommendations that address short- and long-term goals. Also, the Cool Suburbs tool, a decision support tool for designers, architects, planners and approvers is available that scores development projects for their impact (or lack thereof) on local heat at short- medium-, and at long-term scales. Check it out here: https://coolsuburbs.au/

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Yes, as outlined in the Heat Smart City Plan. Also, many individual councils have heat mitigation strategies in place. And the state government has recently released a collection of resources to support stakeholder engagement and provide guidance for industry and community. See here (where greening cities is synonymous for cooling cities): https://www.planning.nsw.gov.au/policy-and-legislation/resilience-and-natural-hazard-risk/urban-heat/cooler-places And here: https://www.planning.nsw.gov.au/policy-and-legislation/resilience-and-natural-hazar

Assessment score:	4
	d-risk/urban-heat/cooler-places/cool-with-urban-structure Countless community and industry information events, workshops, and conferences are held annually. Some examples: https://lgnsw.org.au/common/Uploaded%20files/Environment_Awards/2020/Penrith_Cooling_the_City.pdf https://www.coolingthecommons.com/ https://citygreen.com/events/sydney-event-2023/ https://swelteringcities.org/2025/03/27/parramatta-community-cool-walk-witnessing-the-urban-heat-island-effect/ https://streetfurniture.com/2024-western-sydney-symposium-what-did-we-learn/ https://csu.global/events/green-cities-sydney-challenges-and-opportunities-in-the-city/ Lastly, even politicians are releasing their own strategies to engage with the local community they represent. Here's an example for an MP that held a community forum to capture the voice of the people and then develop a strategy with the help of scientists, formulating actions that businesses, government officials and the community should implement. https://www.andrewcharlton.com.au/have-your-say/climate-adaptation-action-plan/

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Yes, the actions are identified as documented by the above-cited documents and websites. At the community level, it is worth pointing out the Doctors for the Environment organisation and their advocacy for heat safety (https://www.dea.org.au/daily_telegraph_health_experts_warnings_ahead_of_sydney_summer_heat). This is a group of practising GPs with lived experience via their patients. This group also holds an annual event around heat safety, risks and adaptation.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes, the actions are identified as documented by the above-cited documents and web portals.

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	Same as above - these actions from a local to a federal level have been identified, and the Heat Smart City Plan assists in their implementation.

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	I am not an expert in CBA and cannot comfortably comment on the status of such work for Sydney. I do however know of a report that is of interest here, working at regional scale and includes forecasting of cost (as lost productivity, health cost and electricity use) related to heat: https://sydney.org.au/wp-content/uploads/2024/03/Committee_for_Sydney_Burning_Money_March_2024.pdf Also see this work: https://www.frontier-economics.com.au/beating-the-heat/

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	I do not know the answer to this question.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	I do not know the answer to this question.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring is sporadic, resource-dependent (local and state government funding), and so is the evaluation of actions. Large scope for improvements here.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The region is getting hotter, not cooler. Given this trend, the focus of the majority of

Assessment score:	2
	the work is on adaptation, as it is understood that mitigation is not a viable option for Greater Sydney. Our research on urban microclimates across the region has identified cool zones and hot spots. This information is communicated to the public, but it is the result of monitoring the status quo, not assessing the effect of cooling interventions. This can be done (depending on availability of funding) in a few years, when we will be able to compare baseline data from before development has taken place with that when development has taken place, where/where not heat mitigation strategies were embedded in the design. Several funding programs of the State Government have been rolled out to increase tree canopy cover across the region.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I am not aware of any such evidence.

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6. Heat governance

Confidence score:	4

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	See the Heat Smart City Plan for Sydney. Ambulance Service NSW has been identified as a government agency that will be taking on the lead governance role for extreme heat events. However, the Heat Smart City Plan clearly shows the inter-dependencies of agencies and organisations when managing the risks and impacts related to extreme heat. The related structures that connect different organisations in government are currently worked through and are expected to be in place in 2026/27.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	Yes, as documented through the above websites.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	No, and that has been flagged as a substantial barrier in the Heat Taskforce. Some grants are available that support greening the city. While greening will support cooling efforts, the programs might have focus areas like increasing biodiversity or reducing fragmentation, and thus not directly address cooling or heat adaptation. More could be done, but this comes back to resource availability.

References

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Committee for Sydney. (2023). *Defending Sydney: Building on experience of extreme heat, flood, storms, and fires to reduce direct risks to life, assets and productivity, now and into the future* [PDF]. https://sydney.org.au/wp-content/uploads/2023/10/Committee-for-Sydney-Defending-Sydney-October-2023-2.pdf

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https://www.westernsydney.edu.au/__data/assets/pdf_file/0006/2049909/Suburban_microclimate_open_access.pdf

https://www.cityofsydney.nsw.gov.au/-/media/corporate/files/publications/research-and-reports/mapping-summer-microclimates/mapping-summer-microclimates.pdf

https://researchers.westernsydney.edu.au/files/102691189/uws_60046.pdf

Resources listed in: https://wsroc.com.au/projects/project-turn-down-the-heat

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Sydney, Australia
Expert evaluator:	2

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Excellent on diverse sectoral impacts, compound and cascading, not a ton of information included on neighborhood level climate hazards, but they have high neighborhood level engagement. Good coverage of both extremes and creeping changes although could have included a broader set of heat metrics (e.g. humidity, nightime temps)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Good articulation of drivers of vulnerability and exposure, and discussion of root causes including historical oppression of indigenous groups. Less strong at high resolution neighborhood scale in the documents I reviewed, although they work with a large number of local councils

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Quantitative projections for changes in number of extreme heat days as relevant sectoral impacts including changes in labor productivity by sector, and cost of energy and service disruptions, as well as ecological changes. Only thing preventing

Assessment score:	3
	a ‘4’ is lack of detailed neighborhood level projections in the documents I reviewed.

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	There is a comprehensive ~150 page city report comprising scores of detailed recommendations, with extensive discussion of execution, examples of implementation, description of process, and a theory of change.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Both short and long term goals are articulated, with sequencing. Extensive discussion of milestones along the way to achieving goals, diverse set of goals. Goals are not particularly local in scale though.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Very robust co-design process. Almost 400 interviewed, lots of surveys and workshops across diverse sectors. As noted earlier, local councils highly engaged as well. For what it is worth, survey respondents were highly favorable (85-90 percent positive as described in city’s plan)

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	A large number of actions are described, organized by types of actions, and they have a large variety in their scope and depth. Some for example are very sector specific. Difficult to gauge how spatially local the adaptation actions are, however

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	A large number of actions are described, organized by types of actions, and they have a large variety in their scope and depth. Some for example are very sector specific. Difficult to gauge how spatially local the adaptation actions are, however

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	The recommendations section of the city's heat action plan includes several that are already being implemented (heat safe housing, burning money brief, energy resilience program, NSW heatwave subplan review, heat smart learnings), although most are not yet at the implementation stage. Still there is good description of steps needed towards implementation. It is less clear how local the implementations are, although local community engagement appears to have been secured.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	While a large number of recommended adaptations, there is surprisingly little discussion of cost-benefit analysis, even at the large scale let alone the local scale.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	There is extensive discussion of secondary interactions/effects of adaptation strategies, mostly focused on positive benefits. There is also extensive discussion of different adaptation timelines.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	While sequencing tends not to be discussed per se (although years are listed for different recommended adaptations), the approach lends itself well too iterative and flexible approaches, given large amounts of data collection, articulation of goals, and examples of evaluating adaptation strategies (e.g. testing the efficacy of shade device adaptations placed over fruit trees experiencing heat). A number of local adaptation strategies are described, as are processes for engaging diverse communities in the future steps.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	The Sydney heat plan includes a section on governance (P. 129 that includes transparency, funding, governance and visibility components.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	One case described in the NSW adaptation strategy involves providing shade over fruit trees. Several other strategies could be expected to reduce risk, such as the expansion of cooling centers.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	This is not directly described, but the inclusion of intermediate goals, and collection of extensive data would seem to minimize the risk. There is little if any description of how actions could increase peripheral risks.

6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	On the one hand, there is clear acknowledgement about how challenging heat governance is, and each recommended strategy is assigned a leading agency, and a plan is laid out for how the groups can work together. However, these plans are largely aspirational, rather than mandated by law. Engagement of local councils and specificity of proposed actions at least suggests potential for strong local scale.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	High level of academic engagement stands out especially, with a section of recommendations focused on research questions spanning from physical science to

Assessment score:	4
	behavior and communication. Similarly, there is high engagement of sectoral experts, and the private sector.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	At the New South Wales Level, it is noted that $93million AUS is available over 8 years for resilience, but this is not heat-specific. In general there is much discussion in the recommendations of Sydney's heat plan about seeking funding sources, but less funding seems to have been secured for the long term recommended adaptations. That said, initial funding enabled the stellar and ambitious planning to date.

References

Western Sydney Regional Organisation of Councils. (2024). *Greater Sydney Heat Smart City Plan 2025–2030*. https://wsroc.com.au/media-a-resources/reports?task=download.send&id=388&catid=3&m=0

Committee for Sydney. (2023). *Defending Sydney: Building on experience of extreme heat, flood, storms, and fires to reduce direct risks to life, assets and productivity, now and into the future* [PDF]. https://sydney.org.au/wp-content/uploads/2023/10/Committee-for-Sydney-Defending-Sydney-October-2023-2.pdf

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Buenos Aires, Argentina

Scoring sheet

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City case study:	Buenos Aires, Argentina
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards are clearly identified at a local scale with data integration and complex, interlinked, cascading risk perspectives. But neighborhood level and acute versus chronic not clearly identified and data is not “complex” (ie falls short of a 4). Noting, heatwaves are listed in the city planning reports as a top priority among climate impacts to address

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, identified across people, ecosystems, infrastructure with local spatial variations and consideration of underlying risk factors.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Future heat incidence is projected with some qualitative consideration of increase in risks but local context and data integration is thin

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Heat adaptation plan embedded in city adaptation plan, with good detail and relevance to the local context, concrete goals and commitments. Also includes evidence of implementation.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	A mixture of both with some consideration of measurability, assessments, etc.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Public participation mechanisms folded into various aspects of the adaptation plan and appear to be multi-step and multi-modal although content of them and how insights were incorporated into the heat plan are not clearly specified

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Multiple actions comprehensively identified across the city with local context and strong consideration of how heat risk will amplify with climate change

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Multiple actions that address drivers of exposure and vulnerability are identified in local context, addressing root causes and projected changes

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Actions appear to be implemented with specific city government bodies being listed as being in charge and with clear completion dates but potential maladaptation not listed and not clear what the current status is.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	Not explicitly noted.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Co-benefits discussed for each target of adaptation plan with notable mention of heat but not further specified

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Does not appear to be in a sequenced or pathway-based approach although planning for implementation has a timeline

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluation detailed but measurability, target setting and course correction not specified

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence seen

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence seen

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Dedicated bodies and roles indicated (which of existing municipal agencies are in charge of implementation) with consideration of institutionalization, authority, connectivity including timelines, synergies between agencies, review timelines, etc.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Technical expertise seems to be fully implemented with mention of municipal and science collaboration across the reviewed documents. The city pledges to make data produced available publicly.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Some funding appears to be in place while other potential sources and models are identified. But across the documents the lack of funding or funding challenges are highlighted as major obstacles.

References

Gobierno de la Ciudad de Buenos Aires. (2023). *Climate action plan 2050* [Plan de Acción Climática 2050]. https://buenosaires.gob.ar/sites/default/files/2023-02/pac_2050_buenos_aires_eng_0.pdf

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Scoring sheet

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City case study:	Buenos Aires, Argentina
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	The 2050 climate action plan recognizes temperature trends and the change in heat waves. The latter are specific to the city.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	The Plan includes a brief description of the heat islands, brief description, they are not integrated or specialized, co-benefits.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	The threat of heat in the future is addressed, especially in relation to heat waves.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a plan that addresses heat-related measures, but not exclusively. An extreme weather adaptation program is available online.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	The plan considers measures, which it describes by establishing actions, without indicators or deadlines.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The city's adaptation plan mentions actors related to each measure, such as stakeholders, and the community is mentioned in some cases in the description and sub-actions, but without a description of the mechanisms and scope. There is a public participation body through the Climate Change Forum, created by Law No. 5613 in 2016, in accordance with the provisions of Law 3871, which proposes to convene an annual meeting open to the community to discuss issues related to the main objectives of both laws.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	The plan mentions several heat-related actions, but does not explicitly address the temporal dimension. Some actions have been implemented, such as the climate shelter network, available at the following link. Acciones de adaptación | Buenos Aires Ciudad - Gobierno de la Ciudad Autónoma de Buenos Aires

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The plan mentions several heat-related actions, but does not explicitly refer to the temporal dimension.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	It is mentioned that some actions are already being implemented.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Benefits and co-benefits are mainly mentioned, but not always detailed. Costs are not addressed.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	They are mentioned, without going into depth

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	No planning or implementation stages for sub-actions are observed.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	They are only mentioned in some cases, in a preliminary manner.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Some evidence is presented, supported mainly by national or international sources.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not included

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	The city has a Climate Change officer housed in the Undersecretariat of the Environment. It's not just for the heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There are professionals and researchers concerned with the topic, and there is participation in international networks such as City to City, which strengthens the experience.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There are actions, so it is assumed that there is funding, but it has not been possible to find further information.

References

Gobierno de la Ciudad de Buenos Aires. (2023). *Climate action plan 2050* [Plan de Acción Climática 2050]. https://buenosaires.gob.ar/sites/default/files/2023-02/pac_2050_buenos_aires_eng_0.pdf

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Medellín, Colombia

Scoring sheet

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City case study:	Medellín, Colombia
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Sources identify both acute heat shocks or extreme events, such as heat waves, and chronic heat stress resulting from the Urban Heat Island (UHI). Specific critical areas are identified, such as Villa Guadalupe, San José La Cima, Berlín, and the city center, as well as high-risk neighborhoods like Castilla and Ferrini. Furthermore, it links heat to direct impacts on public health, estimating excess deaths annually and monitoring respiratory illnesses and disease vectors.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Information from both academic studies, real-time operational data from SIATA, and official planning document identify several drivers of exposure and vulnerability, including social, environmental and social drivers, at a city level and for specific neighbourhoods The study analyzes how inadequate building materials in informal settlements (zinc, asbestos cement) and low income levels exacerbate the risk.

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	The Medellín Climate Action Plan (PAC) 2020-2050 and its supporting technical documents provide a comprehensive projection of heat-related risks. The analysis goes beyond general climate projections, disseminating risk at the local scale of neighborhoods and rural communities, integrating hazard data (such as the projected increase to 150 days per year with temperatures exceeding 29°C by 2040-2050), population and infrastructure exposure, and socioeconomic and health vulnerability. The city utilizes advanced data integration from SIATA, with high-resolution models (CCSM4 at 1 km x 1 km), and evaluates multiple IPCC scenarios (RCP 2.6, 4.5, and 8.5) to measure both the risks and co-benefits of adaptation measures. Furthermore, it considers complex interconnections between urban design (Urban Heat Island), vegetation loss, and public health impacts (mortality and morbidity).

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	While the city does not feature a dedicated heat adaptation plan, it has a Climate Action Plan (PAC) 2020-2050, which has adaptation as one of its three fundamental strategic priorities and is the guiding document of the district's climate policy and has a formal commitment signed by the Mayor, which gives it legal support for its implementation. Moreover, the city has the Health Adaptation Plan (PASCCM) 2020-2050, which is specifically dedicated to the biological effects of heat and establishes an epidemiological surveillance framework for heat-related illnesses

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	While the PAC features comprehensive short-term (2023), medium-term (2030), and long-term (2050) goals, contextualized within the local environment, and they include a detailed consideration of measurability, evaluations, interconnections, and strategies for achieving them, the quantitative targets focus mostly on mitigation and there is no clear timewise set of objectives on extreme heat. However, it includes specific objectives and actions to mitigate the temperature increase and the Urban Heat Island (UHI) effect, with measurable targets.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	In the Medellin Resilience Strategy, a "co-creation" process is explicitly described for addressing the city's future, integrating the voices of citizens, experts, and leaders in strategic planning exercises.

Assessment score:	4
	For the PAC, Fourteen territorial workshops were held in the 16 communes and 5 districts, involving specific communities, in addition to events for children and youth. Moreover, by law, Participatory Budgeting mechanism exist that allow citizens to select and approve key projects, such as the Green Corridors, through democratic voting, granting them a direct popular mandate for their implementation. Also, a network of environmental organizations and environmental committees exists, acting as communication and oversight bridges between the community and the authorities. describe explícitamente un proceso de "co-creación" para abordar el futuro de la ciudad, integrando voces de ciudadanos, expertos y líderes en ejercicios de planificación estratégica,,.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes, several actions are designed, the most prominent of which are nature-based Solutions (NbS), including a network of 30 Green Corridors that has reduced temperatures by up to 2°C, green walls, and the Renaturalization Plan. Moreover, Infrastructure such as The Alpujarra District Heating and Cooling System, the use of reflective materials (albedo), and cool pavements is devised. The Health Adaptation Plan (PASCCM) for epidemiological surveillance and treatment of heat-related illnesses.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions are proposed for different drivers, including Loss of vegetation, loss of ecological connectivity and the low NDVI, Materials and urban geometry), Informal housing and poverty and regulations ((Sustainable Building Code to regulate green roofs and albedo in new buildings)

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Medellín presents verifiable evidence of the implementation of several key strategies. The Green Corridors program has improved 36 routes (18 roads and 18 along ravines), planting more than 880,000 trees and 2.5 million smaller plants. Additionally, 64 electric buses have been put into service to reduce emissions and waste heat, and the La Alpujarra District Cooling System has been operating since 2016, efficiently cooling seven government buildings. This implementation is supported by data from SIATA, which monitors the thermal effectiveness of these interventions in real time.

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	4
Rationale:	The sources provide a multidimensional analysis that goes beyond purely accounting considerations. In economic terms, the World Bank estimates a Return on Investment (ROI) of 4 to 1 for urban cooling in Medellín, based on reduced mortality and increased productivity. In non-economic terms, the report details benefits in public health (preventing 500 deaths annually), ecosystem services (removal of 40 tons of CO2 from surrounding hills), and social well-being (green jobs for 75 vulnerable people trained as gardeners). The analysis includes detailed comparisons under IPCC scenarios (RCP 2.6 and 8.5), quantifying specific savings in healthcare costs (e.g., US$155 million avoided in a high-temperature scenario).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Comprehensive Synergy Analysis (Co-benefits): The documents identify multidimensional "co-benefits" for adaptation actions. For example, the Green Corridors program not only reduces the temperature by up to 2°C, but also simultaneously improves air quality (reducing PM2.5), increases urban biodiversity, generates green jobs, and reduces premature mortality. These synergies are quantified using tools such as the social Return on Investment (ROI), estimated at 4 to 1 by the World Bank. Cases of maladaptation (e.g. Energy Dependence, Informal Housing or Inappropriate Species) are mostly documented by scientific literature.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	4
Rationale:	The city explicitly uses the Pathways tool to model its climate action routes. This approach allows for the definition of a "development path" where actions are connected gradually and cumulatively until 2050. The Climate Action Plan (CAP) establishes goals and actions organized into three clear time horizons: short-term (2023), medium-term (2030), and long-term (2050). A detailed timeline sequences the implementation of the 33 priority actions across these periods. The governance follows the PDCA cycle (Plan, Do, Check, Act), ensuring that the strategy is a dynamic tool for continuous and flexible development. It is recognized that the plan does not have a fixed endpoint but must be updated with new lessons and scientific evidence.

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	4
Rationale:	Medellín has integrated a robust monitoring system based on the PDCA cycle (Plan, Do, Check, Act), which is the management tool for the governance of the Climate Action Plan (CAP). The system has two specific components: MRV (Monitoring, Reporting, and Verification) for mitigation and M&E (Monitoring and Evaluation) for adaptation and co-benefits. This framework ensures that the goals are measurable and allows for adjustments to the strategy if temperature indicators do not show the expected trend. Furthermore, clear timelines have been defined: annual progress reports, biennial updates of the emissions inventory, and five-year reviews (every five years) to assess climate risk and make structural adjustments to the plan. SIATA acts as the technical hub, providing real-time data to support these decisions.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Existe evidencia física y científica documentada sobre la reducción del riesgo térmico en la ciudad, principalmente a través del programa de Corredores Verdes. Los datos locales indican que esta red de 36 corredores ha logrado reducir la temperatura promedio de la ciudad en 2°C. En zonas verdes específicas y corredores, la reducción ha sido de hasta 3°C o incluso 4.5°C, mejorando inmediatamente el confort térmico. La efectividad es mensurable mediante estaciones de monitoreo y el retorno de la inversión (ROI) se estima en un ratio de 4 a 1 debido a la reducción de mortalidad y visitas a urgencias por golpes de calor. Existe un alto consenso internacional, validado por premios como el Ashden Award 2019 y el reconocimiento del Banco Mundial, que posiciona a Medellín como un referente global de enfriamiento urbano. Aunque se identifican desafíos de sostenibilidad en el mantenimiento, el programa ha sido institucionalizado en los Planes de Desarrollo y cuenta con respaldo ciudadano a través del Presupuesto Participativo.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Maladaptation risk is mostly by scientific evidence

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Medellín cuenta con una arquitectura institucional robusta y formalizada para la gestión del calor y el clima: La estructura se basa en el Sistema de Gestión Ambiental de Medellín (SIGAM), formalizado mediante acuerdos municipales desde 2007 (actualmente el Acuerdo 67 de 2017). El PAC 2020-2050 actúa como el documento rector de la política climática distrital. El liderazgo recae en el Consejo Ambiental de Medellín (CAM), presidido por el Alcalde, y en la Secretaría de Medio Ambiente (SMA), que coordina la planificación a largo plazo y la ejecución de programas como los Corredores Verdes. El DAGRD posee autoridad central para la gestión del riesgo y la adaptación climática. Se evidencia una integración vertical y horizontal. A nivel local, existe articulación entre secretarías (Salud, Medio Ambiente, Infraestructura). A nivel regional, la ciudad se integra con el Área Metropolitana del Valle de Aburrá (AMVA) y el Nodo Regional de Cambio Climático de Antioquia. A nivel global, la conectividad es plena a través de redes como C40 Cities y Making Cities Resilient 2030.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Medellín boasts a robust, multi-level technical architecture. The city utilizes SIATA (Early Warning System), rigorously rated "Very High" based on scientific standards, and employs cutting-edge technology for real-time monitoring. There is deep integration with academia (EIA University, University of Medellín, University of Antioquia, and UPB) for biophysical diagnostics and climate modeling. Capacity building is evident in programs such as the training of 75 citizens from disadvantaged backgrounds as gardening technicians for corridor maintenance and the training of community risk management committees. Accessibility is ensured through an open data policy and the unification of climate information on platforms such as SIGAM and SIAMED.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Medellín has mobilized significant resources and integrated them into its official budget structure. The Green Corridors project had an initial investment of US$16.3 million, and the city invests approximately 200 billion pesos annually in urban sustainability. The Climate Action Plan (PAC) has an approved budget of US$951 million (3.6 trillion pesos) for the four-year period 2020-2023. However, sources point to a structural barrier: the municipal budget is projected in four-year cycles linked to the Municipal Development Plan (PDM), which creates the risk of not having secured resources for the medium and long term (post-2023) if additional regulatory actions are not taken. Although mechanisms such as the Fund for Life and international partnerships (US$150 million managed by the ACI) are being sought, the dependence on the current political cycle limits [the city's ability to act].

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Municipality of Medellín. (n.d.). *Medellín resilience strategy* [City resilience strategy]. Resilient Cities Network. https://resilientcitiesnetwork.org/downloadable_resources/Network/Medellin-Resilience-Strategy-English.pdf

Watts, J. (2023, September 25). *How Medellín is beating the heat with green corridors*. BBC Future. https://www.bbc.com/future/article/20230922-how-medellin-is-beating-the-heat-with-green-corridors

C40 Cities Climate Leadership Group. (2019, October). *Cities100: Medellín's interconnected green corridors*. C40 Knowledge Hub. https://www.c40knowledgehub.org/s/article/Cities100-Medellin-s-interconnected-green-corridors?language=en_US

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Medellín, Colombia
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Medellín thoroughly identifies both chronic heat stress (urban heat island) and acute shocks (heat waves) at the neighborhood level. The city reported a heat island intensity of 7 °C, the highest among 419 cities studied.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The PAC thoroughly analyzes social factors (poverty, education levels), economic factors, and physical factors (valley topography, high urban density, and soil sealing), but only some of them are related to heat in the document.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Advanced climate models (CCSM4) with a resolution of 1 km x 1 km are used to project that by 2040-2050 there will be 150 days a year exceeding the threshold of 29 °C

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	There is the Climate Action Plan (PAC) 2020-2050 and the Resilience Strategy, which include specific objectives to mitigate heat and the UHI effect, although they are integrated into broader climate plans.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The PAC sets clear and measurable goals for 2023, 2030, and 2050

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	In the PAC context, fourteen territorial workshops were held in the 16 communes, and the Participatory Budget is used so that citizens can select green projects, not just those related to heat.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	More than 30 Green Corridors have been implemented, connecting hills, parks, and streets with 8,800 trees and millions of plants. Green roofs and cool pavements are also being promoted. The action is almost only related with the NBS.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	A program is proposed that includes the training of 75 gardeners from vulnerable communities, addressing economic inequality while improving the physical environment; however, this is not directly related to heat or vegetation as a factor.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	According to the reviewed documents, the Green Corridors have been a reality since 2016 and have managed to reduce the average temperature by 2 °C

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	In the case of green corridors, an investment of $16.3 million USD was estimated, and benefits such as the prevention of 33,919 heat-related deaths by 2030 were quantified, but the other documents or actions have not been quantified.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The PAC coordinates some actions that benefit both air quality and the reduction of GHGs, as well as thermal adaptation

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	The PAC sets clear and measurable goals for 2023, 2030, and 2050

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Medellín uses SIATA and SIGAM and reports annually to global platforms such as CDP, although there is an effort to move towards a more robust electronic model by 2023

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Only about corridors, official data confirms reductions of up to 3 °C in specific areas following the implementation

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	The reviewed documents do not make reference to this.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Medellín has a Chief Resilience Officer (CRO) and a Resilience Committee that includes the Mayor and key secretaries, but not directly related to heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	SIATA is a center of technical excellence in hydrometeorological monitoring and climate modeling, accessible for decision-making.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	More than $951 million USD have been secured for the 2020-2023 four-year period for 'Ecocity' programs, and the SISCLIMA Financial Management Committee is in place. This funding is not only for heat adaptation.

References

Alcaldía de Medellín (2021). Plan de Acción climática, Medellín 2020-2050.

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Municipality of Medellín. (n.d.). *Medellín resilience strategy* [City resilience strategy]. Resilient Cities Network. https://resilientcitiesnetwork.org/downloadable_resources/Network/Medellin-Resilience-Strategy-English.pdf

Watts, J. (2023, September 25). *How Medellín is beating the heat with green corridors*. BBC Future. https://www.bbc.com/future/article/20230922-how-medellin-is-beating-the-heat-with-green-corridors

C40 Cities Climate Leadership Group. (2019, October). *Cities100: Medellín's interconnected green corridors*. C40 Knowledge Hub. https://www.c40knowledgehub.org/s/article/Cities100-Medellin-s-interconnected-green-corridors?language=en_US

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Government of Colombia, Ministry of Environment and Sustainable Development. (n.d.). *Plan nacional de adaptación al cambio climático* [National adaptation plan]. United Nations Framework Convention on Climate Change (UNFCCC). https://unfccc.int/sites/default/files/resource/Colombia-NAP-Spanish.pdf

Mexico City, Mexico

Scoring sheet

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City case study:	Mexico City, Mexico
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	**Scope: Both** chronic heat stress such as progressive warming and acute heat shocks (heat events) are identified **Scale:** Discuss different neighborhood types in rural and urban areas. **Dimensions:** Discuss complex interactions and link them to health, transport, drought, air pollution, and ozone. Also discuss how public transit can be impacted

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	**Scope:** Discuss drivers across people, infrastructure, and ecosystem. Discuss the replacement of natural surfaces and how it has intensified the urban heat island **Scale: Neigh**bourhood level is identified **Dimensions: Discuss** root cause and social vulnerability. How poverty is related and how structural drivers around social inequality is related to exposure to heat

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	**Scope: Discuss** hazards, exposure, and vulnerability trends **Scale:** contains information at the neighborhood level

Assessment score:	4
	Dimensions: mentions urban heat island impact and have dataset for projections

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	**Scope: Part of the climate action plan** **Scale:** the scale is city-level with locally specific measures **Dimensions:** Emergency and health-focused. But limited long-term structure. Discuss early warning strategies

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	**Scope: The** climate action program establishes goals and actions for mitigation and adaptation at both short and long-term levels **Scale:** City-wide **Dimensions:** Did not discuss more complex interactions between the goals

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	**Scope:** Contain the intention to conduct stakeholder engagement and the mechanisms exist and acknowledge the importance of it. *"10 workshops attended by 840 people, representatives of government, boroughs, civil society, academia, and citizens."* **Scale:** City wide. Discuss sector specific stakeholders, not a ton of local level stakeholders **Dimensions:** Consultation rather than co production

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	**Scope: Discuss** urban greening to address both chronic and acute heat shocks. Air

Assessment score:	3
	quality is also related to heat exposure **Scale:** Limited in scale **Dimensions:**

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	**Scope:** identifies different actions to address drivers such as reducing environmental, socioeconomic, and gender inequalities **Scale: Lack of** details about implementation **Dimensions: N/A**

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	**Scope:** The measures are implemented with a monitoring system set up, but it's focused on the nature-based solution of the greening of spaces to address heat **Scale:** No discussion of local level implementation **Dimensions:** do not discuss maladaptation

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	**Scope:** Discusses the use of cost-benefit tool, but it is not heat specific **Scale: no data** **Dimensions: no analysis**

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	**Synergies are acknowledged, but trade-off analysis is not done**

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Talk about different timeline and horizons, but not in a pathway-based approach

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	**There seems to be a strong M&W V approach, but a lack of local context**

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	**No data showing so**

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	**No data showing so**

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	No dedicated chief heat officer, but there are climate officers

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	**Identified and in place, but lack local context. Though there is some discussion of capacity building**

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Discuss funding and recognize it as an enabling condition. There is a board climate finance, but not for heat specifically

References

Secretaría del Medio Ambiente de la Ciudad de México. (2021). *Estrategia Local de Acción Climática 2021–2050: Programa de Acción Climática de la Ciudad de México 2021–2030* [Climate action strategy and program]. https://www.sedema.cdmx.gob.mx/storage/app/media/DGCPCA/PACCM_y_ELAC_uv.pdf

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Secretaría del Medio Ambiente de la Ciudad de México. (n.d.). *Executive summary: Programa de Acción Climática de la Ciudad de México (PACCM)* [Executive summary]. https://www.sedema.cdmx.gob.mx/storage/app/media/programas/cambio-climatico/executive-summary-PACCM.pdf

Scoring sheet

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City case study:	Mexico City, Mexico
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	There is reference to heat phenomena, specifically heat waves and urban heat island effect and to locations, but metrics are unclear.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Climate change, heat and humidity, and urban heat island effect are all explained in different places in gov't documents.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Categorically, yes, future heat risks are considered, both generally and for different systems, esp. Transportation. Quantitatively, it's unclear whether there are clear forecasts/expectations of magnitude of risks.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a climate plan, heat fits into the climate plan. But there isn't a heat-focused plan, nor is heat a prominent feature of any part of the plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	There are policy goals, but they are not heat outcome goals.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	There are multiple references to community meetings, survey results, and neighborhood level representation.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	There are adaptations in domains (transport, water, health), and many of these consider heat, but it is limited.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Geography and sector are both used to identify heat exposure risks and vulnerabilities, but I do not find clear measures or explanations of the drivers.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Hard to tell.

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	There was very little mention of cost in any of the documents.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Some of the tables and lists suggest prioritization and emphasis but there are no explicit assessments of trade-offs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There are timelines and plans but little evidence of coordination or pathway-based approach.

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	There seems to be some accounting but no evidence of an evaluation process or methodology.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence

6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Broader climate structure may include heat, but it's not clear.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	There are climate officials and they seem to have access to outside resources (e.g. international city networks)

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There are dedicated climate resources, but if/how they get allocated to heat is unclear. Vast majority of effort is on water.

References

Secretaría del Medio Ambiente de la Ciudad de México. (2021). *Estrategia Local de Acción Climática 2021–2050: Programa de Acción Climática de la Ciudad de México 2021–2030* [Climate action strategy and program]. https://www.sedema.cdmx.gob.mx/storage/app/media/DGCPCA/PACCM_y_ELAC_uv.pdf

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Secretaría del Medio Ambiente de la Ciudad de México. (n.d.). *Executive summary: Programa de Acción Climática de la Ciudad de México (PACCM)* [Executive summary]. https://www.sedema.cdmx.gob.mx/storage/app/media/programas/cambio-climatico/executive-summary-PACCM.pdf

Monterrey, Mexico

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Monterrey, Mexico
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Fits best with 3, but could be closer to 2. “Heat hazards are identified, addressing both chronic heat stress and acute heat shocks at a local scale, with some depth in complex risk perspectives and data integration” Mostly public health challenges, heatstroke Identification and data integration: P. 140 Analysis of Resilience Dynamics explained, includes 2. Extreme heat calculation = Urban heat island plus vegetation index (NDVI) Zones of concentrated vulnerability also identified (extreme heat weighted twice among other indicators (water, air quality, etc) in “ICV” score) to identify priority areas for investment - Map on page 40 identifies the Urban Heat Island in terms of surface temperature -p. 50 maximum annual temperature plotted over time Context: - “high temperatures pose a public health challenge for the city by causing more extreme and recurrent heat waves.” p. 50 - “+8.9oC Increase in temperature in the central area of Monterrey due to urban heat islands. (Manzanilla-Quiñones, 2022)” p. 60 -“Located in a semi-desert area, Monterrey is highly vulnerable to climate change. Recently, the city has experienced extreme temperatures exceeding 40 degrees Celsius, making it the state with the highest number of heatstroke deaths in the country, with 102 in 2023 (Ministry of Health, 2023), *among other impacts such as*

Assessment score:	3
	flooding caused by torrential rains and severe droughts due to the water crisis facing the region." (P. 14, p. 44) --"Currently, there is an upward trend in temperatures and a decrease in rainfall. Over the last 40 years, the average annual temperature has increased from 20.8°C in 1980 to 22.8°C in 2023, while precipitation has decreased from 602.3 mm to 547.9 mm over the same period (IPCC, undated)." p. 50 **Source: WEF** https://www.weforum.org/stories/2023/08/extreme-heat-12-cities-respond-adaptation/ "Monterrey is one of the hottest cities in Mexico. Monterrey suffers $1.8 billion annual labour productivity losses due to heat and humidity, projected to double by 2050. It's actively pursuing private-sector investments and pilot projects to enhance heat resilience."

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Drivers of exposure and vulnerability are identifi ed, addressing people, infrastructure, and ecosystems with local relevance and some consideration of underlying risk factors and data integration. "The expansion of manufacturing facilities and the demand for natural resources, particularly land and water, have created emerging tensions, making the displacement of inhabitants from the central area of the municipality to the peripheries even more visible, exposing larger urban areas to the effects of climate risks such as floods, droughts, and periods of extreme heat." p. 38 -"This persistent **poor air quality** directly impacts the quality of life of the population and contributes to climate change with other side effects such as the urban heat island effect, which poses a challenge to public health. P. 60 **Source: Penn Today** https://penntoday.upenn.edu/news/warming-world-chief-heat-officers-help-adapt-prepare-and-protect From former CHO: "By focusing on extreme heat, we can directly consider how climate change affects people's health. There's a gendered perspective also. Women are the most vulnerable to extreme heat, for several reasons. In the Global South, the majority of the jobs women can take are informal, and the majority of informal jobs take place outside. Women are usually the ones in charge of the house and taking care of their family, and sometimes houses are hotter inside than it is outside. And another way of looking at the vulnerabilities of women is that, in taking care of kids or elders, they sometimes commute a lot, not just to a job but to hospitals or schools or clinics. The vulnerability to heat is also not shared equally across social class. In Mexico, about 70% of housing is self-built. And the most vulnerable people are generally located in places where there's a lack of vegetation—trees and shade. So, the heat island effect is worse in those areas." **Addition Source: (WRI blog)** https://es.wri.org/insights/como-mitigar-las-islas-de-calor-en-monterrey

Assessment score:	3
	“In recent years, the metropolitan area has increased its urban footprint and, therefore, its impervious surface area, at an average annual rate of more than 2%, and almost four times more in peri-urban areas, at the expense of losing vegetation areas that could have mitigated temperature increases. In the last twenty years, the city of Monterrey has lost 38.6% of its environmentally valuable permeable soil, compared to the national average of 21.1%. The discussion of the viability of the expansive, low-density, car-oriented urban model is therefore becoming a priority public policy issue in the current climate context.” The population of Monterrey is highly exposed to ICUs, which exacerbates the impacts of climate change on vulnerable populations with poor access to public spaces.”

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Heat risk(s) are projected but do not address future hazards, exposure, and vulnerability trends in detail, lack relevance to the local context, or fail to consider multiple dimensions “Government projections indicate an increase in maximum average temperatures of 1.5°C by 2040, 2.6°C by 2060, and 5.5°C by 2100. Therefore, the average maximum temperature is expected to increase from 29.5°C to 31°C by 2040, to 32.1°C by 2060, and to 35°C by 2100. In addition, data projects that there will be 26 days with temperatures above 40°C. In comparison, there are currently between 4 and 5 days with these temperatures. (IPCC, n.d.)” p. 50 “Unfortunately, according to climate change scenarios presented in the vulnerability atlas of the National Institute of Ecology and Climate Change, these trends will continue unchanged in the short term but will worsen in the medium and long term (INECC, 2019).” p. 50

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	**Not clear there is a dedicated role and/or budget to the plan’s adoption (needed for 4). Also, it is a general** City Resilience Plan (part of the Global Network of Resilient Cities) that sets specific goals for heat adaptation “Dedicated heat adaptation plan exists with suffi cient detail and relevance to the local context, and includes some concrete goals, priorities, commitments, or evidence of formal adoption or implementation mechanisms”

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Detailed goals exist across short- to long-term timeframes, with local context and some consideration of measurability, assessments, interconnections, and strategies for achieving the goals Primarily listed under environmental goals of their resilience plan: “3.2.2. Reducing heat islands through interventions in public spaces The action focuses on reducing urban heat islands through strategic interventions in public spaces, such as **sustainable drainage systems and the creation of urban wetlands or rain gardens that capture and filter rainwater**. It proposes the **introduction of plant species** from the region in urban spaces, as well as the **integration of materials that absorb heat** and/or reduce its impact on the environment, which helps to reduce the ambient temperature. These interventions are **coordinated** with the green infrastructure strategies outlined in actions 3.2.1 and 3.2.4, ensuring a comprehensive approach to mitigating the heat island effect. The **interventions focus on areas with the highest heat island effect**, such as the downtown area, the industrial zone, and the northwest of the municipality, prioritizing the Barrios en Resiliencia (Neighborhoods in Resilience) program, including Solidaridad, Topo Chico, and Centro Norte. This approach ensures that the **most critical areas** receive priority attention, improving Monterrey's ability to adapt to climate challenges such as rising temperatures, as well as reducing heat stress on the population and promoting a healthier and more sustainable environment.” 104 Heat also listed in the objectives 1.3 Risk reduction and adaptation of **vulnerable settlements:** -“Based on data derived from the **Monterrey Municipality Risk Atlas**, a **portfolio of strategic projects** will be generated for risk mitigation and adaptation to climate change. The strategies will determine the infrastructure and improvements in public spaces and housing in areas of medium and high vulnerability. The interventions will include **construction techniques that can withstand extreme weather events, such as floods and extreme heat**.” p 81 2.1.3 *Consolidate metropolitan protocols and mechanisms for responding to emergencies* 2.2.1 *Digital alert system for climate risks at the metropolitan level [including heat waves]* *2.2.2. Incorporate Monterrey's Climate Resilience component and its layers of information into the Territorial Intelligence Center.* *2.3.2. Consolidate a communication platform between citizens and the government.* *3.2.1. Renaturalization program, including reforestation, revegetation, and forest health in urban and peri-urban areas to improve environmental quality.* *3.2.4. Promote biological corridors within the urban area, linking hills and ravines with rivers, streams, parks, and other urban ecosystems.* *4.2.1. Design and construction of complete streets and green corridors, linked to the mass transportation system and essential local facilities* *4.3.3 Program for the recovery and use of urban vacant lots and abandoned, dilapidated, and underutilized housing.*

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Engagement mechanisms are in place but are limited in their relevance to the local context or reflect a low depth of participation (e.g., one-time or one-way communication). Not clear if there was additional community engagement mechanisms besides a limited set of multi-actor workshops to develop the resilience plan. Extreme heat identified by participants as an impact of climate change in these sessions, although in the middle of concerns after floods, fires, torrential rains, drought, and other general pandemic, industrial risks, security, energy, etc. WEF [see link above]: “Lessons from across Mexico, such as Mérida's citizen-involved reforestation project, offer insights for Monterrey to mitigate economic losses and protect its population from escalating heat challenges”

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple actions are identified that address a mixture of chronic heat stress and acute heat shocks, are relevant to the local context, and demonstrate some consideration of future changes. p. 162 has a catalogue of actions (green pavement, bus stop covers, parks along roads, shade covers, climate roofs, water fountains, vegetation cover in parks, community gardens, cold pavement, expanding tree cover, platform of heat data, cool streets)

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Multiple actions are identified that address drivers of exposure and vulnerability for people, infrastructure, and/or ecosystems in a local context, while partially addressing root causes and future changes The identification and priority of investments in specific neighborhoods with high vulnerability and exposure are identified.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	**The plan's implementation window is 2024-2030.** This includes "presentation of resilience plan, design of monitoring and evaluation process of the resilience plan to align with Monterey 2040, implementation of actions" It appears the resilience plan's presentation is moving along: https://implancmty.geoint.mx/ **Source: One Billion Resilient** https://onebillionresilient.org/hot-cities-chilled-economies-monterrey/ "Private-sector investment and pilot studies for heat resilience are already underway in Monterrey and across Mexico…Investment in the built environment and nature-based solutions: **Passive cooling building pilot studies**, including in Monterrey, have shown promising results in using building design elements to reduce indoor temperature while limiting the need for active cooling. **Heat-reducing urban design features** are also employed in the Regeneración plan for the Monterrey Institute of Technology and Higher Education (Tecnológico de Monterrey), including features such as **underground parking** replacing heat-island above-ground lots, increased density to reduce overall demand for parking, use of **canopies** over exposed plazas, and maintaining features such as east-west orientation of roads that allow winds to cool the campus."

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Costs and benefits are noted only in economic terms for one or more heat adaptation options, but lack detail However, the resilience plan identifies an objective to create a bank of resilience projects that includes a cost-benefic analysis "2.4.3 Creation of a bank of resilient projects A bank of projects will be developed with priority initiatives for building resilience at the municipal and metropolitan levels. Each project will include a description, financial evaluation, **cost-benefit analysis**, and details of its value for Monterrey's resilience. This will provide a solid tool for requesting funding and cooperation from private sector organizations and international agencies."

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Synergies and trade-off s between heat adaptation options are noted but lack detail, relevance to the local context, or consideration of multiple dimensions Heat and air quality synergies are identified in broad terms No trade-offs identified

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Heat adaptation options are not integrated into a pathway-based approach or are explicitly dismissed No mention in report

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring and evaluation processes are identified and partially implemented but lack local context, or fail to consider measurability, target setting, and course correction mechanisms Need for and process to develop monitoring and evaluation is identified. But it is not implemented or detailed how it will happen: Phase 3 implementation (2024-2030): presentation of resilience plan, design of monitoring and evaluation process of the resilience plan to align with Monterey 2040, implementation of actions

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence is identified, or it is explicitly dismissed

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence is identified, or it is explicitly dismissed

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Heat governance structures are identified but not yet established, in early development, lack local relevance, or fail to address multiple dimensions There was a Monterrey Extreme Heat Office (Oficina de Calor Extremo de Monterrey) established by the ex-mayor in 2022 but on May 15, 2025 ABC reported that it was discontinued from not being effective. Inexperienced staff, challenges in structure in urban development office *https://abcnoticias.mx/local/2025/5/15/oficina-de-calor-extremo-en-monterrey-queda-en-el-olvido-249298.html* **Source: Penn Today** https://penntoday.upenn.edu/news/warming-world-chief-heat-officers-help-adapt-prepare-and-protect "I'm different from the rest of the CHOs because I'm not a government official, but I do work directly with the mayor to help generate awareness of the situation with extreme heat both in and out of the municipality of Monterrey. I'm trying to generate awareness at the government level but also within organizations and companies. We're preparing a communications campaign. Some of it will talk about planting trees and why that will be beneficial in the long term, but it will also highlight the dangers of extreme heat and how to protect yourself and others over the short term."

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise is partially in place but lacks local relevance or does not sufficiently address availability, accessibility, capacity-building, and integration Research on projections from the Servicio Meteorologico Nacional used and report and website includes geospatial analysis but not clear if these are ongoing research teams. Also, cannot find detail of accessibility, capacity-building, integration beyond that the plan is being promoted now and has a website

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding is identified but not yet established, lacks local relevance, or does not address multiple dimensions Plan includes the objective: *Action 2.4.3. Creation of a fund with earmarked resources for resilience and climate change financed with municipal budget.* Cannot find more online, not clear in report.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Monterrey, Mexico
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Looking through different kinds of documents (the ones provided plus others that were found and included in the analysis) it stands clear that there exists an identification and characterization of both acute shocks and acute stress (growing baseline condition of heat). This is characterized with more detail in at least some of the neighbourhoods of Monterrey and there is a specific connection between heat and impacts on public health, environment (e.g. pollution) and the economy. Advanced models are used (e.g. including sensors, LIDAR etc.)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Different dimensions of vulnerability are considered, including socioeconomic and sociodemographic, infrastructural, spatial, ecological etc. Analyses based on the index of vulnerability concentration are performed at neighbourhood level and for different sectors in the city. This however is not necessarily performed only for what concerns heat risk, but more generally. Relationship with urban pollution and urban islands is included in the analysis,at least by scientific sources available for planning

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Multiple climate scenarios are used for the assessment, including not only hazard but also trends of exposure and other variables, considering a neighbourhood level and interaction with key systems (eg. energy, water, health and air pollution). In the document “Proyecto del Plan de Resiliencia Urbana de Monterrey”, on top of providing general numbers with respect to future scenarios, there is also an analysis of an integrated vulnerability index based on concentration of vulnerability and resilience variables to different risks (including extreme heat) at the level of neighbourhood. The document also distinguishes, at least in principle, chronic stresses and extreme risks, although I couldn’t appreciate a full analysis of this, and there are data on mortality due to heat risks. It must be said however that the plan is not specifically directed to heat risk per se, so of course the level of depth of certain analyses is lower. There are also other, more sophisticated analyses available In other documents, especially in science, but as of yet it is not clear that they have been included in policy planning.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There exist several plans and strategies of urban resilience and adaptation for Monterrey in which heat is considered explicitly as a relevant dimension but not through a dedicated plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Yes, there are several short to long-term goals across three well defined periods: 2024-2027, 2027-2035 and 2035-2050. Clear indicators are offered around the goals for the different periods. Other instruments and plans sometimes diverge in the precise time horizons for planning (e.g. 2040 instead than 2050 for long-term) but always include clearly defined axes, goals and targets. SMART indicators are often used.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	To elaborate the Plan Estratégico Monterrey 2040 more than 26,000 people were included. A Technical Board for resilience was developed, together with several other mechanisms to engage both with technical profiles, citizens and local community organizations. Most of the instruments analysed clearly detail their participation strategies.

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Monterrey has defined an extensive catalog of actions that go beyond isolated measures. These include nature-based solutions (massive reforestation with native species such as ash), engineering interventions (cool roofs, reflective and permeable pavements), regulations (bioclimatic building codes), and governance systems (Extreme Heat Office). The plans identify and propose specific actions to address chronic stress, such as the Urban Heat Island (UHI) effect, through biological corridors and increased green infrastructure. At the same time, they tackle acute shocks (heat waves) by implementing digital early warning systems and creating a network of local climate shelters. Specific neighbourhood-level actions are devised.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The Urban Resilience Plan defines 46 concrete actions. These cover people (such as the "Municipal Care System" and health services in vulnerable areas), infrastructure (such as "sustainable buildings," "cool roofs and walls," and "cool pavements"), and ecosystems (such as the "native species reforestation" program and the restoration of the Santa Catarina River). The actions are specifically implemented through the "Neighborhoods in Resilience (BeR)" strategy, prioritizing sectors with high thermal vulnerability such as Solidaridad, Topo Chico and Centro Norte

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	The documents not only propose plans but also report tangible progress. The planting of more than 127,000 trees in urban reforestation and watershed projects to mitigate the urban heat island effect has been documented. Operational programs such as "Rainwater Schools" and "Rainwater Neighborhoods," which integrate rainwater harvesting to address the heat-water nexus, have also been implemented. Other ongoing initiatives include the "Adopt a Tree" program and the creation of community gardens and recycling centers. Evidence is currently still only partly available, especially on the effectiveness of impact.

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	The sources detail costs and benefits for various strategies, including green infrastructure (urban reforestation), technological solutions (cool roofs and walls, energy efficiency in buildings) and early warning systems, although these are often not quantified but only qualitatively identified. Some full cost-benefit analysis is provided only for some measures but it is more on mitigation options. In adaptation, there is some evidence, but most of it is in scientific documents more than actual policy ones. Figures on possible financial cost of non-adaptation are provided Monterrey's governance incorporates mechanisms to prevent climate solutions from being counterproductive. The Action Plan for Decarbonization (PAD-MTY) mandates the use of Life Cycle Assessment (LCA) to ensure that building materials do not negate thermal benefits.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Monterrey does not evaluate heat mitigation measures in isolation, but rather seeks an integrated approach. The documents highlight that nature-based solutions (tree planting) not only mitigate urban heat islands, but also provide synergies in air quality (pollutant absorption), water management (water infiltration), and public health. The Decarbonization Action Plan (PAD-MTY) links energy efficiency with poverty reduction and improved economic productivity. 2. Trade-off Identification: The sources identify specific conflicts between objectives. For example, in the manufacturing sector, the trade-offs between general safety measures (use of personal protective equipment, PPE) and specific heat risks are analyzed, since the equipment can increase the worker's body temperature. Peak energy demand during heat waves is also analyzed, where the need for cooling puts the stability of the electrical grid at risk. However, part of the evidence I found was in documents that are not necessarily official policy documents, but more in reports, studies and so on, which may or not be considered in planning. In the Urban Resilience Plan for Monterrey, and also in decarbonization plans, there is an analysis of synergies (with air quality, water and health) and of some trade-offs (e.g. with energy).

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The documents detail that Monterrey's actions are not isolated measures, but rather part of a roadmap with three clear time horizons: short term (2024–2027) focused on institutional strengthening; medium term (2027–2035) oriented towards incentives and rehabilitation; and long term (2035–2050) to achieve total neutrality and consolidated resilience. The plans are intended as the begging of a dynamic and flexible process. Monterrey's governance framework identifies that the heat risk is not only climatic, but also stems from an "urban model of urban sprawl" and the loss of 38.6% of

Assessment score:	2
	permeable soil, so it proposes a transformation change to the city design. I have to say that I found this question especially hard to assess based on the existing evidence. My reasoning was based on that different policy documents exist for the city that integrate heat within their objectives and most of them to have a short to long term planning, and often incorporating neighbourhoods. Also, there are M&E systems in place in the local governance. However, if we limit ourselves only to what specifically and only refers to heat alone, then the score is lower.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	4
Rationale:	Monterrey has legally institutionalized a Monitoring and Evaluation (M&E) system through its Climate Change Regulations. This system is designed to understand the real impact of actions and explicitly allows for adjustments or a redesign of policies if the results are not as expected (course correction mechanism). Furthermore, the Decarbonization Action Plan (PAD-MTY) integrates indicators based on SMART criteria (Specific, Measurable, Achievable, Relevant, and Time-bound) and defines clear quantitative targets for short-, medium-, and long-term horizons (2027, 2030, 2050). The plan also includes the priority monitoring of pilot projects, such as the one at City Hall, to generate evidence and ensure replicability.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	There is tangible, measurable evidence regarding the implementation of solutions to reduce thermal risk. Reports indicate the planting of over 127,000 trees and the creation of a system of parks and green corridors, comprising 94 hectares of rehabilitated land and 73 kilometers of streets featuring extensive tree cover. The effectiveness of these measures has been scientifically validated within the local context using remote sensing (MODIS, Landsat) and LiDAR technology; these data demonstrate that areas with high vegetation density in Monterrey serve as thermal refuges, exhibiting temperatures significantly lower than those of the established urban fabric. Measurability is ensured through "surface temperature variation" indicators and targets to reduce urban microclimate temperatures by up to 2°C by 2030. Consensus and sustainability are reflected in the collaboration with international organizations (WRI, C40, UNEP) and the alignment of these efforts with current state and municipal plans. However, I did find evidence, in science more than in policy, of the effectiveness of some of the measures taken, particularly connected with the use of vegetation. The assessment only covers some of the dimensions provided.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Good progress albeit possibly still partial. Monterrey has legally institutionalized a Monitoring and Evaluation (M&E) system specifically designed to prevent maladaptation. The Monterrey Climate Change Regulations define this system as the mechanism for understanding the actual impact and assessing whether adjustments or a redesign are necessary if actions do not achieve the expected results. The Action Plan for Decarbonization (PAD-MTY) reinforces this by integrating SMART indicators and a monitoring system for its pilot projects, ensuring that implementation generates evidence before replication. Furthermore, there is a high level of consensus through the Resilience Technical Committee, which includes representatives from academic, business, and social sectors to validate goals and strategies. Specific challenges (such as water availability for irrigation in reforestation) have been identified to prevent operational failures in adaptation.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Monterrey boasts a robust and specialized climate governance architecture: ◦ Institutionalization: It has a binding legal framework, the Monterrey Municipal Climate Change Regulations, which define the urban heat island effect and mandate mitigation and adaptation actions. ◦ Authority: There is also the Municipal Inter-Secretarial Commission on Climate Change, chaired by the Secretariat of Sustainable Urban Development (SEDUSO), which brings together all agencies with responsibilities in this area. ◦ Connectivity: The Resilience Technical Working Group was established as a multi-stakeholder co-production space. Furthermore, Monterrey leads metropolitan coordination mechanisms with the 18 municipalities in the region to address heat as a transboundary risk, supported by international organizations such as WRI Mexico and UNEP. Some heat-related offices and positions have been closed, but that does not completely unmake the structure designed in the Plans and policies that had been put in place, and the secretariat of sustainable urban development is still In place, although not dedicated to heat. Also, more recently, other tools have been created (e.g. Cool Cities Lab, to provide actionable and transparent evidence), and there is recording of capacity-building exercises going forward.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Monterrey cuenta con una infraestructura de conocimiento técnico robusta y

Assessment score:	3
	diversificada. La ciudad ha formalizado alianzas con organismos internacionales y centros de investigación como WRI México, SUMe, el PNUMA y CentroGeo para el desarrollo de sus planes estratégicos. La disponibilidad y accesibilidad se garantizan mediante herramientas públicas de diagnóstico energético y la plataforma digital del Centro de Inteligencia Territorial (CIT), que permite visualizar datos geoespaciales y climáticos para la toma de decisiones. La creación de capacidades está institucionalizada a través del "Pilar 1" del PAD-MTY, que establece la meta de capacitar al 100% del personal municipal clave para 2027 y la creación de una "escuela de resiliencia". Finalmente, esta experiencia no es externa, sino que está integrada en los reglamentos y planes de ejecución municipales

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Partial. Monterrey's Climate Change Regulations legally mandate the creation of the Municipal Climate Change Fund and require the Finance Secretariat to allocate specific annual resources in the expenditure budget for climate action. The Resilience Plan proposes the creation of a bank of resilient projects with cost-benefit analyses to attract private investment and international funds (such as the GEF and UNEP), in addition to establishing "earmarkable resources" exclusively for resilience. However, neither of these is specifically targeted to heat stress.

References

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Montevideo, Uruguay

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Montevideo, Uruguay
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Heat wave risk is acknowledged and analysed but mostly in scientific publication and in a very limited form in policy documents, with the climate plan of the Metropolitan Region of Uruguay seemingly having the most advanced analysis among policy documents, while others seem to mostly limit to acknowledge relatively high incidence/moderate risk with low detail in assessment and apparent lack of sufficient data (in fact, the need for more research is acknowledged explicitly). No clearly distinguished analysis of different types of heat risk is present.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Specific analysis exists in scientific literature with good level of detail but more limited in public planning. Analysis of general drivers of vulnerability and risk exists but not specific to heat risks.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	There are projections of increase in temperature in general, and in the climate plan of the metropolitan region of Uruguay there are some scenarios of temperature but

Assessment score:	2
	not specific to different heat risks and for all kinds of heat risk nor with a diversity of scenarios.

---

2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	There is a National Adaptation Plan for cities, which mentions heatwaves among other risks, but not dedicated, and it is not dedicated to Montevideo specifically (although, this being the largest city in Uruguay, clearly it is mentioned). Heat risk is barely mentioned in other policy instruments related to risk management or resilience.

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	There are short- to long-term goals in risk, resilience and adaptation planning in general, but none are specific to heat risk.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	There are strong stakeholder mechanism in place for the National Adaptation Plan on Cities AND for Montevideo specifically (for the resilience plan), but none are specific to heat.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	No specific action was identified addressing specifically heat risk.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	No action was identified addressing specific drivers of risk, although there are actions addressing more general drivers of climate vulnerability.

3.3 Are identified actions being implemented?

Assessment score:	0
Rationale:	No information was available on the implementation of actions, and since no specific actions on risk even appear in public planning, it is unlikely that much implementation has occurred.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Some studies address potential costs or benefits of potential heat adaptation options (such as green infrastructure) but not in a systematic and comprehensive manner or with clear uptake in policy instruments.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No explicit consideration of synergies and trade-offs between heat adaptation options was identified in public policy instruments.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No specific heat adaptation options were identified in public planning, so no pathway-based planning exists on the matter.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	Very little space was apparent in analysed policy instruments on Monitoring & Evaluation and none specific of heat risk management.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence was found.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No mention to maladaptation risk related to heat was found.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	There are governance structures in place or being reinforced for climate management and risk disaster reduction at the country, regional and city level, but none explicitly dedicated to heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	There seems to be some technical expertise in heat risk, enough to prepare analysis for the plans, but there does not seem to be much explicitly dedicated expertise to risk at least in public policy and planning.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There are funding mechanisms mentioned in policy documents for climate management and risk disaster reduction at the country, regional and city level, but none explicitly dedicated to heat.

References

Ministerio de Vivienda y Ordenamiento Territorial, Ministerio de Ambiente, & Programa de las Naciones Unidas para el Desarrollo. (2021). *Plan nacional de adaptación al cambio climático y variabilidad para ciudades e infraestructuras en Uruguay (NAP-Ciudades) – Resumen ejecutivo* [PDF]. https://unfccc.int/sites/default/files/resource/NAP_Cities_and_Infrastructure__Uruguay_Executive_Summary_ENG.pdf

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United Nations Development Programme. (2020, October 28). *How Uruguay is advancing its National Adaptation Plan across cities through adaptive solutions and education*. *Adaptation-UNDP*. https://www.adaptation-undp.org/how-uruguay-advancing-its-national-adaptation-plan-across-cities-through-adaptive-solutions-and

Scoring sheet

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City case study:	Montevideo, Uruguay
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Sources identify heatwaves as a significant impact for the city, especially the scientific article. An increase in the intensity, frequency, and duration of these extreme events is recognized, directly linking them to the urban heat island effect. Additionally, specific studies at the local scale have been conducted to analyze thermal risk using indices such as the UHRI (Urban Heat Risk Index) applied at the census tract level. The Montevideo Action Plan focuses on the increase in temperature at the mesoscale.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Montevideo has mapped social vulnerability using the Unsatisfied Basic Needs (UBN) Index, identifying that the most vulnerable population is concentrated in unestablished areas and stream basins. Scientific studies integrate environmental variables such as land surface temperature (LST), the built-up index (NDBI), and vegetation (NDVI) to determine which areas of the city are most exposed. It is recognized that the lack of green infrastructure and urban density are key drivers of exposure.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	The Climate Action Plan (CAP) and the NAP Cities present projections based on IPCC scenarios (SSP2-4.5 and SSP5-8.5) for near-term (2020-2044) and long-term (2075-2099) horizons. An increase in average temperature is projected across all seasons, along with up to a 150% increase in the number and duration of heatwaves by the end of the century.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Although there is no single, exclusive document on heat, adaptation to this phenomenon is a central and detailed focus in both the Resilience Strategy and Montevideo's Climate Action Plan (PAC). The PAC includes the strategic axis "Resilient Montevideo," with specific targets for infrastructure and health in response to thermal climate risks. The plan is formally adopted and aligned with international commitments to neutrality and resilience.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	The PAC establishes a clear structure with defined goals and milestones for the years 2025 (short term), 2030 (medium term), and the 2040s decade (long term). For example, it proposes a 30% increase in urban trees by 2030 and a 50% increase by 2040 as a measure of thermal mitigation and adaptation.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Montevideo uses innovative tools such as the digital platform "Montevideo Decide" for citizens to propose and influence climate actions. The "MVD Lab" has also been implemented, which are co-creation and experimentation spaces to seek citizen solutions to resilience challenges. The process of developing the plans included participatory workshops with various public, private, and civil society actors.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple solutions have been identified, including blue-green infrastructure, sustainable drainage systems, and urban tree planting plans to regulate temperature. The PAC outlines action lines to adapt infrastructure and buildings with an approach focused on reducing climate risks.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	The plans include some actions, such as comprehensive habitat improvement, and promote nature-based solutions for urban regeneration in areas of high vulnerability and informal settlements.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Many on-site or structural thermal adaptation actions are still in the planning phase or in the development of technical guidelines

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	The PAC foresees the implementation of a system of indicators to measure impact and results, but the detailed cost-benefit analysis is mentioned as a task for the implementation phase started in 2023. The NAP Cities includes cost-benefit analysis as a guiding principle, but its extensive application in Montevideo remains an area of research.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Sources acknowledge the need to seek synergies between adaptation and mitigation (co-benefits), as in the case of urban trees. However, a systematic and science-based assessment of trade-offs over different time horizons is not thoroughly documented in the sources.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The PAC proposes sequenced goals for 2025, 2030, and 2040, which indicates a trajectory design. However, the integration of these options into a flexible 'local adaptation pathway' with regular update mechanisms is still in the process of being institutionalized.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The PAC Montevideo explicitly establishes a monitoring strategy that includes the creation of an indicator system in 2023. Annual progress reports are planned, as well as a full evaluation and update of the plan every 5 years; however, there is still no evidence of this.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Preliminary metrics are available for tracking results, such as the percentage of homes in informal settlements or the area of new public spaces. However, quantitative evidence of an effective reduction in thermal risk due to the actions already implemented is limited in current sources.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	The documents mention the goal of avoiding maladaptation through the use of common conceptual frameworks and institutional guidelines. However, no case studies or documentary evidence are presented that reliably show that the actions have reduced this specific risk.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Montevideo has institutionalized the Executive Resilience Unit (UER) and has a Chief

Assessment score:	2
	Resilience Officer (CRO) with the authority to coordinate these policies. In addition, there is the Departmental Climate Change Working Group (GTCCD) that brings together technicians from various departments of the Municipality in a cross-cutting manner.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	The city collaborates closely with the University of the Republic (Udelar) and international technical consultancies such as Arup for the design of its strategies. The PAC clearly identifies the departments responsible for each line of action, ensuring that technical knowledge is integrated into decision-making.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Montevideo uses its own budgetary funds and accesses international financing, such as the Green Climate Fund, through the NAP Cities project. Specific financial instruments are being developed to promote adaptation projects, and the foundation for a Climate Emergency Fund has been designed.

References

Ministerio de Vivienda y Ordenamiento Territorial, Ministerio de Ambiente, & Programa de las Naciones Unidas para el Desarrollo. (2021). *Plan nacional de adaptación al cambio climático y variabilidad para ciudades e infraestructuras en Uruguay (NAP-Ciudades) – Resumen ejecutivo* [PDF]. https://unfccc.int/sites/default/files/resource/NAP_Cities_and_Infrastructure_Uruguay_Executive_Summary_ENG.pdf

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Santiago, Chile

Scoring sheet

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City case study:	Santiago, Chile
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Yes but not at a neighbourhood level yet. There is a pilot doing so for the Renca municipality but its scaling up for the entire city is still in the making.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes they are at a scientific level, and in some key platforms such as the Climate Risk Atlas

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes, there is quite good projections although not under all possible scenarios.

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a Regional Adaptation Plan, which covers heat among other risks, but it is not really dedicated to this (also, the Plan has not been officially promulgated yet). There is not a 'city' plan as that. Local adaptation plans for individual municipalities within the city are being developed but only a few are completed or near completion.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Same as above, there are goals but only partially dedicated to heat.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	There are explicit community engagement mechanisms in place in the laws and in the official plans, but because of the reasons above, they are not explicitly dedicated to heat, nor to the city as a whole (but rather, at the regional and/or municipality level)

---

3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Yes, there are actions dedicated to extreme heat, some of them locally based and with contextual assessment or based on projection, but not all of them.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Mostly, the actions are only focused on impact on people's health and wellbeing.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is no full evidence on implementation, although preliminary evidence shows that at least some are being implemented.

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	They are only assessed in general terms, with no detailed or dedicated C-B analysis.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	There are preliminary studies assessing this, most of them not finalized; there is some knowledge but not complete.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There is not a really pathway-based approach, there are goals for different timelines but not necessarily sequential. There are pathway based plannings on the Long-Term Climate Strategy and Sectoral Adaptation Plan for Cities but with no specific focus on Santiago, except for some actions.

5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	The law asks for M&E but very little has been implemented so far, although some is in progress (but little evidence of how much it has advanced so far).

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	Not at the required level, most of the actions are still in progress and lack a clear outcome evaluation framework or at least it is not transparently available

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	There is no explicit tackling of maladaptation

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	There are heat governance structures at the regional level but not at the city level, in fact the regional management of the matter is one of the best in the country but there is not always a clear correspondence of this with the most local level. There is also a need for more workforce, capacities and resources.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	There is expertise but mostly in science and consultancies, not too as much in the regional or city planners as such

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The Regional Government has financing, with a prioritization on climate change but not necessarily on heat, and there lacks a more explicit local integration. Moreover, financing is in general always insufficient in these cases (and there is more funding for water than for heat in these contexts). There are some funding options for municipalities to apply (but not the metropolitan city as a whole), although mostly it is directed to communities

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Thesing, G. (2023, August 17). *From Bangkok to Buenos Aires, here’s how 12 global cities are tackling extreme heat*. *World Economic Forum*. https://www.weforum.org/stories/2023/08/extreme-heat-12-cities-respond-adaptation/

Scoring sheet

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City case study:	Santiago, Chile
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Climate Risk Atlas (Arclim - https://arclim.mma.gob.cl/), and action plans are being developed. No neighborhood scale.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Especially in scientific documents (https://doi.org/10.1016/j.jum.2024.11.003; http://dx.doi.org/10.4067/S0718-34022016000100004) and risk plans (as underlying factors) or action plans (when describing the threat). The city adaptation plan includes some factors (Plan sectorial de Mitigación del Ministerio de Vivienda y Urbanismo y Actualización del Plan de Adaptación al Cambio Climático para ciudades)

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	ARCLIM, but not at the local level, only at the commune level.

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	The city has an extreme heat protocol (PRESENTAN PROTOCOLO CALOR EXTREMO Y ALTAS TEMPERATURAS PARA RM – DGAC | Dirección General de Aeronáutica Civil). The climate change action plan has actions, but it is not exclusive to heat (PARCC-RM.pdf)

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	They exist in the regional plan, but only in the short term (5 years), as does the climate change adaptation plan for the cities sector (2025-2030).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Consultation mechanisms exist, but they are not specific to heat. Within the framework of a current regional government program, pocket forests have included community participation (https://www.gobiernosantiago.cl/gobino-de-santiago-y-cultiva-inauguran-bosque-de-bolsillo-de-crecimiento-acelerado-con-innovadora-tecnica-para-hacer-frente-al-calor-extremo/).

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Pocket forests and heat protocol, summer communication campaigns

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Actions so far have been directed mainly at the population

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	At least some actions have a strong evidence base, such as the pocket forests, which have an advisory panel made up of experts. The plans cite national and international sources.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	There is greater emphasis on benefits. Costs are analyzed in general terms, while mitigation is more important.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Pocket forests consider water consumption. The regional government is launching a new project that links health, well-being, and warmth in a platform based on CalHeatScore.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Only short time

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	This is being done with pocket forests. It's not yet a widespread practice, but there is concern about assessing the impacts of these actions.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	mainly on the basis of scientific evidence cited in the plans

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not include

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Only implemented at the regional level, responsible for extreme heat. At the commune level, environmental managers address heat adaptation.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Partial consideration, technical expertise is fragmented. There is collaboration with universities to implement studies and projects

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Regional government funds (FNDR), which prioritize climate change in one of its areas, not specifically heat. It is aimed at the community. In addition, the regional government applies for international funding and participates as an associated entity in applied research projects.

References

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São Paulo, Brazil

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	São Paulo, Brazil
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	Current and future heat wave projections and their potential impacts for the region are included but no finer spatial resolution (Cidade de SP report)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Historical vullnerability and poverty are identified as risk factors but do not include further explanation and are not identified in further detail.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	Future heat wave incidence are modeled in the city plan, but hazards, exposure, and vulnerability are not detailed and the projections lack local context

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	Mention of heat in overall adaptation planning but is vague

2.2 Is there a range of short- to long-term goals?

Assessment score:	0
Rationale:	No goals listed

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Community engagement is mentioned broadly but without any specifications and not in relation to heat risk reduction or planning

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	Expanding vegetation cover is mentioned to reduce the heat island effect but few details are provided and don’t specify chronic or acute shocks

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Again, expanding vegetation cover is mentioned to reduce the heat island effect but few details are provided and don’t specify chronic or acute shocks

3.3 Are identified actions being implemented?

Assessment score:	0
Rationale:	No indication of implementation and no evidence to verify

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No mention of being analyzed

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No mention of being assessed

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No mention

---

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring for city adaptation plan is listed as being undertaken by the “GeoEnvironmental platform, whose implementation process has been underway since October 2020.”

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence identified

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	None identified and discussed

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Some technical expertise discussed (preparation of heat projections and role in monitoring and evaluation) but not robust, specific, or ongoing

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	None listed

References

Government of the State of São Paulo. (2022). *PAC 2050* [Climate action plan]. https://smastr16.blob.core.windows.net/home/2022/11/pac-sp-2050-_coorigidoformato_23_1_12.pdf

Government of the State of São Paulo. (2021). *São Paulo state climate action plan: Guidelines and strategic actions—Rebuilding better, supporting green jobs and accelerating solutions to net zero emissions – Net Zero 2050* [Climate action plan]. https://smastr16.blob.core.windows.net/home/2021/10/cop26_english.pdf

Municipality of São Paulo. (2021). *PlanClima São Paulo: Executive summary* [Draft climate action plan]. https://drive.prefeitura.sp.gov.br/cidade/secretarias/upload/governo/secretaria_executiva_de_mudancas_climaticas/arquivos/planclimasp/Sao%20Paulo_PlanClima_Executive%20Summary_ENG_INTERNAL%20DRAFT_20210407%20(2).pdf

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Scoring sheet

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City case study:	São Paulo, Brazil
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Scope: identify rising temperature and heat wave as main climate threats and discuss both chronic and acute stress Scale: local and high how head island amplifies heat wave and a 10C temperature difference base on location Dimensions: some complication. Heat risks are framed as interacting with urbanization pattens

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Scope: include people's exposure due to poverty and inequality Scale: discuss neighborhood pattern drivers Dimensions: there is some work that is developing spatial data showing differing risk levels in under-invested areas and urban outskirts (Munoz et al., 2025)

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Scope: reports projected more intense heat events and 2 - 3 C average warming by

Assessment score:	3
	end of the century. Address both chronic and acute stressors Scale: local scale map for 2030 and 2050 Dimensions: there is some scenario depth, but limitation analysis

---

2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	No dedicated heat plan, though it is embedded in the climate action plan

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	General climate goals exist but are limited in measurability and are not heat-specific.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Governing bodies exist, but not heat specific. There are some evidence of institutional structure for climate policy but do not show participatory heat-related stakeholder engagement at the local scale

---

3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Scope: identify multiple actions such as nature-based cooling, changing the built environment (albedo strategies), and emergency response for acute heat stress. Scale: discuss these action at the local scale Dimensions: limited future coverage

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Multiple actions, but partial linkage to root causes and limited detail in local actions. Some discussion of social vulnerability around emergency response.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Some verified sources that describe the measure abound tents, hydration services (https://agenciabrasil.ebc.com.br/geral/noticia/2023-11/prefeitura-de-sao-paulo-remonta-tendas-para-dias-de-alta-temperatura). Very little discussion of maladaptation potential

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No city specific cost benefit analysis for heat option

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No assessment of tradeoff is found

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	No discussion of pathway based approach

---

5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	While there is a Sao Paulo-specific climate emergency center (CGE) (https://prefeitura.sp.gov.br/web/secretaria_executiva_de_mudancas_climaticas/w/3

Assessment score:	1
	18145), it is not monitoring adaptation actions

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	While there is evidence to suggest response capacity during heat events, there is no data available to quantify risk reduction

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	The city contains some level of coordination and public dissemination of weather information

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	CGE's mandate and operation suggest there is technical capacity, but it might not be accessible

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Funding is identified but not established

References

Government of the State of São Paulo. (2022). *PAC 2050* [Climate action plan].
https://smastr16.blob.core.windows.net/home/2022/11/pac-sp-2050-_coorigidoformato_23_1_12.pdf

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Municipality of São Paulo. (2021). *PlanClima São Paulo: Executive summary* [Draft climate action plan]. https://drive.prefeitura.sp.gov.br/cidade/secretarias/upload/governo/secretaria_executiva_de_mudancas_climaticas/arquivos/planclimasp/Sao%20Paulo_PlanClima_Executive%20Summary_ENG_INTERNAL%20DRAFT_20210407%20(2).pdf

Muñoz, L. S., Duarte, D. H. S., & Emmanuel, R. (2025). Heat risk in the city of São Paulo: Interactions between SUHI and social inequality. *Urban Climate, 63*, 102568. https://doi.org/10.1016/j.uclim.2025.102568

Government of Brazil, Ministry of the Environment. (2016). *National adaptation plan to climate change (NAP)* [National adaptation plan]. United Nations Framework Convention on Climate Change (UNFCCC). https://unfccc.int/documents/302142

Amsterdam, Netherlands

Scoring sheet

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City case study:	Amsterdam, Netherlands
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The heat plan 2024 focuses on acute heat events through risk communication. A heat stress map for Amsterdam exists with detailed information available at neighbourhood level, but limited attention and understanding for chronic heat stress.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	There is an increasing knowledge of factors of heat vulnerability resulting in more integrated vulnerability assessments of people at neighbourhood level and identification of vulnerable population groups (e.g. social vulnerability maps). Vulnerabilities of infrastructure and ecosystems are not yet assessed (as is also acknowledged in the Amsterdam heatplan of 2024).

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	The KNMI and the Climate Adaptation Service platform offer future scenarios based on several dimensions of heat vulnerability but lack detailed data at the local (neighbourhood) level.

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a dedicated heat adaptation plan (2024) which is yearly reviewed and adapted. The plan clearly describes who does what in different stages of heat adaptation (prevention, preparation, prewarning and warning) but it focuses on communication for behavioural change. Limited attention for heat adaptation of houses and the built environment, although there is some attention for goals on heat adaptation of the built environment in Uitvoeringsagenda Klimaatadaptatie - openresearch.amsterdam.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	There is an overall goal to make Amsterdam heat resilient by 2050. The heat plan Amsterdam 2024 contains short-term goals and actions focusing on communication and behavioural adaptation. The Amsterdam climate adaptation strategy (2020) and Implementation agenda Uitvoeringsagenda Klimaatadaptatie - openresearch.amsterdam contain mostly short term goals and states what is still lacking.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The Amsterdam heatplan 2024 is co-created and yearly updated with relevant professional stakeholders but no direct involvement of citizens and community groups. The Amsterdam adaptation strategy 2020 mentions that the city aims to discuss climate adaptation in ongoing city talks with citizens and businesses but remains vague how and to what extent they will be involved.

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	The heatplan 2024 focuses on communication to stimulate behavioural adaptation to heat (acute heat shocks). The Amsterdam Adaptation Strategy (2020) and Implementation Plan (2021) contain actions in the built environment to address

Assessment score:	2
	chronic heat stress. Reference is made to a.o. Nature based solutions, a heat and drought plan for urban green and hard infrastructures,

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Multiple actions are identified for people, infrastructure, and ecosystems although they are generally referred to as health, housing, habitat, but there is limited consideration of root causes or future changes. Citizens are encouraged to remove tiles from their gardens through the Amsterdam Rainproof program. Also there seems to be limited attention to actions for specific vulnerabilities or vulnerable groups other than in the short term through risk communication.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	Action(s) are implemented but seem to focus mainly on heat risk/stress communication (acute heat events) and ‘easy’ wins such as campaigns to encourage citizens to green their gardens (remove tiles). There seems to be limited attention for specific vulnerable groups when it comes to chronic heat stress and potential maladaptation risks are not considered.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	The assessed documents (heat plan 2024 or in the adaptation strategy 2020) do not mention specific costs or benefits of heat adaptation options or the use of a cost-benefit analysis to select specific options. Furthermore, there is no mention of specific options being targeted to benefit explicit vulnerable groups (so limited attention to climate justice).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	The assessed documents (heat plan 2024 or in the adaptation strategy 2020) do not mention synergies and trade-offs. The Amsterdam adaptation strategy mentions that adaptation should be structurally integrated into ongoing activities in area development and area management, but does not further specify.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	(Heat) Adaptation options are being integrated as much as possible into other policy domains but the assessed documents do not show that this is done in a sequenced pathway approach.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The Amsterdam heat plan 2024 mentions a yearly cycle of monitoring and evaluation through interviews and surveys among the professional stakeholders, but as mentioned before the heat plan is focused on acute heat events. There is no evidence of systematic monitoring and evaluations in the other dimensions (housing, habitat) to address chronic heat stress.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	The assessed plans do not mention the (potential) impacts of their goals/activities. As far as I know there is no scientific study/evidence that assesses the effectiveness of heat plans/actions in reducing heat risks.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	The assessed plans do not mention maladaptation risks or how they can be reduced.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Heat governance structures are identified but are still in early development. The heat plan 2024 does mention clear roles and responsibilities for each stage but this is

Assessment score:	2
	limited to risk communication regarding acute heat events. There is a dedicated adaptation policy advisor who coordinates the preparations and communications for heat events. It is unclear how other dimensions for chronic heat stress (e.g. ecosystems, infrastructure, in the Dutch context referred to mostly as housing and habitat) are governed. These dimensions are mostly addressed through integration of adaptation in other domains of public policy, supported by adaptation policy advisors.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	As far as I know technical expertise is mainly offered through the national Climate Adaptation Services agency and portal Home - Climate Adaptation Platform Netherlands. Furthermore, consultancy firms are regularly hired for conducting (heat) stress tests for specific localities, so most likely the city of Amsterdam has also performed such local tests (with or without external experts).

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Dedicated funding for heat vulnerability (and adaptation) is available through subsidies and research grants, but more systematic and long-term funding is absent.

References

https://openresearch.amsterdam/nl/pdf/viewer?file=%2Fimage%2F2024%2F6%2F24%2Fagenda_klimaatadaptie_2024_2026.pdf

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Scoring sheet

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City case study:	Amsterdam, Netherlands
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Heat stress and heat shocks are identified [hitte stress en hitte golf]. The adaptation plan opens with a heat risk map at the neighbourhood level. Amsterdam has identified a long-term trend where the average number of summer days is projected to increase from 20 to approximately 40 days by 2085.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The drivers of heat exposure and vulnerability are well documented through climate stress tests and risk maps, in the heat plan and the city's 2020 Adaptation Strategy. Drivers are categorised into physical factors and social or building-related factors that reduce a person's ability to cope with that heat. The heat action plan links to an online mindmap that offers access to underlying info and data, often referring to the Dutch klimaatatlas Home - Klimaateffectatlas (that is: not strictly city scale, yet zoomable for Amsterdam). City maps can be found here https://maps.amsterdam.nl/klimaatadaptatie/ (less info layers)

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Heat risks are projected with an emphasis on hazard. For a selection of drivers (1.2) projections are available too.

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Heat Plan and adaptation plan exist. Together they form a comprehensive set. There are dedicated info sheets for specific vulnerable groups such as homeless people. https://openresearch.amsterdam/image/2025/5/26/zomer_hitte_regeling_daklozen-882185176.pdf

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Long-term goals are in the adaptation strategy (more than heat). The heat plan is more operational for during a heat event. The adaptation plan has 2050 as horizon. Plans are monitored and regularly updated (in potential annual for the heat plan, although i could not find a new version for 2025).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	In particular the implementation of the heat plan is comprehensive in its engagement with many organizations identified and detailed info material made available for diverse stakeholder groups.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	The adaptation strategy and heat plan identify actions. The adaptation strategy is operationalised in an implementation plan https://openresearch.amsterdam/nl/page/70325/uitvoeringsagenda-klimaatadaptatie And an adaptation agenda

Assessment score:	4
	https://openresearch.amsterdam/nl/media/inline/2024/6/24/agenda_klimaatadaptie_2024_2026.pdf [note: below i include if the above 2 docs are the source rather than the heat plan and the adaptation strategy]

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The mindmap in the plan has inspired actions. The implementation plan is detailed.

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	Iteration, monitoring, evaluation and learning are made very explicit. The plans acknowledge updates may be needed and it needs to be assessed what works and doesn't work. Maladaptation is not explicitly used as a concept. "We zullen regelmatig onze plannen en opgaven actualiseren als het gaat om klimaatstress, welke activiteiten we hebben uitgevoerd en welke effecten deze maatregelen hebben. Dit kan ook betekenen dat we de planning of aanpak moeten aanpassen of bijsturen. Dit is het 'iteratieve proces' dat in de Strategie Klimaatadaptatie (2020) is geïntroduceerd" "een iteratief proces waarin we elk jaar meer kennis vergaren over wat wel en niet werkt"

---

4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Cost and benefits are identified. This is explicitly planned for the coming years to be done in more detail. [source: implementation agenda]

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Hard to score. Synergies and trade-offs are acknowledged. Assessment is identified as future work, called 'meekoppelkansen' and "Verbanden onderzoeken tussen hitteproblematiek en de problematiek vanuit de andere thema's (droogte, wateroverlast en overstromingen). Op basis daarvan prioriteiten en knelpunten bepalen en oplossen;"

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	There is a clear sequential approach, with ample attention to flexibility. Pathways are not explicitly mentioned.

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5. Monitoring and evaluation

Confidence score:	4

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluation processes are comprehensively implemented. MEL is in place at least on paper. The plans are new and implementation are very recent. Evidence of MEL is limited.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Plans are recent. There is attention to what has worked before. In particular for urban heat island. Monitoring has been undertaken in separate studies, incl of past activities. The evidence remains scattered. An online platform is pilotted https://experience.arcgis.com/experience/aec3fc23a4134a3da32c7cb2cf3b66da

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Awareness exists. Evidence in targeted studies. Particularly for tradeoffs with water security (droughts and floods) awareness is high, possibly with a bias to synergies.

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6. Heat governance

Confidence score:	4

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	Particularly for heatwaves, governance arrangements are detailed in the heat action plan(s), incl details information for specific actor groups. Actions are included for social groups (e.g. elderly, homeless, home owners [https://klimaatadaptatienederland.nl/en/tools/all-tools/heat-home-fact-sheets/]) as

Assessment score:	4
	well as infrastructure (eg cooling bridges)

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Comprehensive knowledge infrastructure is setup at different governance actors, with involvement of knowledge institutions in dedicated programs. Knowledge is expected to build up in coming years, incl in a dedicated online platform https://experience.arcgis.com/experience/aec3fc23a4134a3da32c7cb2cf3b66da Example of targeted involvement of knowledge institutions: https://www.hva.nl/onderzoek/lectoraten/klimaatbestendige-stad

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Already allocation is quite well organised. Improving the allocation of part of the adaptation strategy for all adaptation domains, incl heat.

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implementation plan. https://openresearch.amsterdam/nl/page/70325/uitvoeringsagenda-klimaatadaptatie

adaptation agenda.
https://openresearch.amsterdam/nl/media/inline/2024/6/24/agenda_klimaatadaptie_2024_2026.pdf

Example for homeless people.
https://openresearch.amsterdam/image/2025/5/26/zomer_hitte_regeling_daklozen-882185176.pdf

Athens, Greece

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Athens, Greece
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Current heat hazards are comprehensively identified in Athens, covering both chronic heat stress and acute heat shocks. The Athens Resilience Strategy documents long-term trends of rising summer temperatures and the urban heat island effect of up to 10 °C between center and suburbs (City of Athens, 2017), while the Climate Chance Case Study reports a 5.2% mortality increase per +1 °C above 31.5 °C (Climate Chance Observatory; C40. 2022). Acute events are detailed, including the 1987 lethal heatwave (≈2,000 deaths) (City of Athens, 2017) and the 2021 extreme heatwave described as Greece's worst in three decades: 45 °C in Athens, 140+ wildfires burning 125,000 ha, and over 2,300 excess deaths nationally (1,400 in a single week) (World Bank, 2021). Local vulnerability mapping further links heat exposure with demographics, green space, and income (World Bank, 2021). Direct impacts across health, activity, and infrastructure, including mortality, energy demand, pollution, productivity loss, floods, and wildfires, are explicitly recognized (City of Athens, 2017; World Bank, 2021). With Athens also integrating meteorological and mortality data into a heatwave categorization and early warning system, the identification of hazards is detailed, multidimensional, and at the neighbourhood scale.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	The drivers of heat exposure and vulnerability are comprehensively identified in

Assessment score:	4
	Athens, spanning people, infrastructure, and ecosystems. Physical drivers include the urban heat island effect of up to 10 °C, caused by dense, low-quality urban fabric, impermeable surfaces, and scarce vegetation (City of Athens, 2017; World Bank, 2021), with asphalt and cement trapping and releasing heat further emphasized (Eurocities, n.d.). Social drivers of vulnerability are detailed through neighborhood-level mapping correlating land surface temperature with income, children, and green space distribution (World Bank, 2021), and through recognition of aging, poverty, unemployment, and at-risk groups such as homeless people, migrants, and refugees (City of Athens, 2017). Infrastructural drivers include aging, poorly insulated housing stock, car-dominated public space, and reliance on air conditioning and vehicles that increase ambient heat (City of Athens, 2017; World Bank, 2021). Finally, reports also warn that Athens' dense urban core with limited parks and tree canopy exacerbates exposure and could make central areas 15 °C hotter than rural surroundings by 2050 (One Billion Resilient, n.d.). This combination of geospatial data, socioeconomic analysis, and physical-infrastructure insights provides a detailed, neighborhood-scale picture of risk drivers.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Athens provides quantified and locally relevant projections of future heat risks, addressing both chronic heat stress and acute shocks, but these do not extend to a variety of detailed scenarios. The Athens Resilience Strategy projects average summer temperature increases of +2 °C by 2021–2050 and +4 °C by 2071–2100, alongside more frequent and intense heatwaves, flash floods, and an urban heat island effect of up to 10 °C (City of Athens, 2017). The Building Urban Heat Resilience case study adds that by 2050 Athens will face double the number of heatwave days (an extra 15–20 annually) and 12% less rainfall (World Bank, 2021). Projections are also linked to health outcomes through the heatwave categorization methodology, which draws on 30 years of mortality and meteorological data to forecast health risks (World Bank, 2021). These projections demonstrate local-scale relevance and some depth by covering hazards, exposure, and vulnerability. However, they are based on a single trajectory of climate change and do not include multiple scenarios, socioeconomic pathways, or systematic assessments of interconnections such as water and energy trade-offs.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Athens has a dedicated and formally adopted heat adaptation plan, but the absence of a dedicated and sustainable budget limits it from reaching the highest score. The Athens Resilience Strategy 2030 integrates heat risks into its Climate Change Adaptation Action Plan, setting priorities for green infrastructure, public health

Assessment score:	3
	protection, and awareness campaigns (City of Athens, 2017). Building on this, the city launched the Athens Heat Action Plan (2021) with the Arsht-Rock Resilience Center, overseen by the Chief Heat Officer, and structured around Awareness, Preparedness, and Redesign. The plan includes concrete measures such as heatwave categorization, early warning systems, cooling centers, buddy systems, reflective surfaces, and aqueduct-based irrigation pilots (World Bank, 2021; Wallace, 2023). These elements demonstrate institutionalization, local relevance, and implementation mechanisms. However, while Athens has mobilized project-based financing, including a €55m European Investment Bank loan supporting green corridors and sustainable water management (World Bank, 2021), there is no evidence of a dedicated, recurring municipal budget line for heat adaptation. Instead, funding depends on external grants and project-based loans, raising concerns about long-term financial sustainability.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Athens has defined a broad set of adaptation goals that span from immediate to long-term horizons, but these are not formally framed as short-term, medium-term, and long-term targets. The Athens Resilience Strategy 2030 identifies measures that are already underway, such as cooling centers, water fountains, and public awareness campaigns, alongside goals that require further development like pocket parks, vertical gardens, and bioclimatic street design, and long-term projects such as the Double Development (City of Athens, 2017). The Athens Heat Action Plan reinforces this mix by pairing immediate health protection measures, including alerts and a hotline, with infrastructure upgrades and future-oriented redesign efforts like aqueduct irrigation and green corridors (World Bank, 2021). More recent initiatives describe pilots such as pocket parks, reflective surfaces, and redesigned squares while signaling longer-term redesign of urban spaces (One Billion Resilient, 2023). This shows that Athens' goals cover multiple time horizons and are relevant to the local context, yet the sequencing is implied rather than explicit, and targets are not consistently measurable.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Athens has established stakeholder and community engagement mechanisms that are locally relevant and participatory, though not fully embedded in heat-specific planning. The Athens Resilience Strategy 2030 was developed through an inclusive process involving over 140 organizations and 900 citizens in 40 workshops, conferences, and public events, supported by focus groups with experts, community leaders, migrants, and homeless residents to co-design resilience priorities (City of Athens, 2017). This reflects substantial consultation and collaboration in shaping the city's resilience and adaptation agenda. However, there is limited evidence that heat-focused adaptation planning has been developed through equally deep and iterative co-production with communities, which suggests a moderate level of engagement.

3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Athens has identified a wide variety of actions to address both acute heat shocks and chronic heat stress, including preparedness measures like early warning systems, alerts, hotlines, and cooling centers, as well as longer-term redesign and nature-based solutions such as green corridors, reflective surfaces, and aqueduct irrigation (City of Athens, 2017; World Bank, 2021; One Billion Resilient, 2023). These actions are locally relevant and demonstrate some consideration of future hotter conditions through urban redesign and water management initiatives. However, they are not explicitly linked to detailed climate scenarios, and there is no assessment of maladaptation risks or trade-offs such as water use during droughts.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Athens has introduced multiple actions that address the drivers of heat exposure and vulnerability across people, infrastructure, and ecosystems, though the treatment of root causes and future changes is only partial. The Athens Resilience Strategy 2030 identifies vulnerabilities such as high density, limited green space, aging building stock, poverty, unemployment, migrants, and homeless populations (City of Athens, 2017). Actions proposed include expanding green infrastructure through green corridors, pocket parks, vertical gardens, and blue corridors; bioclimatic street design and regulation of cool materials to mitigate dense urban heat; and public health measures like cooling centers, water fountains, and awareness campaigns targeting vulnerable groups (City of Athens, 2017). The Building Urban Heat Resilience case study highlights the use of geospatial mapping that correlates land surface temperature with income, children, and green cover to prioritize interventions (World Bank, 2021). More recent initiatives described in One Billion Resilient include pocket parks, whitewashing, redesigned squares, and aqueduct-based irrigation systems as measures to cool dense neighborhoods and expand access to shade (One Billion Resilient, 2023). These actions clearly address drivers within human and natural systems at the local scale, but root socio-economic drivers (e.g., poverty, unemployment, aging) are acknowledged more than they are directly acted upon, and actions are not systematically tied to future vulnerability scenarios. For this reason, Athens aligns best with score 3.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Athens has moved beyond planning and pilots to implement a growing range of heat adaptation actions, although full-scale delivery is still in progress. Preparedness measures are well established, including the heatwave categorization system, early warning protocols, the EXTREMA app, cooling centers, and heat alerts and hotlines (World Bank, 2021). On the infrastructure side, the city has begun to realize longer-term redesign initiatives. The revival of Hadrian's Aqueduct is underway, with

Assessment score:	3
	Athens and its water utility using the historic network to supply non-potable water for irrigation and cooling (World Bank, 2021; Athens-Macedonian News Agency, 2023). In 2024, the city launched the EU-funded “Cooling Havens” program, backed by €6.25 million to construct seven neighborhood cooling stations powered by water and shading, running through 2028 (European Urban Initiative, 2024). Likewise, the Double Regeneration in Votanikos, including a major new park, has advanced with permits secured and construction preparations underway (Kathimerini, 2023; Greek Reporter, 2023). Localized pilots such as pocket parks, whitewashing, and redesigned squares with shading and misting systems are also in operation (One Billion Resilient, 2023). This evidence demonstrates that Athens is delivering a mix of preparedness measures, nature-based pilots, and larger-scale projects with secured funding and construction underway. While many transformative interventions are still in progress and not yet citywide, implementation has clearly advanced beyond early-stage pilots.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Athens mentions funding sources for adaptation measures but does not provide systematic cost–benefit analyses. The Athens Resilience Strategy identifies potential financing mechanisms including municipal budgets, EU structural funds, European Investment Bank loans, and private sector contributions (City of Athens, 2017). The Building Urban Heat Resilience case study confirms that a €55 million loan from the EIB supported three green corridors and sustainable water management at Lycabettus Hill (World Bank, 2021). These references demonstrate that financing is considered in economic terms. However, the documents do not include comparative analysis of costs and benefits, nor do they assess non-economic outcomes such as health, quality of life, or productivity. There is also no evidence of evaluating potential maladaptation risks in financial terms. This means that Athens notes funding availability but does not analyze costs and benefits in detail, which corresponds to a score of 1.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	The reviewed documents show some acknowledgement of synergies across Athens’ heat adaptation actions, but they stop short of detailed assessments. The Building Urban Heat Resilience case study highlights that nature-based solutions provide a “resilience dividend” with multiple co-benefits, such as cooling, biodiversity, recreation, and water management (World Bank, 2021). The Athens Resilience Strategy also describes how green corridors, shading, and water elements jointly improve air circulation, reduce heat stress, and enhance quality of life (City of

Assessment score:	1
	Athens, 2017 Athens Resilience Strategy). However, trade-offs and potential maladaptation risks are not explicitly analyzed. For example, measures that depend on water reuse (Hadrian's Aqueduct irrigation, sewage mining) are presented as solutions, but the risks of competing water demands under future drought scenarios are not discussed. Nor are timeframes (short-, medium-, long-term synergies or trade-offs) systematically assessed.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Athens has organized its heat adaptation actions into structured frameworks but does not present them as part of an explicit pathway-based approach. The Athens Resilience Strategy 2030 and the Athens Heat Action Plan group actions under themes such as green infrastructure, built environment, public health, awareness, and the pillars of Awareness, Preparedness, and Redesign (City of Athens, 2017; World Bank, 2021). Some measures are clearly immediate, such as cooling centers and heat alerts, while others are longer-term, such as aqueduct irrigation and large-scale regeneration projects. However, these time horizons are implied rather than explicitly framed as short-, medium-, and long-term targets, and there is no indication of a sequenced or iterative pathway with regular review. Nor are costs, benefits, synergies, or trade-offs integrated into planning. For this reason Athens aligns with score 2, reflecting partial organization within a pathway-like framework but not a comprehensive pathway approach.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Athens has identified monitoring and evaluation (M&E) mechanisms for adaptation, but evidence of systematic implementation is limited. The Athens Resilience Strategy 2030 commits to tracking actions through performance indicators and KPIs, integrated with SDG indicators and linked to municipal planning cycles (City of Athens, 2017). It also mentions producing regular evaluation reports and corrective action plans. These provisions show that M&E is structurally embedded in the strategy. However, the reviewed sources provide little concrete evidence that targets are being measured or that results are used for course correction. The Building Urban Heat Resilience report and subsequent accounts (World Bank, 2021; One Billion Resilient, 2023) emphasize implementation of specific measures but do not describe how progress is systematically monitored. This indicates that Athens has partially implemented M&E processes, but with weak evidence of measurability, target tracking, or feedback loops in practice.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	While Athens has introduced measures such as early warning systems, cooling centers, the EXTREMA app, and green interventions, there is little evidence that these actions have measurably reduced heat risk. The Building Urban Heat Resilience report notes that a categorization methodology linking heat and mortality has been piloted, but also stresses that deaths, illnesses, and injuries from heat are massively under-recorded, leaving effectiveness undocumented (World Bank, 2021). The Athens Resilience Strategy outlines adaptation actions but does not provide outcome data (City of Athens, 2017). International cases (e.g., Medellín, Paris) are cited as proof of concept, but not for Athens itself. This means evidence is limited, indirect, and not locally verified.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	The reviewed sources do not provide evidence that Athens' adaptation plans or actions explicitly monitor or reduce maladaptation risks. While many measures, such as green corridors, reuse of Hadrian's Aqueduct water, and mobile sewage mining for irrigation, are framed as sustainable and circular water solutions (World Bank, 2021), there is no evaluation of potential trade-offs (e.g., water competition during droughts, energy demand from cooling technologies, or unintended social inequities). The reports themselves acknowledge gaps in evaluation and impacts, noting the absence of institutionalized monitoring frameworks (World Bank, 2021). Similarly, the Athens Resilience Strategy and related documents outline multiple projects but do not analyze risks of maladaptation or set targets to avoid them (City of Athens, 2017). In short, Athens has no documented evidence that its actions avoid creating new risks.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Athens has established dedicated governance structures for heat that are both institutionalized and locally relevant. In 2021, in partnership with the Arsht-Rock Resilience Center, the city appointed Europe's first Chief Heat Officer (CHO), reporting directly to the Mayor and tasked with coordinating citywide heat resilience (World Bank, 2021; One Billion Resilient, 2023). The CHO role is formally embedded in municipal governance, giving it authority to design and oversee adaptation measures across departments while coordinating with health, social services, infrastructure, and civil society partners. This builds on earlier governance structures such as the Chief Resilience Officer (CRO) and the Office of Resilience and Sustainability, created under the 100 Resilient Cities initiative to deliver the Athens Resilience Strategy and its Climate Change Adaptation Action Plan (City of Athens, 2017). Together, these roles demonstrate that Athens has institutionalized responsibilities, decision-making authority, and cross-departmental connectivity for

Assessment score:	3
	heat adaptation.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Athens has built significant technical expertise for heat adaptation, though capacity gaps remain. The Athens Resilience Strategy highlights partnerships with the National Observatory of Athens, and universities to support data-driven policymaking and scenario-based planning (City of Athens, 2017). The strategy also involved expert working groups and a Resilience Steering Committee of interdisciplinary specialists guiding integration into city operations (City of Athens, 2017). The Building Urban Heat Resilience report confirms collaboration with the Arsht-Rock Resilience Center and scientific committees to design the heatwave categorization methodology, integrating climate science and public health expertise (World Bank, 2021). At the same time, the same report points to institutional capacity challenges, noting a lack of trained professionals to design and implement NbS and the need to build capacity fast (World Bank, 2021). Taken together, Athens clearly has locally relevant and accessible expertise through partnerships and embedded advisory mechanisms, but gaps in institutional staffing and long-term technical capacity prevent a comprehensive score.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Athens has secured some dedicated funding streams for heat adaptation, but long-term sustainability and adequacy remain limited. The Athens Resilience Strategy 2030 outlines multiple projects financed through municipal funds, structural funds, EU programs, and private donations (City of Athens, 2017). More significantly, Athens secured a €55 million loan from the European Investment Bank (EIB) under the “Athens Resilient City and Integrated Development” program, which financed major nature-based solutions, including three green corridors and sustainable water management on Lycabettus Hill (World Bank, 2021). These mechanisms demonstrate that dedicated financing has been mobilized. However, the Building Urban Heat Resilience report highlights persistent challenges: climate risks are not yet fully prioritized in decision-making or budgeting, and the city lacks a long-term sustainable mandate or institutionalized budget line for heat adaptation (World Bank, 2021). Funding therefore depends heavily on external sources (EU, EIB, donors) and short- to medium-term project-based allocations, rather than guaranteed, recurring municipal budgets.

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Athens, Greece
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	In general yes, with supporting data. Complex risk perspective is inadequate. Overall the document makes rich hazard identification but complex risks can have further details and data projections

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	It does well on the exposure side but the vulnerability data can be made significantly granular for both demographic groups and sectors/systems

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Yes but details are limited and scenarios are limited - broader projections are made

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	It references other documents on this subject and also has a section on CCA action plan which can be seen containing elements of a structured plan. ‘Plans of action’ are discussed pertaining to specific projects/actions. Difficult to classify this as a HAP

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Yes but these more as different project with varying timelines that can address heat stress

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Yes, in the current form (during document preparation). Future continuity of such engagements cannot be fully ascertained.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	A tricky 3 as future component is implied and at times mentioned but is not specified in several actions

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Tricky, these actions appear to be cognizant of future risks but don't necessarily consider them. Otherwise major vulnerability and exposure drives are identified and remedial measures are prescribed across systems and sectors

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	There is limited information to examine ongoing actions against criteria for further

Assessment score:	2
	scoring. Many actions are reported to be ongoing which seem verifiable through the internet (assumed).

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Limited local relevance, several such options seem planned and lack further information

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	Yes but not across all possible scenarios/actions - otherwise specific information is provided

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Yes, the actions are considered across different time scales with apparent localized actions but review and update mechanisms need further information for concrete assessment

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Tricky - need more information but the information here seems localized with review mechanisms - information on specific actions are limited which makes assessment tricky

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Too early to measure - multiple ongoing projects that may reduce heat risks are reported but actual reduction reporting in implied not evident

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Too early to measure - clear focus on reducing maladaptation but actual maladaptation reduction reporting will take time but otherwise it is partially established through careful planning and checks

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	More information needed - as this is not a dedicated HAP, it is difficult to comment on this with confidence. Heat governance here can be seen as part of larger governance structure proposed which inter alia covers heat resilience

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	More information needed - a lot of technical and scientific stakeholders and collaborations with them are mentioned but localized context/relevance for heat stress reduction is unclear

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	More information needed - overall funding can be attributed to adaptation but not necessarily only to reducing heat stress

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Barcelona, Spain

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Barcelona, Spain
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The Barcelona heat action plan 2025 is very comprehensive; it mentions diverse acute and chronic heat hazards across health, infrastructure, economy and the environment in quite detail (as far as my Spanish goes …), and also mentions and elaborates extensively on social justice explicitly.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Drivers of exposure and vulnerability are identified for people, infrastructure, and ecosystems with some consideration of underlying risk factors and data integration. There seems to be considerable attention for the locations of vulnerable groups and there are specific heat vulnerability maps including information per neighbourhood on socio-economic parameters.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	The heat plan 2025 has a temporal scale of 10 years (up to 2035). Short and longer term (10 years) goals are mentioned but future risk projections seem to be general or missing (as far as I could understand from the heat plan in Spanish). The climate

Assessment score:	3
	action plan of Barcelona does refer to and identify future heat risks specifically and in quite detail.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	There is a dedicated heat adaptation plan for the next 10 years and it contains short and medium term goals for different dimensions (health, infrastructure, buildings, vulnerable groups) and both for acute (emergency actions for intense heat) and chronic heat risks. There is also a separate municipal heat wave plan that focuses on risk communication, along the lines of the heat plan of Amsterdam.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Both short and longer term goals are mentioned in the heat plan 2025-2035 and they cover a range of dimensions, see above. The study by Berner et al (2025) indicates considerable attention for vulnerability analyses and prioritizing vulnerable groups.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The heat plan 2025-2035 mentions that the plan underwent an integral and participatory coproduction process that involved municipal departments, social agents and citizens. This participatory approach is confirmed by the synthesis of the stakeholder survey and also by the fact that ¾ of the proposals were integrated into the plan. The study by Berner et al (2025) also mentions thematic workshops for citizen participation and specific efforts to reach out to schools, communities and neighbourhood centers.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	In the heat plan 2025-2035 various different actions are proposed or already being implemented that address both acute and chronic heat stress across multiple domains. There is no indication of considerations of future changes.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	See above. I that the focus on different forms of vulnerability and different vulnerable groups is quite remarkable compared to for instance Amsterdam.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	There is some evidence that several short term actions are being/have been implemented, such as better access to parks and climate shelters. Maladaptation is addressed by piloting large scale actions before full implementation.

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	The assessed documents do not mention specific costs or benefits of heat adaptation options or the use of a cost-benefit analysis to select specific options. There is considerable attention for actions to support vulnerable groups, but it does not seem that these benefits are systematically analysed based on the documents.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies (co-benefits) are mentioned such as for instance job creation from climate (adaptation) action, heat shelters that also enhance social interactions, urban greening that also provides co-benefits. Trade-offs mentioned are increased energy demands from cooling and social inequalities from climate actions. It is unclear whether these synergies and trade-offs are systematically assessed.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	(Heat) Adaptation options are being integrated and coordinated between different

Assessment score:	1
	levels of government, but the assessed documents do not show that this is done in a sequenced pathway approach.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	The heat plan mentions both context indicators and effort indicators. For instance the percentage of actions executed are tracked, such as measuring temperature reduction in green areas and climate shelters. Specific indicators are used such as the heat-attributable mortality rates, number of heat protocol activations, number of vulnerable people contacted, number of shae elements installed and cooling devices in the city.

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	The city is using impact indicators such as the heat attributed mortality rate, green surface area and degree of shelter coverage. It is unclear how much this has reduced heat risk. It does mention that these indicators are updated annually so this means that knowledge on actual performance of the heat plan should be available (but I did not find any information/evidence of heat risk reduction).

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	It is mentioned that heat actions are piloted before full implementation, and that they are guided by scientific research. There is no information or evidence that this has reduced maladaptation.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Although there is no dedicated heat adaptation office/officer, but it is mentioned that

Assessment score:	3
	they are evaluating the creation of a chief heat officer. The Climate Change Office is responsible for driving and monitoring the city's Climate Plan, including heat adaptation. Heat adaptation actions are managed by the Urban Services and Public Space management division. For Pla Calor 2025-2035 an "impeller working group" was created, involving members from Environment, Health, Emergencies, Urban Planning, Social Rights, Districts, and other critical areas, to ensure efficient coordination and a comprehensive response to heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	It is difficult to assess this. The documents do mention for instance that research is conducted for instance on the impacts of heat adaptation actions.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The Pla Color mentions a global budget of 111 million euros for its execution, which is annually reviewed. Other budgets that are mentioned are 100 million euros for improving thermal comfort in schools; a shading program with 300.000 euros, as well as providing funds and subsidies for private actors to promote heat adaptation. However, the stakeholder analysis mentions limited resources as a key barrier to the implementation of adaptation actions.

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Scoring sheet

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City case study:	Barcelona, Spain
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Heat hazards are identified, addressing both chronic heat stress and acute heat shocks at a local scale, with some depth in complex risk perspectives and data integration. Not clear there is advanced data integration from Climate Adaptation Plan and Heat Strategy **People's health and survival:** • Heat has a direct effect on mortality, mainly on young children and elderly people. **People's quality of life and public safety:** • More discomfort due to the heat; emergency situations caused by heat waves "The main effects of climate change (more heat, less water) will also lead to changes in energy consumption patterns, with less demand for heating forecast while the demand for water and cooling could rise." In Barcelona, a heat wave is defined as a situation where maximum temperatures exceed 33.1oC for three or more consecutive days. Sustained, excessive heat leads to an increase in mortality and morbidity rates, especially among the more vulnerable groups such as the elderly, babies, people with physical or intellectual disabilities that have limited mobility or self-help, people with chronic illnesses, those who take medication that affects the central nervous system and those who live in socially precarious situations. The estimated number of deaths resulting from the 2003 heat wave was 411 (Borrell), although some studies put a higher figure: 537 (Tobias) and 665 (Martínez-Navarro, F). There have been eight heat waves in the city in the last 34 years and the most

Assessment score:	3
	vulnerable areas are concentrated in neighbourhoods nearest the Besòs sector, part of Horta and a large part of the Sants-Montjuïc district. Current: 1 heat wave every 4 years; Heat wave: when maximum temperatures exceed 33.1oC for three or more consecutive days.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Drivers of exposure and vulnerability are comprehensively identified, addressing people, infrastructure, and/or ecosystems at the neighborhood level, with detailed analysis of risk drivers and inclusion of multiple and reliable data sources “Climate change does not affect everyone in the same way. Each place has its particular social and cultural features, which are very often conditioned by their geographical and economic situation. In Barcelona’s case, some neighbourhoods (due to their location, socio-economic situation or building quality) and some people (because of their age, status or health) are more vulnerable. From a climate justice perspective, the biggest challenges that climate change will pose are an increase in the vulnerable population threatened by energy poverty, health problems linked to heat waves and the possibility of food becoming more expensive. Heat waves affect neighbourhoods differently, depending on their characteristics. In the analysis of the heat waves of 2012 and 2015, daytime temperatures were found to be highest in Les Corts, Eixample Esquerra, Nou Barris and Ciutat Vella. In contrast, the areas with the lowest temperatures were in the coastal area, specifically in Barceloneta and Poblenou, due to the thermoregulatory effect of the sea. However, at night the situation is reversed, with the highest temperatures recorded on the coast. The area showing the least variation in maximum and minimum temperatures is the city centre….2017 maps by census track for vulnerability to heat waves and heat wave risk map” “The city also monitors heat-attributable mortality. Additionally, there is a heat risk map that overlays historical exposure (how heat has been distributed across the city) and vulnerability (based on indicators such as green space, socioeconomic status, age, and energy demand of buildings). Current drivers of heat exposure and vulnerability are also assessed. Several heat vulnerability maps are used, including IVAC (produced by the Metropolis Institute) and CLIMATE READY, a European project.” Barcelona Climate Plan: “In Catalonia, 19% more elderly people die when there is a heat wave. This figure can be as high as 27% in Barcelona, according to a study carried out by ISGlobal with data for the period between 1983 and 2006. The length of the heat wave is a more important factor than the intensity of the heat. And 1.6% of the people who die in the summer months do so because of the heat. Elderly people are the most sensitive group, so the older people are, the more mortality increases when heat rises. The increase is 15% for the 60-70 age bracket and 17% for those between 70 and 80, while there are 26% more deaths for those aged 80-90 in very hot weather. If they are over 90, the mortality rate is as high as 36%. But although elderly people suffer most in very hot weather, children under one are vulnerable too. The study shows that infant mortality for those under one year old also increases by 25% on extremely hot days, especially among babies just a few weeks old. We are only talking about very few cases, but in an analysis that covers a lot of years, the trend is significant.”

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Heat risks are comprehensively projected, addressing most or all future hazards, exposure, and vulnerability trends in detail at a relevant local scale, with a variety of detailed scenarios, interconnections, and advanced data integration “Future heat risks are actively assessed. The Heat Plan includes provisions for evaluating how heat could impact the city’s infrastructure, including a simulation exercise for a 50°C scenario. A publicly available vulnerability analysis explores how rising temperatures could affect basic infrastructure, fire risk, the urban heat island effect, biodiversity, and more.” - survey End of century: 2 heat waves a year (committed): 4-5 heat waves a year (passive) Detailed infographic: hot day >30oC frequency per year; >35oC, nighttime temp over >20, >25 “Singular aspects, particularly heat waves, are integrated into scenario-based analytical frames (Fig. 1).” Berner et al., 2025 “The plans introduce a heat-wave vulnerability index that considers the physical and socio-economic factors of residents, enabling the prioritization of specific urban development measures like climate shelters, street greening and green infrastructure access (BCN1, 85).” Berner et al., 2025

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	A comprehensive, locally relevant heat adaptation plan exists, with clearly defined goals, priorities, and commitments, formal adoption, and evidence of implementation support through dedicated roles and/or budget: **Strategy to Combat the Heat. Heat Plan 2025-2035**

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Comprehensive goals exist across short- to long-term timeframes, with local context, and include detailed consideration of measurability, assessments, interconnections, and strategies for achieving the goals. “The plan outlines specific goals, including proximity targets for climate shelters, an increase of green space by 1m² per resident, improved thermal comfort in 170 schools, water features in each district, 7 hectares of sustainable urban drainage systems, the elimination of energy poverty, and coastal and beach protection measures.” survey

Assessment score:	4
	Climate Plan #3 goal “preventing excessive heat” 2030 goal: 100% of the population at least 5 minutes on foot from a climate shelter (facilities and urban parks that provide good thermal comfort conditions and which could shelter sensitive people in the event of heat waves). Short term: “Strengthen the services for the most vulnerable people at the Citizen Help and Information Offices (OACs) to help prevent the effects of heat and other extreme climate events (2020).”

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Engagement mechanisms are in place and relevant to the local context, and reflect a moderate depth of participation (e.g., multiple consultations or involvement in shaping plans) “Stakeholders and community members were engaged in developing and implementing the Heat Plan. A participatory process involved 180 people representing various organizations across 8 sessions, resulting in 94 proposals. These proposals are publicly available on the Decidim.Barcelona platform. Approximately 76% of them were incorporated into the final plan.” -survey “The short-term actions of the Climate Emergency Plan include establishing mechanisms to ensure the participation of social groups vulnerable to climate change in the planning process. This goal is not yet integrated into the current planning strategies but is intended for future implementation and remains largely undefined in the plans; the strategies do not clarify whether those who provided input or participated in co-production workshops met this requirement. Instead, they focus on leveraging local knowledge as a foundation for the process by building on neighborhood community networks and encouraging resident organizations to engage in climate adaptation efforts through funding opportunities (BCN1, 155).” A total of 141 organisations were actively involved in drawing up the CBC. Four participatory sessions were held which culminated in its signing and presentation to the City Mayor on 23 November 2015. A plan monitoring committee was also set up in the Council to ensure the participatory process ran smoothly and the planned schedule was adhered to. 7.3 Create design criteria and, with public participation, plan the network of urban green corridors; 16.5. Strengthen the participation of the local community

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Multiple actions are comprehensively identified, addressing a mixture of chronic heat stress and acute heat shocks, with local context, and strong consideration of future changes Short-term actions (2018–2020) 3.1 Review the Action Plan for Preventing the Effects of Heat Waves on Health, 3.2 Identify existing and potential climate shelter spaces: 3.3 Prioritise the cooling actions Medium- and long-term actions (2021–2030) 3.4 Deepen our knowledge of how climate change affects the health 3.5 Deepen our knowledge of the urban climate 3.6 Create the “Barcelona, city of shade” programme 3.7 Create water gardens 3.8 Improve the thermal comfort of climate shelter facilities 3.9 Create new climate shelter spaces 3.10 Increase health service staff to deal with heat waves (2030) 3.11 Take action to increase the reflectance index of city pavements and terraces 4.11 Study building systems and solutions adapted to Barcelona to improve their protection against heat and passive cooling 6.4 Analyse how climate change specifically affects each district in order to identify possible risks and vulnerabilities (heat) 6.5 Locate and characterise the areas at risk (of extreme heat) 7.4 Prioritise the actions planned in the PIVU in those districts and neighbourhoods with fewer green spaces or infrastructure and those areas most exposed to heat (2020). Each page on bottom lists cross-cutting.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Multiple actions are identified that address drivers of exposure and vulnerability for people, infrastructure, and/or ecosystems in a local context, while partially addressing root causes and future changes Survey “Heat adaptation actions are selected and prioritized based on feasibility and impact. Priority is given to interventions in neighborhoods or populations most vulnerable to heat—for example, nursery and primary schools are being air-conditioned, and targeted interventions are underway in vulnerable neighborhoods identified in the Neighborhood Climate Plan.”

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Multiple actions are implemented with verified evidence, addressing a range of heat risks in a locally relevant context, but maladaptation risks are not considered “Numerous heat adaptation actions are underway. These include: A network of 400 climate shelters, covering 99% of the population within a 10-minute walk Expansion of green spaces

Assessment score:	3
	Shade infrastructure where greenery cannot be planted Nine water play areas for children Heat-awareness training for caregivers of vulnerable populations An emergency operational plan (established in 2003) that is currently being updated Key challenges limiting implementation include limited economic resources and bureaucratic delays.” survey

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Costs and benefits for multiple heat adaptation options are analyzed in detail, relevant to the local context, and include some economic and non-economic factors and maladaptation risks “A cost-benefit analysis of the initiatives in the Climate Plan, including the heat variable, will be performed with the collaboration of UNHABITAT. Updating the identification of priority risks in Barcelona based on technical and scientific criteria, data and indicators on the expected impact and vulnerability of the city, with cost-benefit analyses that include economic, environmental and social factors, as well as action proposals and monitoring indicators. This also includes updating the vulnerability and heat risk maps.” -Heat Strategy

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies and trade-off s between heat adaptation options are assessed but are limited in relevance to the local context or lack depth in assessment Synergies (co-benefits) noted in Heat Plan and Adaptation Plan across actions. Tradeoffs not explicitly named. “Reinforcing and adding new initiatives and resources to protect people in situations of vulnerability, seeking synergies with other programmes and social projects that already exist and assessing the need to develop new projects with this goal:” -Heat Plan

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Heat adaptation options are organized within a pathway-based approach but have limited relevance to the local context or lack depth in planning → does not meet

Assessment score:	2
	criteria of 3 because it does not have regular review and updates, flexible, iterative, etc. Survey: “Adaptation strategies and actions are implemented in sequenced phases. Each project under the Heat Plan has defined stages.” Each line of action has a section for monitoring indicators, operating indicators

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluation processes are fully implemented in a local context, while partially addressing measurability, target setting, and course correction mechanisms → not clear what course correction would be, percentage of actions executed tracked but effectiveness not always measured “Adaptation actions are regularly monitored. Each year, the city tracks the percentage of actions executed. In some cases, they assess the effectiveness of interventions in public space, such as measuring temperature reduction in green areas, shaded zones, and climate shelters. Mortality attributable to heat is also monitored. A defined set of indicators in the Heat Plan (e.g., green surface area) is used for ongoing evaluation.” survey MONITORING INDICATORS • Number of places to shelter that have been identified and set up. • Degree of cover these places offer. • Energy consumed by shelter facilities (kWh/m2). • Number of times the Heat Wave Protocol is activated. • Increase in the city’s tree cover (%). • Heat-related morbidity and mortality. • Number of water gardens.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Evidence is partially established but lacks local relevance or does not sufficiently consider effectiveness, measurability, sustainability, and consensus “There is also evidence that heat adaptation efforts have reduced risks. Research conducted by various institutions has observed that residents are adapting to heat, though it remains unclear whether this is due to self-protection, increased use of fans or air conditioning, expansion of green areas, green corridors, or other factors.” survey

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	Evidence exists but is limited, lacks local relevance, or does not address multiple dimensions → piloting does not fully address multiple dimensions. “To reduce the risk of maladaptation, the city pilots large-scale actions before full implementation. Adaptation efforts are guided by scientific research.“ survey

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	Heat governance structures are comprehensively implemented in a local context, fully addressing institutionalization, authority, and connectivity “The Climate Change Office is primarily responsible for driving and monitoring the city's Climate Plan, which includes both mitigation and adaptation components. Most adaptation actions are managed by the Urban Services and Public Space Maintenance division, which comprises five departments: The Climate Change Office (a cross-cutting technical structure) The Water Cycle Department The Cleaning and Waste Department The Green Space Department The Public Space Department The Energy and Environmental Quality Department These groups meet weekly and biweekly with municipal leadership to track the progress of the Climate Plan. A key governance challenge is that heat is a cross-cutting issue affecting all departments and extending beyond local jurisdiction. Technical staff require both training and adequate time to manage this type of integrated governance.” survey

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	Technical expertise is fully implemented in a local context, with partial consideration of availability, accessibility, capacity-building, and integration Creation of risk indicators, mapping, appears to be in-house and ongoing

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	Dedicated funding is fully implemented and sustainable in a local context, with partial consideration of both adequate quantity and long-term sustainability The Heat Plan has an initial budget of 111.6 million euros and will be rolled out in the period up to 2035, with reviews every five years and inter-departmental follow-up based on indicators for health, greenery, temperatures and more. From: https://www.barcelona.cat/infobarcelona/en/tema/climate-emergency/com-fem-front-a-la-calor-a-barcelona-pla-calor-2025-2035_1532137.html

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Istanbul, Turkey

Scoring sheet

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City case study:	Istanbul, Turkey
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current heat hazards are identified through documentation of rising average temperatures, increasing numbers of hot days, urban heat island effects, and extreme heat events affecting Istanbul. The materials distinguish between long-term warming trends and episodic heatwaves and describe associated impacts on health, urban infrastructure, and environmental systems at the city scale. However, the identification does not extend to the neighborhood level and provides limited treatment of complex or cascading heat-related risks and data integration. (Istanbul Sustainable Energy and Climate Action Plan 2030, Risk and Vulnerability Assessment – Urban Heat Island; Istanbul Climate Change Action Plan 2021, Climate Hazards – Temperature and Extreme Heat)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Current drivers of heat exposure and vulnerability are identified through discussion of urban heat island effects linked to dense urbanization, land cover change, reduced green spaces, and built environment characteristics, as well as impacts on population health and vulnerable groups. The documents reference factors affecting people, infrastructure, and ecosystems with city-level relevance and include some consideration of underlying drivers such as urban form and environmental conditions. However, identification remains largely at the city scale, with limited neighborhood-level differentiation and limited integration of multiple data sources or

Assessment score:	3
	detailed root-cause analysis. (Istanbul Sustainable Energy and Climate Action Plan 2030, Risk and Vulnerability Assessment – Urban Heat Island; Istanbul Climate Change Action Plan 2021, Climate Risk Assessment – Temperature and Extreme Heat)

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Future heat risks are projected through climate model–based assessments describing increases in average temperatures, hotter summers, more frequent and intense heatwaves, and the amplification of heat risks due to the urban heat island effect. The projections address future hazards and related risks to health, infrastructure, and urban systems at the city scale and reference multiple climate scenarios. However, projections are not consistently linked to detailed future exposure and vulnerability trends at the neighborhood level, and integration of socioeconomic scenarios and cascading risk interactions remains limited. (Istanbul Climate Change Action Plan 2018, Climate Change Projections for Istanbul; Istanbul Climate Change Action Plan 2021, Climate Hazards – Future Climate Hazards: Temperature and Extreme Heat)

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2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	No dedicated heat adaptation plan is evidenced in the reviewed materials. While extreme heat and urban heat island effects are discussed within broader climate action and adaptation frameworks, none of the documents constitute a standalone, formally adopted heat adaptation plan with defined goals, priorities, or implementation mechanisms. The absence of such a plan is explicitly highlighted through analysis noting the need for a dedicated Heat Action Plan for Istanbul. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021; *Managing an Invisible Disaster: Developing a Comprehensive Heat Action Plan for Istanbul*)

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Goals related to climate adaptation and resilience are articulated across medium- and long-term horizons within broader climate action frameworks, including targets extending to 2030 and 2050. However, heat-specific adaptation goals are not clearly defined, are not consistently framed across short-, medium-, and long-term timeframes, and lack explicit linkage to heat risk assessments or measurable

Assessment score:	1
	heat-related outcomes. As such, goals referencing heat remain indirect and embedded within general climate objectives rather than forming a coherent, time-sequenced set of heat adaptation goals. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	Stakeholder and community engagement mechanisms are evidenced through participatory processes used in the preparation of broader climate action plans, including consultations with municipal departments, experts, institutions, and residents. These mechanisms demonstrate engagement at the city scale and involve multiple stakeholders in shaping climate-related planning. However, engagement is not specific to heat adaptation, does not demonstrate a high depth of participation (e.g., co-production focused on heat risks), and lacks explicit linkage to ongoing or iterative community engagement on heat adaptation measures. (Istanbul Sustainable Energy and Climate Action Plan 2030, Stakeholder Participation; Istanbul Climate Change Action Plan 2021, Process and Stakeholder Engagement)

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Multiple actions addressing heat hazards are identified, particularly measures targeting chronic heat stress through urban heat island mitigation, such as increasing green spaces, green roofs, permeable surfaces, shading, and surface material changes. These actions are described as locally relevant and linked to current and future temperature increases and heat intensification. However, actions addressing acute heat shocks (e.g., heatwaves) are limited, and consideration of emergency or short-term response measures for extreme heat events is minimal. (Istanbul Sustainable Energy and Climate Action Plan 2030, Adaptation Actions – Urban Heat Island; Istanbul Climate Change Action Plan 2021, Existing Adaptation Measures and Adaptation Actions)

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Actions addressing drivers of heat exposure and vulnerability are identified through measures targeting land cover, urban form, and ecosystem conditions, including expansion of green spaces, green roofs, permeable surfaces, shading, and material

Assessment score:	3
	choices aimed at reducing urban heat island effects. These actions address drivers affecting people, infrastructure, and ecosystems and are framed with city-level relevance. However, actions are not consistently linked to underlying social or socioeconomic drivers of vulnerability, and consideration of future changes and root causes remains partial. (Istanbul Sustainable Energy and Climate Action Plan 2030, Adaptation Actions – Urban Heat Island; Istanbul Climate Change Action Plan 2021, Adaptation Actions and Existing Adaptation Measures)

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Some actions related to heat risk reduction are reported as being undertaken within broader urban and climate initiatives, such as expansion of green spaces and urban environmental improvements. However, the documents largely describe planned, ongoing, or proposed actions rather than providing clear, verifiable evidence of implementation specifically tied to heat hazards or heat vulnerability reduction. Explicit evidence demonstrating implementation of a range of heat-focused actions, their scale, or their effectiveness is limited. (Istanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

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4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	No explicit analysis of the costs and benefits of heat adaptation options is evidenced in the reviewed materials. While adaptation actions related to urban heat island mitigation and broader climate resilience are described, the documents do not present systematic evaluations of economic or non-economic costs and benefits specifically associated with heat adaptation measures. Consideration of potential trade-offs or maladaptation risks related to heat adaptation options is not documented. (Istanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No explicit assessment of synergies or trade-offs between heat adaptation options is evidenced in the reviewed materials. While multiple adaptation actions relevant to heat (e.g., green infrastructure, urban form interventions) are described, the

Assessment score:	0
	documents do not analyze how these options interact with one another, nor do they assess potential conflicts or co-benefits across different timeframes. Science-based evaluations of synergies, trade-offs, or temporal interactions specific to heat adaptation are not documented. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Heat-relevant adaptation actions are organized within broader climate action and adaptation planning frameworks that include timelines and phased targets extending to 2030 and beyond. However, these actions are not structured within a dedicated, sequenced, or iterative pathway-based approach specific to heat adaptation, nor are they explicitly linked to decision points, thresholds, or adaptive pathways over time. Consideration of flexibility, regular review, or pathway adjustment specific to heat risks is limited. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring and evaluation processes are described for adaptation actions within broader climate action frameworks, including the identification of indicators and reporting structures for adaptation measures. These processes indicate partial implementation of monitoring at the city scale. However, monitoring and evaluation are not specific to heat adaptation actions, lack clearly defined heat-related targets or outcome indicators, and do not clearly document mechanisms for course correction based on heat-related performance. (İstanbul Sustainable Energy and Climate Action Plan 2030, Monitoring for Adaptation Actions; Istanbul Climate Change Action Plan 2021, Monitoring, Evaluation and Reporting)

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No explicit evidence demonstrating reductions in heat risk is documented in the reviewed materials. While adaptation actions relevant to heat are identified and, in some cases, reported as underway, the documents do not present measured outcomes, trend analyses, or evaluation results showing reduced heat exposure,

Assessment score:	0
	vulnerability, or impacts. Quantitative or qualitative evidence linking actions to demonstrable reductions in heat-related risk is not provided. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No explicit evidence of identifying, assessing, or reducing maladaptation risks related to heat adaptation is documented in the reviewed materials. While various adaptation actions are proposed or described, the documents do not address potential unintended negative consequences of these actions, nor do they include safeguards, evaluations, or adjustments aimed at avoiding maladaptation. Consideration of maladaptation risk in relation to heat adaptation measures is not evidenced. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	Governance structures for climate action and adaptation are established at the municipal level, with defined institutional roles and coordination mechanisms within broader climate and sustainability frameworks. However, these structures are not specific to heat adaptation and do not assign clear responsibilities, mandates, or coordination mechanisms explicitly focused on managing heat risks. Dedicated governance arrangements for heat-related planning, response, or oversight are not evidenced. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021; *Managing an Invisible Disaster: Developing a Comprehensive Heat Action Plan for Istanbul*)

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise related to climate change and adaptation is evidenced through the involvement of municipal departments, technical staff, external experts, and research institutions in the preparation of climate action and sustainability plans. The documents indicate access to climate modeling, risk assessment, and technical analysis capacity at the city level. However, expertise is not explicitly dedicated to heat adaptation, and there is limited evidence of specialized technical capacity

Assessment score:	2
	focused on heat risk management or its accessibility for ongoing heat-specific planning and implementation. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	No dedicated or sustainable funding streams specifically allocated to heat adaptation are evidenced in the reviewed materials. While broader climate action and adaptation efforts reference general municipal budgets, external financing, or project-based funding, none of the documents identify earmarked funding, long-term financial commitments, or budget lines explicitly supporting heat adaptation. Financial provisions specific to heat risk management or heat-focused adaptation actions are not documented. (İstanbul Sustainable Energy and Climate Action Plan 2030; Istanbul Climate Change Action Plan 2021)

References

Istanbul Metropolitan Municipality. (2021). *Istanbul climate change action plan* [Climate action plan]. https://cevre.ibb.istanbul/wp-content/uploads/2023/05/istanbul_climate_change_action_plan_v03.pdf

Istanbul Metropolitan Municipality. (2018). *Istanbul climate change action plan: Summary report* [Summary report]. https://cevre.ibb.istanbul/wp-content/uploads/2022/05/Ozet_Rapor_Ingilizce.pdf

Tokaç, F. Z. (2025). Managing an invisible disaster: Developing a comprehensive heat action plan for Istanbul. *ICCAUA Proceedings Journal, 8*, 587–593. https://doi.org/10.38027/ICCAUA2025EN0305

Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change. (2024). *Turkey climate change adaptation strategy and action plan 2024–2030* [National adaptation strategy and action plan]. https://iklim.gov.tr/db/english/icerikler/files/Uyum(1).pdf

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Istanbul, Turkey
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	Some attention to the increase of intensity & frequency of heat extremes in the Istanbul Climate Action Plan (2021) both past and future projections, but no attention for detail or context, no specific identification of vulnerable groups or spatial areas beyond generalized statements. The more recent Istanbul Sustainable Energy and Climate Action Plan 2030 (2023) only addresses the UHI effect.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Both plans mentioned above mention exposure and vulnerability only in general terms (elderly, chronically ill, etc.). Critical infra is mentioned in relation to UHI. No consideration for ecosystems. No underlying risk factors are discussed.

1.3 Are future heat risks projected?

Assessment score:	0
Rationale:	The Istanbul Climate Action Plan (2021) contains some projections under different scenarios of temperature change. But heat risks are not explicitly projected.

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	There is no dedicated heat adaptation plan for Istanbul. See also Tokac (2025).

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	The Istanbul CAP (2021) mentions only the following general goal without any details nor time planning: reducing the urban/rural temperature difference, limiting the number of nights with extreme heat, reducing the increasing urban heat effect in Istanbul with measures to be taken. The Istanbul SECAP (2023) mentions only reduction of UHI as an explicit goal.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	The Istanbul CAP (2021) mentions stakeholder engagement only superficially without providing any details as to which stakeholders were involved and how. For the SECAP (2023) 2 stakeholder workshops were organised with other key sectors: Transport, Waste and Water. But without further detail.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	The actions of the two most relevant docs (CAP and SECAP) focus mainly on addressing the UHI effect and address chronic heat stress through tree planting (CAP) and urban greening more generally (SECAP). No attention for acute heat shocks, such as emergency responses. Also no consideration for future changes.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Actions concern mostly people but without consideration of specific vulnerable groups, areas and no attention for future changes.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	Some actions are mentioned as implemented but details regarding implementation are missing. The documents do mention the importance of monitoring, but there is no mention of actual evaluation of actions (e.g. number of trees planted etc).

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4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	In the reviewed documents there is no mention of doing CBAs for different adaptation options. The CAP mentions public acceptance as one relevant criterion for selecting adaptation options.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Not discussed at all

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	0
Rationale:	Not discussed at all

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	The CAP mentions the timing (yearly) and responsibility (which dept) of the two main adaptation actions, but without any further specification. The SECAP mentions how the UHI is monitored by means of two indicators. No further specification, no target setting or correction mechanisms are mentioned.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	I found no evidence.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I found no evidence.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	0
Rationale:	As far as I could read there are no dedicated roles for heat governance. The CAP mentions that it is necessary to cooperate with different departments. These departments include transport, energy, etc., but it does not mention where primary responsibility for the coordination of this cooperation lies. The document does mention that the Directorate of Health and Sanitation Department of Health Parks and Recreation Directorate Department of Rail System Activity program Service provision is responsible for tree planting (see table p. 73). For cooling critical infrastructure the Department of Housing and Urban Development Directorate of Health and Sanitation is responsible.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	Difficult to assess but my impression is that technical expertise is limited and mainly geared towards chronic heat stress but not acute heat stress.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	The CAP mentions the municipality and nation governments as financial source of adaptation actions, but there is no further specification or elaboration.

References

Istanbul Metropolitan Municipality. (2021). *Istanbul climate change action plan* [Climate action plan]. https://cevre.ibb.istanbul/wp-content/uploads/2023/05/istanbul_climate_change_action_plan_v03.pdf

Istanbul Metropolitan Municipality. (2018). *Istanbul climate change action plan: Summary report* [Summary report]. https://cevre.ibb.istanbul/wp-content/uploads/2022/05/Ozet_Rapor_Ingilizce.pdf

Tokaç, F. Z. (2025). Managing an invisible disaster: Developing a comprehensive heat action plan for Istanbul. *ICCAUA Proceedings Journal, 8*, 587–593. https://doi.org/10.38027/ICCAUA2025EN0305

Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change. (2024). *Turkey climate change adaptation strategy and action plan 2024–2030* [National adaptation strategy and action plan]. https://iklim.gov.tr/db/english/icerikler/files/Uyum(1).pdf

Milan, Italy

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Milan, Italy
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	2

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	English docs present the physical science side of heat hazard only, in a comparatively limited way. https://www.sciencedirect.com/science/article/pii/S2212095525000513 <- journal article underlying summary is more comprehensive, but it's a methods paper; primarily concerned with demonstrating a new modeling strategy rather than a grounded summary of urban heat hazards in Milan. 2022 plan and 2025 update have more detail.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	https://www.preprints.org/manuscript/202505.1157/v2 is only a preprint, but it is focused on heat & heat vulnerability overlaps. It's a spatially explicit project focused in Milan, but still manages to have relatively little actual local context. 2022 plan and 2025 update have more detail.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	https://www.frontiersin.org/journals/climate/articles/10.3389/fclim.2023.1130365/full <- oddly written, unclear funding process & independence. Nonetheless, the paper does present future heat risk, with pretty high spatial resolution. Little depth and variety in scenarios, interconnections, and data integration. The 2025 plan appears to have access to comprehensive heat forecasts for 2050; the translations I have are not good enough to parse the source of the forecasts.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	To mitigate the heat island and cool the urban system, the Plan identifies strategies and actions that bring cross-cutting benefits with respect to multiple vulnerability factors. The 2025 update: https://repository.comune.milano.it/s/mBNRpiMHZ9ZqN55 seems to have a great deal of detail on specific adaptation strategies. The Milan heat plan is actually a subset of their overall climate response plan, but I think the appropriate sections are robust enough that they 'count'. Specific foci include: Potential Extreme Heat Risk Index (HPR)

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Yes; there are a large number of goals related to heat, which i can see in the 2025 update. A specific one is "Contribute to limiting the local temperature increase to 2°C by 2050 through urban cooling actions and reduction of the urban heat-island effect in comparison to 2017 (translation via ChatGPT)". Strategies for achieving the goals include *Improving the energy efficiency of the private building stock *Developing and tracking their Potential Extreme Heat Risk Index (HPR), based on hazard (land surface temp), and vulnerability (demographics) *increasing green and blue infrastructure, particularly urban vegetation, both at ground level and integrated into buildings (green roofs and walls); *increasing the albedo of built surfaces, such as using light-colored roofs; *using permeable paving materials; *increasing access to usable, high-quality green space and to water.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Based on this model, the Actions in Area 5 of the Air and Climate Plan can be placed at different levels. The lowest level, “Inform,” is represented by Action 5.1.1, “Awareness-Raising Plan,” and the highest level, “Empower,” by Action 5.1.4, “Permanent Citizen Representative Body,” currently called the Permanent Citizens’ Assembly on Climate. -> chat GPT translation, page 25. A Milanese University has a climate adaptation plan following many of the same goals outlined here: https://www.polimi.it/fileadmin/asset/image/PACC2026/Executive_summary_ENG.pdf

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	All the Key Performance Indicators in the 4.2 section in their table seem to relate to heat hazards, exposure and vulnerability. (pages 32-38 of the real italian version).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	All the Key Performance Indicators in the 4.2 section in their table seem to relate to heat hazards, exposure and vulnerability. (pages 32-38 of the real italian version).

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	The Monitoring Matrix from 2025 (pages 60-63 in the original Italian) highlights several specific actions taken to make progress on the various 4.2.* goals outlined in the original 2025 monitoring plan. The plan overall describes considering maladaptation somewhere, but it’s not listed in the specific goals.

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4. Adaptation strategy

Confidence score:	4

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	“For each of the 49 Actions, the following have been identified: • capital costs, meaning capital expenditure, for example the cost of assets to be acquired; • operating costs, meaning current expenditure, for example the costs of maintaining and operating assets; • economic benefits, for example savings in energy expenditure. Hidden costs will be evaluated during monitoring where possible. For each Action, these cost items will be used to calculate a Net Present Value (NPV) and a Return on Investment (ROI) on the basis of a general discount rate.” (page 21 of Monitoring Program for the Air and Climate Plan)

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	The large set of adaptation actions have some notes on benefits to other sectors (heat/climate/emissions, e.g.) but not quantitatively, at least as translated.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	4
Rationale:	The 2025 update is comprehensively planned, iterative and sequenced. Seems relevant to the local context, with a well-defined “local adaptation pathway” integrating multiple factors across different timeframes and supported by regular review and update mechanisms.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Monitoring and evaluation processes are fully implemented in a local context. The translation I could get is not good enough to know if they’re addressing course correction mechanisms, but the updates are lengthy.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Current urban greenery is modeled as providing approximately 1°C of cooling.

Assessment score:	3
	Milan_First_Monitoring_Report_2025_English.pdf page 30

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I didn't find anything trying to ask the question.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	Permanent Citizens' Assembly on Climate seems to exist and have oversight power.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	White literature suggests reasonably close collaboration between Milan climate/heat governance and managers and research scientists: https://www.preprints.org/manuscript/202505.1157/v2

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	**"Funding from the Ministry** will also cover the costs of training and internal capacity building activities within the administration on climate change adaptation issues." (I don't know how to identify the magnitude/sustainability of the funding that is referenced here). Milan was important in the development of this financing plan for air quality adaptation: https://www.eib.org/files/documents/financing-air-quality-plans.pdf This is suggestive evidence that other goals such as heat, which fall under Milan's overall climate response are likely to have similar considerations of finance, but I've not yet found detailed evidence.

References

Comune di Milano, DP Città Resilienti, & Direzione Transizione Ambientale. (2021). *A green and resilient Milan* [Presentation]. https://www.institute-urbanex.org/wp-content/uploads/2021/07/8_Urban-Lab_16.07.2021_Torricelli.pdf

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Comune di Milano. (2022). *Piano Aria Clima* [Climate action plan]. https://www.comune.milano.it/documents/20126/430903598/Piano+Aria+Clima+-+Approvato+-220325.pdf/bb865fc9-f37b-a90a-b4d1-ff595e7162ef?t=1652093098404

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Milan, Italy
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	I have not seen evidence for attention to chronic heat stress (but I might have overseen this …)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The air & climate plan (PAC 2022) shows maps combining the distribution of (air) temperatures with exposure (e.g. near greenery) & vulnerability (elderly, young children, unemployed, crowded population) culminating into heat wave risk maps across neighbourhoods.

1.3 Are future heat risks projected?

Assessment score:	1
Rationale:	The PAC mentions an increase of temperatures between 2020 and 2050 between 1 and 2.3 degrees, but no further details are provided

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	0
Rationale:	There is no dedicated heat adaptation plan

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There are certain adaptation actions that are supposed to be implemented by 2030, such as a large tree planting effort, using schools as cool oasis, implementing green roofs. Other than that the PAC only mentions that Milan should become climate resilient by 2050.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The PAC has undergone extensive consultation of citizens and local stakeholders, based on a participatory agreement approved by the city council. Stakeholder mapping has been done, and there are several stakeholder engagement activities, including participatory budgeting. Individual comments have been collected and registered at www.decidim.org. There is no evidence of the influence of participation on decision-making.

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	Various adaptation actions are mentioned in the PAC, the most dominant being the Forestami initiative, a large reforestation plan including the planting of 220,000 trees by 2030, and pavement activities. It also mentions the existence of an emergency plan and extreme app for acute heat stress. No demonstration of future changes.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	The PAC mentions that urban greening initiatives will take place in UHI areas and places of interest such as schools, hospitals and retirement homes.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	It is not clear whether and to what extent all actions mentioned in the PAC are actually implemented. One news article provided as evidence mentions that many of the new trees that were planted have died. The same news article also mentions that one obvious action, i.e. to restore old water canals, has not been considered nor implemented. By the way, a good example of the restoration of an old water way in the city of Utrecht, see De grachtengordel van Utrecht is voltooid

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	I found no evidence of CBAs conducted for adaptation options

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Some synergies between mitigation and adaptation are mentioned very globally/generally in the PAC, and in the document form the ADAPT portal

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	One document (from the ADAPT portal) mentions the creation of a heat resilience officer and urban resilience department who collaborate with the department of civil protection in support of a risk communication strategy. They also collaborate with the urban regeneration department to design territorial interventions. It is unclear whether/how this collaboration works out in practice. There is no evidence of a pathway approach.

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5. Monitoring and evaluation

Confidence score:	0

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	I found no evidence.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	I found no evidence.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I found no evidence.

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	The ADAPT document is the only document that mentions the creation of a chief resilience officer (in line with being a 100 resilient cities member) and a department of urban resilience. I could not find any information on how adaptation is institutionalized and how much authority the officer and department have.

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	I found no evidence.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	I found no evidence.

References

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Paris, France

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Paris, France
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current heat hazards are clearly identified as recurrent heatwaves and rising summer temperatures. The France Adaptation Plan (PNACC-3) recognises heat as one of France's most significant and growing climate risks, especially for urban areas such as Paris, and prioritises health and social protection. The Assessing the Level of Adaptation to Heat Waves in Parisian Housing report analyses measured indoor temperatures across 60,000 dwellings, setting operational thresholds (27 °C at night / 30 °C during the day) to define hazardous conditions. This demonstrates quantitative understanding of present-day urban heat hazards. However, comprehensive neighbourhood-scale mapping or multi-sector integration is not provided, warranting a score of 3.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) identifies vulnerable populations, including older adults, children, the chronically ill, and low-income households, and acknowledges the need to prevent widening social inequalities under heat stress. The Parisian Housing Study further isolates building-related drivers of exposure such as window orientation, shading, roof insulation, and ventilation, linking them directly to exceedance of comfort and safety thresholds. Together, these sources provide clear evidence of people- and infrastructure-related drivers of vulnerability. Limited information on ecosystem or spatial (UHI) drivers prevents a higher score.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) outlines the national warming trajectory (TRACC) of approximately +2 °C by 2030, +2.7 °C by 2050, and +4 °C by 2100, explicitly linking these projections to policy action. The Parisian Housing Study models future exceedance probabilities under near- and long-term climate scenarios (2040 and 2080), demonstrating that passive measures will reach performance limits and that night-time overheating will intensify. These projections establish forward-looking understanding of urban heat risk in Paris, though the absence of multiple socioeconomic scenarios and inter-sectoral linkages keeps the score at 3.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	France possesses a comprehensive national adaptation plan (PNACC-3) that includes extensive coverage of heat risks and urban resilience. The plan identifies heatwaves as a central adaptation priority, introducing cross-cutting measures in health, urban planning, and housing to reduce thermal risk. It also references the continuation of the Plan National Canicule (PNC), which operationalises preparedness and early-warning actions. At the city level, while the Parisian Housing Study demonstrates targeted actions to evaluate and retrofit dwellings for heat resilience, there is no explicit, stand-alone Paris Heat Adaptation Plan within the evidence provided. Paris's adaptation to heat is therefore integrated into broader national and sectoral frameworks rather than represented by an independent municipal strategy. Hence, a score of 3 is appropriate.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The *France Adaptation Plan (PNACC-3)* clearly articulates phased objectives extending to 2030, 2050, and 2100, aligned with national climate projections (TRACC trajectory). These include goals to: Protect vulnerable groups from intensifying heat; Enhance resilience of buildings and urban environments; Integrate adaptation into all public policies; and Build adaptive capacity through monitoring and periodic updates. The *Parisian Housing Study* reinforces this temporal dimension by modelling

Assessment score:	3
	medium-term (2040) and long-term (2080) thermal performance scenarios, directly linking them to practical implications for housing retrofits and passive cooling strategies. Together, these reflect coherent short- to long-term perspectives. However, the absence of specific local implementation timelines for Paris's own initiatives limits a perfect score.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The France Adaptation Plan (PNACC-3) highlights the importance of public awareness, inter-ministerial coordination, and local actor mobilisation, encouraging participatory development through territorial governance frameworks. However, the evidence provided does not include detailed documentation of Paris-specific community consultation or co-production processes in heat adaptation planning. The Parisian Housing Study was conducted in collaboration with public housing operators (RIVP and CSTB), indicating some level of institutional stakeholder involvement, yet there is no clear reference to community participation, civic organisations, or resident engagement in the adaptation process. Therefore, while institutional coordination is evident, participatory inclusion remains weak in the available evidence.

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	The *France Adaptation Plan (PNACC-3)* identifies multiple actions to mitigate heat hazards, including: Strengthening heat-health surveillance systems (building on the Plan National Canicule); Improving urban design to reduce urban heat-island effects through nature-based cooling and shading; Enhancing emergency response during extreme heat events; and Mainstreaming adaptation in municipal planning and public infrastructure investments. At the local level, the *Parisian Housing Study* quantifies overheating risk and proposes passive cooling measures such as insulation reinforcement, reflective materials, improved shading, and cross-ventilation. These constitute clear, evidence-based hazard-oriented actions. However, no single document consolidates all of Paris's actions into a unified city plan, leading to a score of 3 rather than 4.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) explicitly targets social and territorial inequalities, aiming to protect at-risk populations through improved health-care access, information systems, and coordinated public communication. It promotes adaptation of housing and social infrastructure to minimise disparities in heat exposure. The Parisian Housing Study directly addresses physical drivers of vulnerability, including building materials, insulation quality, and ventilation, by testing and comparing adaptive solutions. These actions target structural and behavioural levers influencing exposure. Nevertheless, explicit documentation of community-led or socially inclusive programmes (e.g., outreach for low-income renters or migrants) is not evident in the evidence set. Hence, a solid 3 reflects good identification of technical and institutional actions, with some social gaps remaining.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) reports ongoing implementation across ministries and territorial authorities, building on lessons from earlier PNACC phases. It includes monitoring of sectoral measures and acknowledges progress in integrating adaptation into housing, health, and planning policies. At the city level, the Parisian Housing Study represents an applied implementation initiative, involving the City of Paris, RIVP, and CSTB, with pilot actions to retrofit and evaluate thermal performance in social housing stock. This demonstrates tangible implementation within a critical urban sector. However, the documents do not provide a full monitoring framework or metrics on implementation coverage, pace, or outcomes, leaving uncertainty regarding scale and continuity. The appropriate score is 3.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) discusses the economic rationale for adaptation, emphasising the need to integrate climate risks into public investment and to account for the cost of inaction in future heat-related damages. It promotes cost-benefit considerations for measures such as retrofitting public buildings, reinforcing healthcare systems, and expanding green infrastructure, underscoring that early adaptation is economically advantageous. At the local level, the Parisian Housing Study effectively weighs the relative efficiency of passive interventions, such as insulation, shading, and ventilation

Assessment score:	3
	improvements, under different climate horizons (2040 and 2080). Although precise monetary valuations are not presented, the study assesses performance gains versus technical feasibility, serving as a qualitative cost–benefit appraisal for Paris housing adaptation. Given the strong qualitative economic reasoning but limited quantitative valuation, a score of 3 is appropriate.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) acknowledges interactions among adaptation measures, calling for alignment between mitigation and adaptation actions, particularly regarding building energy use and public health. It stresses the need to avoid maladaptation, such as increased air-conditioning leading to higher emissions. This indicates awareness of systemic synergies and trade-offs at the policy level. The Parisian Housing Study also touches on such dynamics, showing that passive cooling options (e.g., shading and insulation) can reduce overheating but may become less effective under high-end scenarios, implying future trade-offs between passive and active systems. However, these trade-offs are described qualitatively without structured comparative analysis across multiple adaptation pathways. Evidence of strategic awareness is clear, but systematic quantification or integrated evaluation is lacking; therefore, the score is 3.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) is explicitly iterative and forward-looking, structured around phased implementation horizons (2030, 2050, 2100). It encourages dynamic adaptation planning, revising measures based on monitoring results and future climate projections, an implicit pathway-based orientation. Similarly, the Parisian Housing Study evaluates the progressive performance limits of passive cooling over time and stresses the need for anticipatory upgrades as conditions worsen, effectively mirroring a stepwise adaptation logic at the building level. While both documents show clear temporal sequencing and adaptive foresight, they stop short of formal “adaptation pathways” mapping or scenario branching that integrates decision thresholds. Consequently, the appropriate score is 3.

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	The France Adaptation Plan (PNACC-3) includes a formal monitoring and evaluation mechanism, building on earlier PNACC cycles. It specifies periodic reviews, indicator-based tracking, and reporting through national agencies (such as ONERC), ensuring transparency and adaptive learning. This demonstrates an institutionalised commitment to continuous assessment of adaptation progress. At the city level, the Parisian Housing Study exemplifies technical monitoring of indoor thermal conditions, systematically measuring dwellings' exposure and performance against comfort thresholds. The study represents a robust monitoring exercise within the housing sector. However, the evidence lacks citywide integration of results across all sectors and does not show a dedicated Paris-specific monitoring platform. Thus, a score of 3 is appropriate.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The France Adaptation Plan (PNACC-3) acknowledges that some progress has been achieved in reducing mortality and health impacts from heat through improved early-warning systems and public health preparedness since the 2003 heatwave. It notes the institutional learning embedded in the Plan National Canicule, which continues to strengthen alert mechanisms and risk communication. In Paris, the Housing Study demonstrates that certain retrofit measures (such as better insulation, shading, and ventilation) effectively reduce indoor overheating risk under current conditions. However, the evidence does not yet quantify citywide reductions in vulnerability or mortality, and the long-term effectiveness of these measures under projected extremes remains uncertain. The available data suggest partial, localised reductions in risk, but not comprehensive city-level evidence, hence a score of 2.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	The France Adaptation Plan (PNACC-3) explicitly warns against maladaptation, particularly the excessive reliance on energy-intensive cooling technologies that could undermine mitigation goals. It promotes nature-based solutions, passive design, and ventilation strategies to maintain low-carbon coherence. This shows strategic awareness of maladaptation risk at the national policy level. The Parisian Housing Study reinforces this by prioritising passive thermal measures over mechanical cooling, aligning with sustainable adaptation principles. Yet, there is no systematic evidence presented that tracks or measures the extent to which maladaptive practices (e.g., rising AC use or unequal access to cooling) have been reduced in practice. Hence, while policy intent to avoid maladaptation is evident, measurable outcomes remain limited, warranting a score of 2.

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	France has a robust governance framework for climate and heat adaptation under the PNACC-3, coordinated through the Ministry for the Ecological Transition and supported by entities such as ONERC (National Observatory on the Effects of Climate Change). The plan delineates clear responsibilities across ministries, regional authorities, and local governments, ensuring that adaptation, including heat risk management, is embedded within territorial planning. At the municipal level, the Parisian Housing Study illustrates operational governance through collaboration between the City of Paris, RIVP (a major social housing operator), and the CSTB (Scientific and Technical Centre for Building). This partnership structure reflects effective vertical and horizontal coordination for implementing heat adaptation in the built environment. While formal coordination is evident, the absence of a dedicated Paris-specific governance body or heat office limits the comprehensiveness of this structure. Hence, a score of 3 is justified.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	The France Adaptation Plan (PNACC-3) demonstrates extensive national and local technical capacity through research institutions, meteorological services (Météo-France), and specialised agencies responsible for modelling, data management, and scientific monitoring of heat risks. The plan promotes knowledge transfer and capacity building among local governments, technical experts, and urban planners. The Parisian Housing Study exemplifies the high level of technical expertise and data accessibility at city scale, employing quantitative simulations, thermal comfort thresholds, and forward projections. The collaboration between RIVP and CSTB highlights strong institutional capacity in both applied research and practice, ensuring technical findings directly inform policy and design. This integrated research-policy interface and accessibility of technical knowledge justify a score of 4.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The France Adaptation Plan (PNACC-3) mentions the need for sustainable financing mechanisms to support local adaptation and mobilise investments through public and private channels. It references ongoing national funding instruments for

Assessment score:	2
	territorial resilience, building retrofits, and research, but does not specify a ring-fenced or long-term fund dedicated solely to heat adaptation. In Paris, the Housing Study was conducted within the framework of existing municipal and housing agency budgets, showing reliance on project-based rather than recurrent funding. No evidence was found of a dedicated or multi-year financing mechanism for heat risk reduction specific to the city. While the existence of general climate adaptation funding channels is clear, the lack of specific, sustained allocation for heat adaptation warrants a score of 2.

References

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Roccamena, L., Alessandrini, J. M., Gervasi, P., Guilhot, J., Kyriakodis, G., Molesin, S., ... & Wei, W. (2025). Assessing the level of adaptation to heat waves in Parisian housing. *International Journal of Ventilation*, 1-41. https://doi.org/10.1080/14733315.2025.2530261

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Paris, France
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	PCAP provides timeline of heat hazards in Paris, quantifies it in terms of likely affected population and sectors (and other variables), differentiates between day and night impacts, implies differential vulnerability and presents past key events

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, PCAP considers differential vulnerability to heat stress, provides tangible information along with reasoning for likely most vulnerable communities, infrastructure type, predisposition etc.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes, it provides quantitative information on this under various variables including temperature projection, heating acceleration (likely frequency in future), increase in heatwave and night temperature and impact on life and infrastructure

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2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	1
Rationale:	This is tricky to answer as PCAP is not a dedicated heat action plan but it engages at length with heat stress and how to enhance Paris's adaptation to that including specific actions and prioritized groups - in general it focuses on "protection Parisians" including their adaptation to heat stress in the short and long term. It talks about 'heat plans' (eg. a Heatwave plan) but more in the sense of plans of action (than the document itself being a HAP)

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	It provides well formulated actions for reducing heat stress in the short to long term with specific goals, target groups and timelines. Only the MEL part is scant in such actions. Interconnections are implied but need more information to be specific.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Paris is a global leader in participatory governance and this is well reflected in this document which provides mechanisms for participatory governance, localizing and tailoring interventions based on local vulnerabilities and proactively chalks community and stakeholder engagement opportunities.

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Yes, the PCCP recommends actions pertaining to both current and future trends in chronic and acute heat stress with clear timelines for certain actions. Alongside long term solutions such as greening improved permeation, it also focuses on simulation for heat stress, mobile shelters, access to cool space etc.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes, it identifies several root causes of heat stress (physical and social) and advocates tangible tailored solutions that often have defined targets and timelines

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	This is tricky to score as multiple actions are reported for future implementation while some actions are reported to be completed - which in turn should be verifiable. No direct verification method is presented but the nature of projects completed makes them verifiable through online search (assumed).

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	This can be scored 3 if not for the lack of consideration of maladaptation for each action, otherwise, it provides specific costs on multiple actions with local co-benefits (and direct benefits)

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	Synergies and trade-offs at the local level considered and presented (with referencing to credible sources) - timeframes can be strengthened

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	It adopts clear timeframes for actions and provides localized options that can be seen from a pathways lens.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Ticky to score as conceptually it can be ranked 4 as recommendations tick all the boxes but actual implementation of such recommendations is time dependent as many actions are planned for futures

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Too early to comment on this but actions seem to be on the right trajectory to reduce heat risks, however, majority will unfold in times to come

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	2
Rationale:	Too early to comment on this but actions seem to be on the right trajectory to reduce maladaptation. The document is cognizant of sector/action specific maladaption and provides recommendations to reduce them,, however, majority will unfold in times to come

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	More information needed- as full institutionalization, authority and connectivity can't be verified from reading the document alone but it does provide a strong localized heat governance for Paris.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	More information needed- the PCCA mentions a host of technical institutions but reading the document alone isn't suffice to comment if these expertise are fully integrated for all future implementation or these are more like data and expertise pools that may or may not be available throughout the implementation of this plan

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	3
Rationale:	More information needed - on paper, yes. The PCCA presents an array of short, medium and long term funding options that are specific and can be used but these

Assessment score:	3
	are meant for all the actions mentioned and long term sustainability will only become verifiable in future

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References

Ville de Paris. (2024). *Paris Climate Action Plan 2024–2030* [Plan Climat 2024–2030]. https://cdn.paris.fr/paris/2025/06/25/plan-climat-en-9E8O.pdf

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Baltimore, USA

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Baltimore, USA
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Current extreme heat impacts on human health, businesses, and infrastructure are identified (DP3 p247). Some data sources have been integrated to show the historic incidence of heat (daytime and nighttime air temperatures in summer displayed spatially), showing spatial differences in heat exposure. (DP3 p252) Also using data on heat-related emergency department visits and heat-related deaths to show current health hazards (DP3 p266) There is a limited discussion on the energy demand impacts of high heat and potential for brownouts, but not in depth description of the risks.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	The DP3 relies on CDC's social vulnerability index (SVI) to analyze vulnerability to hazards in Baltimore (p21-22). While relying on this approach is at least data-driven, it lacks a local context and heat-specific considerations of drivers of vulnerability. Also using the National Risk Index (NRI) (p55). Discussion of the urban heat island effect is clear, describing that a lack of environmental amenities and certain building materials make the city hotter (DP3 p48) There is more discussion of social drivers of vulnerability on p55 of DP3, mentioning factors such as age, income, disabilities, and English proficiency, but this is not a

Assessment score:	2
	heat-specific discussion, so it lacks an in depth understanding of drivers of heat vulnerability.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	DP3 acknowledges that “climate change is expected to increase the severity and frequency of extreme heat events in Baltimore City” (p263). Data from University of Maryland are used to show increases in the number of high heat days by end of century (DP3 p264).

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is not a formal, stand-alone document for Baltimore’s heat adaptation plan. However, there is a Climate Action Plan (2024), which also references other documents and efforts relevant to extreme heat. These include the 2023 Baltimore City Disaster Preparedness and Planning Project (DP3), the Heat-Illness Prevention Plan (2024), and the 2019 Baltimore Sustainability Plan.

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Because there is not a single heat adaptation document, there is not a collated list of clear goals. There are however various goals and recommendations across the multiple documents listed above in 2.1 Many of the goals and recommendations involve building and relying on community resilience hubs for emergency preparedness, communication, management, and response (DP3 p 467-472) The sustainability plan and the climate action plan both discuss green infrastructure and urban canopy goals, but in vague terms. Goals for the whole disaster preparedness plan are listed on p19, but these are not heat specific (DP3 p19).

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Community engagement strategy described on p34 of DP3– this describes the prior engagement approach used to produce this updated plan. This section does not discuss engagement mechanisms going forward.

Assessment score:	1
	The monitoring and evaluation section describes ongoing community outreach, but this is vague and limited in detail (p458)

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Action B11 from Climate Action Plan promotes the use of cooling rooftop technologies (CAP p60) Actions N1-N3 promote urban greening to address extreme heat risks (CAP p81) Action O3: Create a Heat Management Plan (CAP p) Maryland Dept of Health monitors heat conditions, and issues excessive heat watches, warnings, and advisories (DP3 p257)

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Little consideration of root causes or future changes, but some actions can be seen to address drivers of exposure and vulnerability, such as the heat warning systems and changes to the built environment.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	The heat watches, warnings, and advisories are implemented. There is not evidence provided either way on whether the other actions have been implemented yet.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	In the publicly available documents I've seen, there is very limited quantitative analysis of costs and benefits. Benefits are often discussed in qualitative, non-economic terms, such as the public

Assessment score:	1
	health benefits of heat exposure reductions, and the environmental amenities of tree canopy and other green projects (CAP). The DP3 includes reference to FEMA estimates of the potential (economic) cost savings of pre-emptive emergency preparedness measures, but this is a general estimate and lacks local context (DP3 p18).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	I found very little discussion of synergies and trade-offs, beyond a very general mention of trade-offs being acknowledged during community engagement efforts. (CAP p50,52)

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	The plan does not appear to be integrated in a pathway-based approach, beyond acknowledgement of certain monitoring and updating mechanisms have a planned sequence (DP3 p457-463).

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5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The hazard mitigation plan (DP3) is described as a dynamic document with regular updating protocols in place (DP3 p457). Responsibilities are assigned to different actors for different types of evaluation and updates. Monitoring activities are described to include meetings to discuss implementation progress; site visits for active projects; periodic reporting; and forum convening (p459). There is mention of the sustainability office working to select a tool that will provide visibility and streamlined tracking of Baltimore's climate and resilience goals (p459) Evaluation will include assessing whether "the planning process and actions have been effective", but clear evaluation criteria are not provided (p460)

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	Planned actions are discussed with an understanding of how they may reduce heat risk, but with limited citation of evidence.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	DP3 states that “Baltimore City is aware of maladaptation and evaluates all adaptation practices recommended in the 2023 DP3 update to prevent this from occurring” (DP3, p20). However, no deeper explanations or analysis are offered on how this is achieved.

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	While there is no dedicated Heat Office or Officer, there is some clear identification of roles and authority for the planned heat governance. These include joint actions and responsibilities from the Baltimore Sustainability Office, Department of Planning, and the Office of Emergency Management (DP3 p25).

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	There is reference to the role of technical experts in creating the current Climate Action Plan, but no explicit reference to the role of technical expertise going forward (CAP p38-39). There also appears to be relationships with the University of Maryland for data and analysis of climate data and social vulnerability data (cited throughout the DP3), but again there is no clear statement of the established role of technical expertise moving forward.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There is no clear dedication of sustainable heat adaptation funding. However, city funds appear to cover certain parts of the plan, such as the heat emergency preparedness (DP3 Table 13-4 p385), and there is mention of seeking grants and partnerships for future actions (CAP p91).

References

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https://www.baltimoresustainability.org/wp-content/uploads/2024/01/2024-01-30_Baltimore2023DP3.pdf

The 2019 Baltimore Sustainability Plan. (2019)
https://www.baltimoresustainability.org/wp-content/uploads/2021/04/SustainabilityPlan_03-02-20-Compressed.pdf

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Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Baltimore, USA
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Comprehensive hazard mapping but did not find evidence that differentiates chronic from acute.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Vulnerability drivers and vulnerable populations clearly articulated.

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	High-level heat hazard projections are considered but future vulnerability trends and neighborhood level hazard projections are not apparent in the materials reviewed.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Broader disaster preparedness plan includes a chapter on extreme temperatures with clear goals.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Range of concrete goals are listed in disaster preparedness plan.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Community engagement is robust

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	3
Rationale:	Many actions identified to address hazard within buildings and outside

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Some actions focus on exposure

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Several actions are being implemented

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Many options are identified but not in a cost-benefit framework

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Many actions as part of a comprehensive plan but explicit synergies and tradeoffs not discussed

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Mix of short and long terms goals but not presented with path dependence in mind.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Disaster plan contains generic mechanisms for monitoring and evaluating multiple risk reduction strategies. These are not specific to heat but rather focus on general process like an annual report.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No evidence found

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	No evidence found

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	Broader sustainability office is responsible for heat.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Heat risk mitigation strategy reflects substantial technical expertise in vulnerability mapping.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Did not find robust evidence of dedicated funding.

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Baltimore City Department of Public Works. (2024, August). *Independent review of DPW heat-related policies and procedures* [PDF]. City of Baltimore. Retrieved July 8, 2025, from https://www.baltimorecity.gov/sites/default/files/upload/2024-Independent-Review-DPW-Heat-Policies.pdf

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Miami, USA

Scoring sheet

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City case study:	Miami, USA
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Many dimensions of heat described; only thing preventing a ‘4’ is the complex hazards and fine scale data and projections weren't particularly fleshed out

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Inclusion of Chris U.’s work on neighborhood vulnerability, discussion of root causes like redlining, and scope ranging from preexisting conditions to different labor groups

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Certainly discussed for hazards, but not with the scope or neighborhood level focus shown for current hazards. Similarly, not a lot of projections of changing vulnerability and exposure

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Many concrete goals and policies, inclusion of local scales and small groups

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	The only negative I observed was few explicitly stated goals that extended to 10 years or beyond (despite the fact that some actions, like tree planting, if implemented would yield benefits beyond 10 years)

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	Good description of community surveys, role of communities in heat advisory bodies, inclusion of many agencies, working in multiple languages

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Very broad scope and of a diverse range of depths, good local examples. Slightly weaker on weaving projections into adaptation planning (although most strategies would likely benefit in both current and future climate…still some might not, for example, if waters became so warm as to no longer offer cooling)

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Current exposure and vulnerability appear well targeted, including at local scales, but root causes of vulnerability, and projections of exposure and vulnerability do not appear to drive actions to a large extent

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	While many actions have been identified, and there is good description of next steps towards implementation, it is less clear how many adaptation actions have already been implemented, beyond the process ones associated with convening, etc.

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4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	Many strategies discussed, local scales included, and cost addressed in qualitative way. But actual cost-benefit analyses and other methodologies not described. There is discussion of broader benefits, but few of broader costs besides gentrification

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	While local context is provided and different types of strategies are positioned based on their differences, there isn't much discussion of interactions between strategies, or about how strategies differ at different time horizons.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	The high engagement with multiple stakeholders speaks to high potential for flexible adaptation pathways, but there is less discussion of how it will be done. In general the local dimension is well captured but there is not a strong sequencing

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Strong stating of goals and benchmarks, and what could be monitored and evaluated, and good mention of citizen science. However, specifics are lacking (e.g.' temperature should be measured before and after'), and it is not clear if M & E is actually happening.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	Most of the evidence base seems to come from literature review and experiences in other places or contexts, possibly because there has not been time yet to witness reduced heat risk yet locally.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	1
Rationale:	It may be too early to tell; the aforementioned descriptions of things to be wary of, such as gentrification following greening of neighborhoods, at least points to potential for evidence in the future (whereas if no one is thinking about it, it will be tough to gather evidence.)

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Scope and scale are strong, with many agencies and entities involved across different jurisdictions, including local ones. However, while there is some discussion of how they will interact and which groups are most suited for which aspects, the documents fall a bit short in the ‘dimensions; category, since they don't describe how the interactions will work between the different groups, who will oversee what, who will have the last word, how long term work will be ensured, etc.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	A diverse set of experts, including those with local expertise have been included in the task forces and planning documents

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	Difficult to tell. Clearly there has been some funding to date including to pay for heat resilience officer, but the documents don’t describe long term funding (so tough to say if there is sustainable funding in place, but probably not I would venture based on the materials)

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City of Miami. (2024). *Miami Forever Climate Ready: Extreme Heat Plan.* https://www.miami.gov/My-Government/Climate-Change-in-the-City-of-Miami/Climate-Change-Action/ExtremeHeatPlan

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Scoring sheet

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City case study:	Miami, USA
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	*Addressing both chronic heat stress and acute heat shocks:* Miami Forever Climate Ready: Extreme Heat Plan (EHP) addresses both past heat and future heat risks *At the neighborhood level:* Not explicitly by neighborhood. *With detailed complex risk perspectives:* The extreme data and research section in EHP (p. 5) suggests that the city has been involved in different types of risk perspective analysis *Advanced data integration:* Multi-hazard integration is lacking. Although, EHP talks about compounding risks at the intersection of mosquito and heat seasons.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	*Drivers of exposure and vulnerability are comprehensively identified, addressing people, infrastructure, and/or ecosystems:* EHP has fairly detailed language on social vulnerability. EHP also includes discussion on global warming and the importance of addressing human-driven GHG emissions locally to address heat (p. 5). *At the neighborhood level:* not at the neighborhood scale. *With detailed analysis of risk drivers and inclusion of multiple and reliable data sources:* yes, numerous organizations have contributed research (NOAA, Google, NWS, ACEEE, Florida International University)

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	All three reference documents have some information on future/mid-century heat risk projected. These projections are not localized by neighborhoods, but that may have been a political decision.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	Both Miami EHP and Miami-Dade County EHAP serve as heat adaptation plans with policies in place to address long term heat mitigation. Neither plan has clear funding mechanisms associated with all policies (albeit some policies refer to raising the stormwater utility fee) but both plans have policies to identify funding- suggesting delayed action, if and when funding has been identified hence the score of 3.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	*Comprehensive goals exist across short- to long-term timeframes, with local context, and include detailed consideration of measurability, assessments, interconnections, and strategies for achieving the goals:* Both Miami EHP and Miami-Dade County EHAP identify short- and long-term strategies. Measurement metrics not included in all strategies.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	*Engagement mechanisms are comprehensive, in place at a relevant local scale, and reflect a high depth of participation (e.g., iterative collaboration, co-production, or meaningful influence in decision-making).* Yes, at the county level, there appears to have been public engagement through task forces and six public workshops.

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	*Multiple actions are comprehensively identified, addressing a mixture of chronic heat stress and acute heat shocks, with local context, and strong consideration of future changes:* Yes, all three resources identify heat hazards in varying contextual scales (city, county).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	*Multiple actions are identified that address drivers of exposure and vulnerability for people, infrastructure, and/or ecosystems in a local context, and addressing root causes and future change.* Yes, action items are directed to some vulnerable groups such as rental residents and outdoor workers in EHP and affordable housing residents, assisted living/nursing home residents, and outdoor workers' safety in the county EHAP. In terms of infrastructure, the County Extreme Heat Toolkit is fairly comprehensive. Regarding ecosystems a number of policies seek to add tree canopy. I saw a lack of policies addressing the inherent resilience of ecosystems in longer heat waves.

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	News reports suggest action on cooling centers (City of Miami, 2025), and limited action on tree canopy (Miami Herald, 2025)

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Miami-Dade County Extreme Heat Toolkit includes descriptions on benefits and tradeoffs. But these descriptions read as generic reproduction of literature rather than Miami-specific analysis.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Nothing found

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	The Miami EHP does create pathways for most of the adaptation strategies. However, in the absence of adaptive pathways for all strategies/policies, it is difficult to know how all strategies form interlinked pathways (i.e., the idea of adaptive management)

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	I could not find any impact monitoring. Likewise, measurability, target setting, and course correction mechanisms are missing.

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	There appears to be some evidence showing heat-related deaths have decreased from 2023 to 2024 despite increasing heat exposure (Associated Press, 2024; Miami Dade County Office of Environmental Risk and Resilience, 2025). I could not find the public health report or 911 report on this data. Evidence on sustained trend in heat-related deaths lacking.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not found

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Miami-Dade County has had a Chief Heat Officer- Jane Gilbert (World Economic Forum, 2023). However, she is no longer their CHO and I think the position is no longer funded.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	As evident in the three plans, local scholars in Florida's Universities as well as nonprofit and businesses such as the Cleo Institute, the Florida BRACE program, host quite a bit of technical expertise.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	As per EHP, there appears to be city-level funding for Tree Canopy strategies through the stormwater utility fee. The county is also offering the Heat and Hydration Small Business Support Grant for outdoor workers (2025). Beyond this, I could find no other direct funding mechanisms.

References

City of Miami. (2024). *Miami Forever Climate Ready: Extreme Heat Plan.* https://www.miami.gov/My-Government/Climate-Change-in-the-City-of-Miami/Climate-Change-Action/ExtremeHeatPlan

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Hirji, Z., & Stringer, D. (2024, June 4). *Cities appoint heat officers to cope with record temperatures.* Bloomberg. https://www.bloomberg.com/news/features/2024-06-04/chief-heat-officers-are-writing-a-new-playbook-for-deadly-temperatures

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Philadelphia, USA

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Philadelphia, USA
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Very high spatial resolution, consideration of different durations

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	As described in the Hunting Park report, the City's vulnerability index combines "population, age, income, language, educational attainment, race and ethnicity, social isolation, and health" [information], at neighborhood scales

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	Projections at various temporal resolution and coverage have been combined with baseline high resolution temperature data, which is about the best that can be done

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Described in various docs

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	Some goals described in various docs

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	Documents describe extensive work with communities, including multi-lingual surveys that lead to priorities, evaluation post-activity, etc.

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Numerous strategies described, ranging from tree planting, to white roofs, to cooling centers, to other types of canopies, to air conditioning, to linking to public health systems

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	See above about links to health sector. Surveys have also explored where and how the vulnerable experience heat (including topics like cost of running an air conditioner even if you have one, secondary effects of heat like differential social isolation

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	3
Rationale:	There clearly are lists of heat adaptation types, and there clearly have been cost estimates, and surveying of pros and cons. I gave a ‘3’ instead of ‘4’ because I did not see discussion of maladaptation risk

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	I saw some discussion of this for example around multiple benefits of greening and around costs of AC and tree planting.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	There is not a strong sequencing or discussion of how it will be done

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	3
Rationale:	Many scientists and city officials are involved

5.2 Is there evidence of reducing heat risk?

Assessment score:	4
Rationale:	The city is monitoring temperatures post-adaptation strategy, and the stakeholder survey sites evidence of reduced heat deaths, although attributing the cause is of course challenging

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I didn't see anything on this

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	City has a chief resilience officer and the documents describe strong partnerships and accountability.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	In addition to all the partnerships described in this document, for example with Penn and Drexel, and communities, I know Philadelphia is forming a Panel on Climate Change that mirrors NYC's.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	The documents describe how philanthropies have played an important role in places like Hunting Park, but it is not clear what the current larger-scale funding environment looks like.

References

City of Philadelphia, Office of Sustainability. (2021). *Philadelphia climate action playbook* [Report]. https://www.epa.gov/system/files/documents/2023-12/philadelphia-climate-action-playbook.pdf

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Heat.gov. (2025). *Heat!...It's a Philly thing: After-action report/improvement plan* [Report]. https://heat.gov/wp-content/uploads/2025/08/Heat.Its-a-Philly-Thing-AAR-1.pdf

City of Philadelphia. (2022). *All-Hazard Mitigation Plan* [Hazard mitigation plan]. https://www.phila.gov/documents/hazard-mitigation-plan/

City of Philadelphia, Office of Sustainability. (2016). *Growing stronger – Toward a climate-ready Philadelphia* [Climate preparedness report]. https://www.phila.gov/documents/growing-stronger-toward-a-climate-ready-philadelphia/

Scoring sheet

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City case study:	Philadelphia, USA
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Yes. In the 15 page section focusing on heat in Philadelphia hazards plan update Heat hazards are comprehensively identified, addressing both chronic heat stress and acute heat shocks at the neighborhood level, with detailed complex risk perspectives and advanced data integration

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Yes, in Philadelphia hazards plan update shows multiple complex strategies for integrating heat hazard with vulnerability. Also shown interactively here: https://www.arcgis.com/apps/webappviewer/index.html?id=611a8271c62a47e7929213e7e6bde02a

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes, 1 page section outlining future heat risks.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	“Beat the Heat Community Relief Plan” is a 50 page document outlining locations, strategies and community perspectives on heat adaptation and mitigation. Didn’t find any evidence of current staffing or budget. This would bump score up to 4.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Yes, the climate action plan includes a range of goals. It’s primarily focused on emissions reductions, not heat. However, heat preparedness is an explicit topic in the Climate action plan. No *heat specific* metrics and measures are proposed, though metrics are used overall. https://www.phila.gov/media/20210113125627/Philadelphia-Climate-Action-Playbook.pdf https://www.phila.gov/media/20210113125824/CAP-Executive-Summary_English.pdf

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	“From July 2018 to January 2019 the Beat the Heat Team heard from more than 600 residents and community leaders in Hunting Park about their experiences with heat and their vision for a cooler and more climate resilient neighborhood.” Evidence of staffing & workplan: https://www.phila.gov/media/20190719091522/04-Heat-team-sample-work-plan.pdf

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3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	The only documents I can find really discussing heat hazards are wrapped into the broader climate action plan and its updates, and heat is not really the focus of the document. Interestingly, the 2021 Climate Action Plan and the 2018 Hunting Park documents focus on extreme heat to a significantly greater extent than the 2025 CAP Update. There was a planned 2025 Strawberry Mansion heat plan, to be modeled after the Hunting Park activities. However, it looks like little came of it. Perhaps this is because it was a federally funded EJ initiative, and the new federal administration cancelled a great many of these types of grants. I couldn't find specific documentation of the grant cancellation, but the documentation about which federal grants and projects were cancelled in 2025 generally is very poor. The initiative has a website, but lacks the depth of the Hunting Park plan, and does not mention heat exposure, climate change, or anything forward looking. Current city page on what it's doing about heat: https://www.phila.gov/guides/extreme-heat-guide/why-its-getting-hotter/ (trees, solar, and energy are described as key action items).

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	2026 Hazard Mitigation Plan The city planned actions addressing *heat* are clear and comprehensive (Heat watch/warning/advisory), with attention to vulnerable populations, while the discussion of actions addressing heat exposure root causes are broad, but cursory. 2022 Hazard Mitigation Plan has more depth than 2026 on temporal changes in hazard magnitude, and a less broad discussion of kinds of actions. Discussion of future changes, + "The City is preparing for these changes through initiatives to increase green spaces and improve infrastructure, but challenges remain, especially in economically disadvantaged areas" *Notes importance of greening in historically redlined neighborhoods.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Heatline is a nursing phoneline open during heat emergencies; aiming to reduce impact for vulnerable populations. The 2018 Huntington Park plan was clear, comprehensive, local, and addressed multiple dimensions of the problem. The 2025 Strawberry Mansion plan is much narrower, and addresses only the energy burden aspect of heat exposure. 3 actions identified, one of which is implemented with verified evidence, addressing a range of heat risks in a locally relevant context. No maladaptation discussion.

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	https://treephilly.org/resources/tree-benefits/ includes a benefits assessment only (no costs). Based on assertions in stakeholder survey lists of heat adaptation types, and some inference that pros and cons have been considered.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Stakeholder survey suggests an approach which considers pros and cons of various approaches from a multidimensional perspective. Updated to 2 because there is no evidence about the depth/rigor of these assessments.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	“Adaptation strategies and actions are sometimes implemented in sequenced phases.” (Stakeholder survey)

5. Monitoring and evaluation

Confidence score:	3

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	1
Rationale:	https://pmc.ncbi.nlm.nih.gov/articles/PMC5970988/ In that paper, philadelphia is the only city out of 20, to have a statistically significant association between heat alerts and heat deaths. The authors speculate that Philly policy responses to heat (like Heatline, perhaps) may drive the negative association. However, the authors are using a 95% confidence interval, and so with ~60% odds, we *expect* one city's 95% CI to fall outside 0. This evaluation was performed by outside academics, not the city itself. “Adaptation actions are sometimes monitored and evaluated.” (Stakeholder survey)

Assessment score:	1
	Because this lacks any detail about the depth or complexity, I still gave it a 1. There is no evidence of “measurability, target setting, and course correction mechanisms”.

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The evidence is quite weak though some exists in the stakeholder survey; likely indistinguishable from a zero effect when you do the statistics right.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Nobody has even asked the question, as far as I can tell.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	https://www.phila.gov/departments/office-of-sustainability/ The Office of Sustainability (OOS) works to improve quality of life in all neighborhoods. Our teams work with partners across the city to advance environmental justice, reduce carbon emissions, and **prepare Philadelphia for a hotter** and wetter future. (emphasis mine). Divisions include Energy and Climate and Environmental Justice; both relevant to heat adaptation and mitigation, but without a direct formal focus on heat. https://www.phila.gov/media/20250520143315/City-of-phila-org-chart.pdf <- in Philadelphia org chart.

6.2 Is there technical expertise in place and accessible?

Assessment score:	3
Rationale:	I could not find documentation of specific technical experts and their relationship to the Philly OOS, but given the technical depth of many of the documents and reports in OOS publications, technical expertise must be accessible. https://www.phila.gov/departments/office-of-sustainability/publications/

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Only via OOS, not uniquely focused on Heat.

References

City of Philadelphia, Office of Sustainability. (2021). *Philadelphia climate action playbook* [Report]. https://www.epa.gov/system/files/documents/2023-12/philadelphia-climate-action-playbook.pdf

City of Philadelphia. (2019). *Beat the Heat Hunting Park: A community heat relief plan* [Community plan]. https://www.phila.gov/documents/beat-the-heat-hunting-park/

Heat.gov. (2025). *Heat!...It's a Philly thing: After-action report/improvement plan* [Report]. https://heat.gov/wp-content/uploads/2025/08/Heat.Its-a-Philly-Thing-AAR-1.pdf

City of Philadelphia. (2022). *All-Hazard Mitigation Plan* [Hazard mitigation plan]. https://www.phila.gov/documents/hazard-mitigation-plan/

City of Philadelphia, Office of Sustainability. (2016). *Growing stronger – Toward a climate-ready Philadelphia* [Climate preparedness report]. https://www.phila.gov/documents/growing-stronger-toward-a-climate-ready-philadelphia/

Beat the heat huntington park community relief plan: focused on heat, a variety of strategies for heat management, community engagement, and citywide introspection.

Phoenix, USA

Scoring sheet

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City case study:	Phoenix, USA
Expert evaluator:	1

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	*Addressing both chronic heat stress and acute heat shocks:* The Heat Action Plan by definition deals with acute heat stress. However, the Tree and Shade Master plan (2024), and the Maricopa County Hazard Mitigation Plan (2022) does a great job of capturing chronic heat stress (long-term heat illness). *At the neighborhood level:* To a certain extent. The Heat Action Plan allocates policies to population groups (hikers, mobile home residents), which will inherently affect certain neighborhoods more than others (neighborhoods with parks and natural areas, neighborhoods with mobile home parks). *With detailed complex risk perspectives:* Maricopa County has an evolved process for attributing illnesses and mortality to heat. The 2025 plan mentions risk differentiation by gender and age categorization (79% male, 55% among 35-64 age group), urban/ rural (66%/77%), access to airconditioning (62% with a/c, but not working), among unhoused (50%), and substance use (58%). Plan challenges the idea of a “heat season”, arguing a large number of deaths in Maricopa County actually occurs in NWS’s Heat Risk is moderate or below moderate (p. 9). *Advanced data integration:* Cross-hazard integration is missing.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	*Drivers of exposure and vulnerability are comprehensively identified, addressing people, infrastructure, and/or ecosystems:* The Hazard Mitigation Plan (2024)

Assessment score:	3
	mentions the role of urbanization in increasing heat risks (p. 227). HMP (2024) documents population groups vulnerable to current heat, not ecosystems. *At the neighborhood level:* not at the neighborhood scale. *With detailed analysis of risk drivers and inclusion of multiple and reliable data sources:* yes, numerous state, national, and peer-reviewed journal sources including Arizona Department of Health Services, FEMA, NOAA, journal articles from Proceedings of the National Academy of Sciences

1.3 Are future heat risks projected?

Assessment score:	4
Rationale:	The Hazard Mitigation Plan (2024) has figures on future heat risks with past and projected number of days in a year with high temperatures in Phoenix, AZ at-or-above 100 °F and above 110 °F, classified by jurisdictions (p. 221-223).

---

2. Adaptation plan

Confidence score:	2

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	3
Rationale:	The Heat Response Plan is an emergency plan. The Tree and Shade Master Plan appears to much more adaptation focused, oriented towards reducing chronic heat exposure by adding shade. The funding allocation for this plan is unclear to me, funding mechanisms mentioned, but status of funding and therefore actual implementation unclear, hence the score of 3.

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	*Comprehensive goals exist across short- to long-term timeframes, with local context, and include detailed consideration of measurability, assessments, interconnections, and strategies for achieving the goals:* The Tree and Shade plan has Years 1-4 action items with specific and measurable metrics (p. 79)

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	*Engagement mechanisms are comprehensive, in place at a relevant local scale, and reflect a high depth of participation (e.g., iterative collaboration, co-production, or meaningful influence in decision-making).* As discussed on pages 16-25, multiple mechanisms were used for seeking and documenting input, including public events,

Assessment score:	4
	tailored workshops, planning committee meetings, with comments on trees and shade specifically tied to extreme heat

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	*Multiple actions are comprehensively identified, addressing a mixture of chronic heat stress and acute heat shocks, with local context, and strong consideration of future changes:* The Heat Response Plan, Tree and Shade Master Plan, and the Hazard Mitigation Plan all have specific strategies for addressing heat, and managing future heat in the case of the latter two plans.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	*Multiple actions are identified that address drivers of exposure* and vulnerability for people, infrastructure, and/or ecosystems in a local context, and addressing root causes and future change. Action include for example: “Revise municipal building and zoning codes to reduce the use of materials that contribute to the urban heat island effect”.....”Promote and expand programs that provide energy assistance to low income residents during the Summer” - 2024 Hazard Mitigation Plan

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	*Multiple actions are implemented with strong evidence of implementation:* Around 15 shade structure and tree canopy projects in the capital budget program (2025-2030). In late 2024, the city approved $60 million to increase shade (Davis-Young, 2024). The city also collaborates with the Maricopa County Association of Governments to provide access to publicly available cool spaces (Trego et al., 2025). In addition there are multiple initiatives to raise awareness about heat risks among vulnerable groups, such as ‘Take a Hike, Do it Right’ and ‘We’re Cool’. Comprehensively addressing a range of heat risks in a local context: Yes, they have a range of strategies, including strategies on heat response and long-term heat mitigation that are led by the City, as well as programs to encourage private action and education. Fully considering potential maladaptation risks: somewhat, the Tree and Shade plan recognizes the need to consider effective water resources management while adding trees (the drought-greening dilemma). Other conditions like air quality, the compounding impact of heat+storm etc are not really discussed or translated into

Assessment score:	3
	policy.

---

4. Adaptation strategy

Confidence score:	1

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Nothing comprehensive found. The Shade plan includes the water costs of tree care (p.44).

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	Nothing found in any of the relevant plans

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	2
Rationale:	Heat adaptation options in the Tree and Shade as well as the Hazard Mitigation plan are sequenced, but without justification for the sequence.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	Monitoring and evaluation processes are implemented in a local context, in terms of budget spending and project completion, as seen in the City Manager's Performance Dashboard and the Phoenix Parks and Preserve Initiative (PPPI or 3PI) initiative. But impact monitoring is missing. Likewise, measurability, target setting, and course correction mechanisms are missing

5.2 Is there evidence of reducing heat risk?

Assessment score:	3
Rationale:	Maricopa County Public Health reports drop in number of heat related deaths (2024), despite better documentation methods and historically high temperatures. Only from public health perspective. Evidence on sustained trend in heat-related deaths lacking.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Not found

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	4
Rationale:	The The Office of Heat Response and Mitigation coordinates on heat resilience with multiple departments and units with City of Phoenix, as well as local nonprofits, universities, and Maricopa County Association of Governments (Trego et al., 2025)

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	Based on Meerow & Keith (2024), I would say the technical expertise is comprehensively implemented, bringing together public health+emergency management+urban planning+climate science, addressing capacity-building, and integration at the local level.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Phoenix has a heat relief budget but also supplements with other funding sources (Davis-Young, 2025-NPR; Duhownik, 2025; Maricopa County, 2023).

References

City of Phoenix. (2025, March 27). *2025 Heat Response Plan.* https://www.phoenix.gov/content/dam/phoenix/heatsite/documents/FINAL%20-%202025%20HEAT%20RESPONSE%20PLAN.pdf

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Scoring sheet

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City case study:	Phoenix, USA
Expert evaluator:	2

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	The city and its plans clearly understand the current hazards, but the lack of foresight about how much extreme heat is likely to change in the coming years is problematic. There appears to be an implicit acknowledgement that the future will be hotter, but there is no data for that. This means that in many ways, the existing plans are always at best “up-to-date” instead of forward-looking.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Climate change is barely mentioned. The heat island effect and other local phenomena are identified clearly, but these are secondary problems. The primary driver is not identified.

1.3 Are future heat risks projected?

Assessment score:	0
Rationale:	They are not projected.

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Yes. There are plans at the local, county, regional, and state levels. They are almost entirely about how to deal with health-related heat stresses.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	There are goals for shade and for awareness campaigns, but there do not seem to be goals for other aspects.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	3
Rationale:	The plans almost entirely avoid the private sector. Government bodies are well-covered, and there is a lot of attention on homeless, underhoused, and poor communities which have a lot of contact with the government, but the private sector is barely mentioned.

---

3. Adaptation Actions

Confidence score:	4

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	As they pertain to human health, the hazards are identified. As they pertain to other issues like infrastructure preparedness or the viability of wildlife, I did not see evidence of a plan.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	So long as we focus entirely on human health, yes. The City of Phoenix has identified and understands the drivers of heat related health problems.

3.3 Are identified actions being implemented?

Assessment score:	4
Rationale:	The implementation seems very good within and across the government. The Heat Office and Chief Heat Officer seem to be working well across government departments, and the issue has gotten a lot of public attention, so there is substantial awareness.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	It's not clear. The focus appears to be almost exclusively on acute illness and death, and the main strategies appear to be quite inexpensive (awareness, regulatory change, shade investments). It's a bit like they are thinking of health as if they run an emergency room at a hospital. Harder-to-measure issues like children's learning, chronic health problems, depreciation of physical assets, costs of air conditioning, social problems like violence, etc. all seem to receive far less attention. For example, there is regulation on rental housing that requires renters to be able to cool their homes to 82°F with air conditioning. How does this regulation affect the rental market? If the regulation required cooling to 75°F (which is far better for sleeping), what would the benefits be to renters and to the city? What additional costs would landlords incur? This kind of question doesn't appear in the materials.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	3
Rationale:	The benefits of having a cross-governmental focus on heat as a topic appears to have created synergies. I don't see many trade-offs.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	It's hard to tell for sure, but the plans appear to be structured over time with measures of accountability and coordination.

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	It's too early to tell how well the actions will be monitored, but the focus on severe illness and death limits both the range of things being monitored and the resulting insight. Even mortality appears to focus on heat deaths in which the death is specifically identified as being from heat. Measures of all cause mortality are likely to be better proxies for heat stress.

5.2 Is there evidence of reducing heat risk?

Assessment score:	4
Rationale:	Especially in the most extreme cases, people in Phoenix have cooling stations, even homeless people who resist housing have a special outdoor facility, and there is more shade. The strategies Phoenix is using are very direct, so heat risk will be

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I see no evidence of this. I see no evidence of maladaptation at all. It's a big problem.

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	Inside the government and across jurisdictions and administrations there appears to be a high degree of coordination. In terms of who "owns" certain outcomes, it's not clear from the materials. It's also not clear what will constitute success or failure in the future, which would help with accountability and governance.

6.2 Is there technical expertise in place and accessible?

Assessment score:	4
Rationale:	The engagement of technical experts within the government and from the academic community appears to be strong. Arizona State University is a distinctive institution because of its combination of practicality and scholarship. It appears to be an ideal partner.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	There appears to be a strong commitment to a moderate level of staffing and investment for the current model which focuses on emergencies, avoiding serious health problems/mortality, and shade. What's not clear is whether there will be funding for other forms of heat adaptation including larger infrastructure improvement. Higher temperatures will bring new problems and are unlikely to scale linearly. For example, the current plans focus heavily on homeless populations. But at higher temperatures there could be large-scale heat problems for people in homes that simply cannot be cooled enough for yet higher, more prolonged heat.

References

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Sacramento, USA

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

For each assessment score, provide a brief rationale identifying the evidence used and explaining your reasoning. If no evidence supports an effort, assign an assessment score of 0 and reflect limitations in the quantity or quality of evidence through the confidence score. Cite all publicly available evidence in the References section of the scoring sheet or within your written rationale and clearly document any stakeholder survey responses or firsthand knowledge used.

City case study:	Sacramento, USA
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	4
Rationale:	Identification of both human health hazards and infrastructure hazards, and the ways they can interact and compound. Specifically, discussion of heat exhaustion, stroke, and death; and infrastructure impacts: energy generation and distribution; transportation. Compounding risks: black-outs and higher energy bills and disruption of medical or social services (CAAP p14-16) Neighborhood-level specificity in different temperature experiences. Map on CAAP p149

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	4
Rationale:	Comprehensive description of UHI effect, noting which types of neighborhoods are most affected. NASA data analysis of neighborhood level exposure. Identification of both physical and social drivers of vulnerability: “outdoor workers, unhoused residents, and people without air conditioning equipment or adequate ventilation, and people who may be unable to pay for increased energy use by using air conditioning are most vulnerable” “Those who fear exposure to crime may hesitate to open windows, residents with limited transportation options may be unable to travel to cooler locations, while some may not be aware of the dangers posed by high heat or may not think of themselves as susceptible. Some individuals, including the elderly, those taking certain types of medication, and children, can also be more sensitive to the effects of heat” (CAAP, p14)

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Projections of annual maximum temperatures and number of extreme heat days are used (CAAP, p12-13) Clear use of data: Assessment of how climate change will impact Sacramento is based on “publicly available data produced by the Geospatial Innovation Facility at the University of California, Berkeley with funding and advisory oversight by the California Energy Commission and the California Strategic Growth Council, comparing the historical period to mid-century projections.” (CAAP, p11) also mentioned on page 128, this data are from the Cal-Adapt project.

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	Goals, Policies, and Actions section of the Adaptation section of CAAP (p143). Has been adopted by Sacramento City Council in 2024

2.2 Is there a range of short- to long-term goals?

Assessment score:	4
Rationale:	Goals, Policies, and Actions section of CAAP (p143), specifically GOAL A-2: “Create built environments that reduce exposure to extreme heat and mitigate urban heat island effect.” (p146) objectives of providing access to green space within a quarter-mile of home for all residents by 2030 and of achieving a baseline tree canopy of 25 percent by 2030 and 35 percent by 2045. Other goals include: cooling design techniques; cool roof retrofits; cool libraries; drinking water fountain access; shade structures; extreme weather outreach

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	The role of stakeholder and community engagement is discussed, identifying keep stakeholder groups (CAAP p187), but lacks detail on the specific engagement mechanisms. (discussion of prior engagement explained in chapter 4, starting p41)

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3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	4
Rationale:	Yes, Actions A-2-1 to A-2-14 all clearly listed and identified, addressing impacts of both chronic and acute heat hazards (CAAP page 151-154). A-2-1: Heat reduction in the public realm A-2-2: Bus shelter design A-2-3: Cooling landscape standards A-2-4: Heat-resilient design techniques (standards and municipal code relating to passive cooling and energy demand reduction) A-2-5: Urban forest plan A-2-6: Minimum tree requirements A-2-7: Parking lot shade ordinance A-2-8: Street standards for tree canopy A-2-9: Tree education A-2-10: Cooling centers in high priority locations A-2-11: Extreme weather outreach strategy A-2-12: Severe weather action plan A-2-13: Home air conditioning A-2-14: Heat reduction in parks

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	Yes, there are actions that address some drivers of heat exposure and vulnerability, but lack depth in addressing root causes. Also, seemingly all actions focus on heat impacts on people, and not on infrastructure or ecosystems. Of the 14 actions listed above, the ones most relevant for addressing root causes and drivers of vulnerability might be: A-2-1: Heat reduction in the public realm A-2-3: Cooling landscape standards A-2-10: Cooling centers in high priority locations A-2-11: Extreme weather outreach strategy A-2-12: Severe weather action plan A-2-13: Home air conditioning

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	At the time of the document (2024) 2 of the 14 actions were implemented in phase 1 (A-2-11 extreme weather outreach strategy and A-2-12 the severe weather action plan), with the remaining 12 actions scheduled to begin implementation during phase 2 (2025-2030).

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Various costs and benefits (economic and non-economic) are mentioned for different actions and strategies, but not comprehensively analyzed for all. Most commonly listed benefits are the public health benefits and environmental quality; cost savings are also mentioned. Detailed economic costs of implementing each action are not available; but there is discussion of individual versus city costs. There is also discussion of the counterfactual costs of doing nothing (p 191)

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies are discussed at a surface level; mostly in the form of discussion of co-benefits that certain heat adaptation actions provide. Synergies between existing general policies and the heat adaptation goals/actions are listed and discussed (p 147-148)

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	Clear articulation of a two-phase approach, with lead agencies and supporting agencies identified. Most actions involve design and feasibility study steps to implement in an iterative way. Routine updates to CAAP are planned, where progress will be reported and approaches will be revisited. Table 8-2 Implementation timeline (p 195)

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5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The listed actions will be monitored, and progress will be reported to the City Council in 2027. But there it is lacking in detail how each action will be monitored and evaluated. No depth of discussion on target setting or course correction. “The City will provide a report with information on the implementation status and monitoring results to City Council in 2027” (p 194)

5.2 Is there evidence of reducing heat risk?

Assessment score:	1
Rationale:	There is very little citation of evidence that the indicated actions are reducing heat risk.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I did not find any discussion of maladaptation risks.

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6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	While no specific “Heat office” exists for the city of Sacramento, there are clear governance mechanisms in place. Action A-1-2 establishes an Adaptation and Resilience Staff in the City Manager’s Office. CAAP clearly identifies which agencies are responsible for implementing each heat adaptation action, with institutional power, authority, and connectivity opportunities identified.

6.2 Is there technical expertise in place and accessible?

Assessment score:	1
Rationale:	There is very little discussion of technical expertise. There will be some ongoing community engagement efforts; certain actions rely on existing emergency management networks; data and climate science expertise from Geospatial Innovation Facility at the University of California, Berkeley and Cal-Adapt.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There does not appear to be sustainable funding that is specifically dedicated to heat adaptation; but there are funding and financing strategies identified that apply to heat adaptation actions. These include various state funding opportunities and other grant opportunities, most of which remains to be secured. (p 191)

References

City of Sacramento. (2024, February 27). *Climate Action & Adaptation Plan.* https://www.cityofsacramento.gov/content/dam/portal/cdd/Planning/adopted-2040-general-plan/R2024-0067%20Adopting%20and%20Implementing%20the%20Sacramento%20Climate%20Action%20and%20Adaptation%20Plan.pdf

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Sacramento Metropolitan Air Quality Management District. (n.d.). *Capital Region Urban heat island mitigation project*. Retrieved July 7, 2025, from https://urbanheat-smaqmd.hub.arcgis.com/

California Natural Resources Agency. (2022). *Protecting Californians From Extreme Heat: A State Action Plan to Build Community Resilience.* https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Climate-Resilience/2022-Final-Extreme-Heat-Action-Plan.pdf

Scoring sheet

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City case study:	Sacramento, USA
Expert evaluator:	2

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	4

1.1 Are current heat hazards identified?

Assessment score:	3
Rationale:	Yes, the maps here are very clear, interactive, and written with public understanding in mind. Modeling uses an index which does not distinguish between chronic and acute heat stressors.

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Yes, factors like surface albedo, waste heat from vehicles, and local to regional weather conditions and prevailing wind directions are described, but it's not as clearly put together as the overall modeling effort for current heat hazards. SacAdapt also has a comprehensive Vulnerability Assessment: focusing on physical vulnerabilities of the transportation system to extreme heat. https://www.cityofsacramento.gov/content/dam/portal/pw/mas/climate-action/sacadapt/SacAdapt_VulnerabilityAssessment.pdf

1.3 Are future heat risks projected?

Assessment score:	3
Rationale:	Yes, carefully projected, and presented for 2050 in the UHI project summary report.

---

2. Adaptation plan

Confidence score:	4

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There exists: (1) State level adaptation plan, with all the criteria requested for score of (4); except that it is statewide, and so does not have sub-city scale perspectives included. (2) MSA area adaptation plan, with a comprehensive list of transportation focused opportunities, strategies, and potential financial mechanisms for implementation. Not a fully budgeted and staffed plan of action. Focused on the transportation system.

2.2 Is there a range of short- to long-term goals?

Assessment score:	3
Rationale:	9 pilot project/case studies identified, budgeted, and apparently in process. Framework provided for developing longer term plans and goals but not an actual plan of action or mid-long term goals.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	4
Rationale:	https://www.airquality.org/LandUseTransportation/Documents/Community%20Priorities%20Report.pdf Full fledged communities priority report put together, including listening sessions, youth engagement, and a survey administered at 20 locations/events, including multi-lingual outreach.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	all i can find is the transportation report, so all actions, while somewhat for this sector, are focused on only one affected area. https://www.cityofsacramento.gov/content/dam/portal/pw/mas/climate-action/sacadapt/SacAdapt%20Final%20Approved%20Plan%20260414.pdf

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	2
Rationale:	https://www.cityofsacramento.gov/content/dam/portal/pw/mas/climate-action/sacadapt/SacAdapt%20Final%20Approved%20Plan%20260414.pdf Actions that address drivers of heat exposure within the transportation sector are identified (shade stops, cool roofing, HVAC system age and capacity), with some depth, but focused on transportation system only: not multiple areas.

3.3 Are identified actions being implemented?

Assessment score:	1
Rationale:	https://www.cityofsacramento.gov/content/dam/portal/pw/mas/climate-action/sacadapt/SacAdapt%20Final%20Approved%20Plan%20260414.pdf The final adaptation plan was only signed in April 2026. There hasn't been much progress in this short time.

---

4. Adaptation strategy

Confidence score:	3

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	2
Rationale:	Heat resistant pavement binder: cost-benefit assessment part of implementation plan. Plan for cooling via built environment, active transit pathways, urban forest plan, shade trees. Economic costs assessed. No non-economic cost or benefit assessment yet. The implementation guidance does have a cost benefit analysis assessment: it focuses on user experience, but does not yet consider any maladaptation perspectives, therefore doesn't allow score of 3. https://www.cityofsacramento.gov/content/dam/portal/pw/mas/climate-action/sacadapt/SacAdapt_%20Implementation%20Guidance%20Final.pdf

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	0
Rationale:	No discussion of synergies across different options.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	3
Rationale:	The combination of the pilot studies and the portfolio of climate adaptation options shows a flexible approach for heat adaptation.

---

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	https://sacramento.legistar.com/View.ashx?M=F&ID=15493957&GUID=6B5A6A4C-7F10-4366-9395-530664EE1D4D annual ish long form reporting on progress towards Sacramento's Climate Action & Adaptation Plan. However, reducing heat is only described as an ancillary benefit to the overall climate adaptation plans. Thus, there is still no heat specific monitoring.

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	No monitoring = no evidence

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	Maladaptation risk was not considered in planning strategies, and there is no monitoring plan.

---

6. Heat governance

Confidence score:	3

6.1 Are heat governance structures established?

Assessment score:	3
Rationale:	SacRT (Sacrament Rapid Transit) has nobody in a climate/heat focused role on the org charts: https://www.sacrt.com/wp-content/uploads/Department-Org-Charts-03.10.2026.pdf City of Sacramento has a Climate Action & Sustainability Team formed in 2021, seems to have ~quarterly public meetings. https://www.cityofsacramento.gov/public-works/mobility-and-sustainability/climate. No apparent heat focused staff. However, staff & governance structures for the CAAP (where heat is a formal and explicit aspect of the CAAP) 'count' towards heat governance specifically, score is revised to incorporate governance structures around climate action and adaption, which are robust.

6.2 Is there technical expertise in place and accessible?

Assessment score:	0
Rationale:	No heat related technical expertise is identifiable in city documents, org charts, or other public records.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	1
Rationale:	There does appear to be some funding for heat adaptation actions in the transportation sector.

References

City of Sacramento. (2024, February 27). *Climate Action & Adaptation Plan.* https://www.cityofsacramento.gov/content/dam/portal/cdd/Planning/adopted-2040-general-plan/R2024-0067%20Adopting%20and%20Implementing%20the%20Sacramento%20Climate%20Action%20and%20Adaptation%20Plan.pdf

Sacramento County Planning and Environmental Review. (2017). *Climate Change Vulnerability Assessment for the Sacramento County Climate Action Plan.* https://planning.saccounty.gov/PlansandProjectsIn-Progress/Documents/Climate%20Action%20Plan/Climate%20Change%20Vulnerability%20Assessment.pdf

Sacramento Metropolitan Air Quality Management District. (n.d.). *Urban heat island mitigation plan* [PDF]. Retrieved July 7, 2025, from https://www.airquality.org/LandUseTransportation/Documents/UHI%20Mitigation%20Plan.pdf

Sacramento Metropolitan Air Quality Management District. (n.d.). *Capital Region Urban heat island mitigation project*. Retrieved July 7, 2025, from https://urbanheat-smaqmd.hub.arcgis.com/

California Natural Resources Agency. (2022). *Protecting Californians From Extreme Heat: A State Action Plan to Build Community Resilience.* https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Climate-Resilience/2022-Final-Extreme-Heat-Action-Plan.pdf

https://www.cityofsacramento.gov/public-works/mobility-and-sustainability/climate/Initiatives/adaptation-resilience/sacadapt

Toronto, Canada

Scoring sheet

*Please assign an assessment score from 0 (none) to 4 (very high) to each assessment question using the **Heat Adaptation Scoring Rubric** and one confidence score from 0 (no confidence) to 4 (very high confidence) to each benchmark criterion using the **Degree of Confidence Scoring Rubric.** Base each judgment on the available evaluation evidence, including publicly available documents, stakeholder survey responses (if available), and firsthand knowledge of the local context.*

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City case study:	Toronto, Canada
Expert evaluator:	1

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1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	2
Rationale:	The main hazard identified is acute heat shock and the impacts on human health, with little to no mention of chronic heat stress. There does not appear to be any neighborhood level analysis of hazards, beyond mentioning that lower income apartment buildings are more likely to face higher temps and power outages. They do include data on the estimated number of heat-related premature deaths in the city. (Toronto First Resilience Strategy)

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	Both the Toronto First Resilience Strategy and the Heat Relief Strategy documents have pretty comprehensive lists of the health factors that drive human health vulnerability to heat, and mention other interacting infrastructure factors as well (mostly about housing and power outages). There is some local relevance but no neighborhood level analysis.

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Mid and late century climate projection data appear to be used to estimate the

Assessment score:	2
	number of future heat days, but this is only shown for one scenario, with no neighborhood level projections. (Toronto First Resilience Strategy)

---

2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	4
Rationale:	The City of Toronto Heat Relief Strategy was published in 2025, with clearly defined goals, commitments, and responsibilities.

2.2 Is there a range of short- to long-term goals?

Assessment score:	2
Rationale:	Toronto's climate resiliency strategy includes multiple goals related to heat (p68), and the Heat Relief Strategy includes related actions. The goals are not super detailed, but do offer some consideration of assessment and interconnections.

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	2
Rationale:	It appears that somewhat extensive stakeholder and community engagement mechanisms were used to create the Toronto First Resilience Strategy, but plans for continuing engagement are lacking. There is minor mention of future community engagement (p147 next steps), but little detail on how that will continue to be implemented.

---

3. Adaptation Actions

Confidence score:	3

3.1 Are actions addressing heat hazards identified?

Assessment score:	2
Rationale:	The main actions identified in the Toronto First Resilience Strategy have to do with home and apartment retrofitting to improve resilience during heatwaves. These are mentioned as important for chronic and acute heat stress hazards, but not a lot of detail is provided for these actions.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	3
Rationale:	The City of Toronto Heat Relief Strategy focuses on public messaging, outreach, and creating cool spaces that people can go to during heatwaves, with clear local roles and responsibilities identified. Related actions for reducing the urban heat island effect through green infrastructure are also mentioned.

3.3 Are identified actions being implemented?

Assessment score:	3
Rationale:	Home resilience and retrofit actions are already underway (p72). Tree planting strategy is being implemented. A more detailed heat action plan is also being developed.

---

4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	1
Rationale:	Costs and benefits are not analyzed in economic terms, but benefits are mentioned in non-economic terms, but not extensively.

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	2
Rationale:	Synergies between some actions are mentioned, but not in detail, such as how home retrofits and green infrastructure can help achieve multiple goals, and how certain flood planning can also be synergistic with heat action planning.

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	Very little discussion of these plans being sequenced or pathway-based, but they are iterative in the sense that there are institutional structures in place for them to be revised and updated regularly.

---

5. Monitoring and evaluation

Confidence score:	2

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	2
Rationale:	The Resilience Strategy document mentions monitoring as part of the evaluation phase for many actions, but without clear details or implementation

5.2 Is there evidence of reducing heat risk?

Assessment score:	2
Rationale:	The Resilience Strategy draws on evidence about how building retrofits will reduce heat risk, but lacks local context.

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	From what I have read, there is no mention of reducing maladaptation risk specifically.

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6. Heat governance

Confidence score:	2

6.1 Are heat governance structures established?

Assessment score:	2
Rationale:	For some of the actions (like emergency heat relief) there are clear governance established, but for other actions like retrofitting there is less clear governance established.

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	Technical expertise is partially in place— was clearly drawn upon for different elements of the plans and actions, but there is not a clear/coherent establishment of technical expertise mechanisms going forward.

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	2
Rationale:	Hard to score without clear understanding, but the available documents do not have a detailed funding plan, but there are currently funded agencies with some of the

Assessment score:	2
	roles and responsibilities of the plan actions.

References

City of Toronto. (2019). *Toronto's first resilience strategy* [Resilience strategy]. https://www.toronto.ca/ext/digital_comm/pdfs/resilience-office/toronto-resilience-strategy.pdf

Toronto Public Health. (2025). *City of Toronto heat relief strategy* [Report]. City of Toronto. https://www.toronto.ca/wp-content/uploads/2024/05/9635-PublicHealthHeatReliefStrategy.pdf

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Bilhete, B. (2025, June 6). *Toronto's getting hotter. Experts say a chief heat officer could help the city adapt*. CBC News. https://www.cbc.ca/news/canada/toronto/chief-heat-officer-toronto-1.7553121

Scoring sheet

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City case study:	Toronto, Canada
Expert evaluator:	2

---

1. Climate impact, vulnerability, and risk assessment

Confidence score:	3

1.1 Are current heat hazards identified?

Assessment score:	1
Rationale:	No discussion of neighborhood scales, complex or compound heat, virtually nothing about timescales except 2 day heat definition

1.2 Are current drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Superficial generic mention of vulnerable groups, but nothing that feels Toronto specific

1.3 Are future heat risks projected?

Assessment score:	2
Rationale:	Only hazards really are described in future, and no neighborhood resolution or compound dimensions

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2. Adaptation plan

Confidence score:	3

2.1 Is there a dedicated heat adaptation plan?

Assessment score:	2
Rationale:	There is a broader 2019 resilience plan, but it focuses relatively little on heat. There is also a heat plan but it does not include any long term risk or long term adaptation components

2.2 Is there a range of short- to long-term goals?

Assessment score:	1
Rationale:	Minimal focus on heat in any kind of specific way. Some highly general goals that are heat relevant, regarding things like mobility and transportation, but the connects drawn to heat are minimal at best

2.3 Are stakeholder and community engagement mechanisms in place?

Assessment score:	1
Rationale:	Some workshops in 2018-2019 back when that had a resilience officer but not clear much has happened since then especially in terms of anything that would support long term planning

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3. Adaptation Actions

Confidence score:	2

3.1 Are actions addressing heat hazards identified?

Assessment score:	1
Rationale:	A few solid strategies for ‘public housing towers’ identified, like retrofits, more AC, and insulation. Overall though shockingly few tangible actions identified.

3.2 Are actions addressing drivers of heat exposure and vulnerability identified?

Assessment score:	1
Rationale:	Only generic language about vulnerability. Decision to focus on public housing towers lifts this from ‘0’ to ‘1’ (although they dont talk specifically about vulnerability and exposure in the towers

3.3 Are identified actions being implemented?

Assessment score:	2
Rationale:	The few actions do appear to be, but tough to say given that the heat plan is 6 years old

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4. Adaptation strategy

Confidence score:	2

4.1 Are costs and benefits of heat adaptation options analyzed?

Assessment score:	0
Rationale:	I saw no discussion of this

4.2 Are synergies and trade-offs between heat adaptation options assessed?

Assessment score:	1
Rationale:	Essentially no, but I gave a ‘1’ since broader themes like equity and justice were linked in a general way to heat resilience. Perhaps this could VERY generously be deemed a ‘synergy’ of heat adaptation options

4.3 Are heat adaptation options planned in a sequenced, pathway-based approach?

Assessment score:	1
Rationale:	I scored a ‘1’ rather than a ‘0’ only because the building tower resilience strategies are very local.

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5. Monitoring and evaluation

Confidence score:	1

5.1 Are adaptation actions monitored and evaluated?

Assessment score:	0
Rationale:	I saw no discussion of this

5.2 Is there evidence of reducing heat risk?

Assessment score:	0
Rationale:	I saw no discussion of this

5.3 Is there evidence of reducing maladaptation risk?

Assessment score:	0
Rationale:	I saw no discussion of this

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6. Heat governance

Confidence score:	1

6.1 Are heat governance structures established?

Assessment score:	1
Rationale:	15 different agencies are involved in heat management, but they have not had a resilience officer in years, and they have never had a heat resilience officer

6.2 Is there technical expertise in place and accessible?

Assessment score:	2
Rationale:	A diverse group of experts is described, it just isn't clear how much they are all doing together

6.3 Is there dedicated and sustainable heat adaptation funding?

Assessment score:	0
Rationale:	I am assuming the absence of discussion of this means it is not in place (which could be incorrect)

References

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Supplementary information references

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