Appendix B: Disruption analysis of municipality services

1 Power System

1.1 Scenario: BASELINE

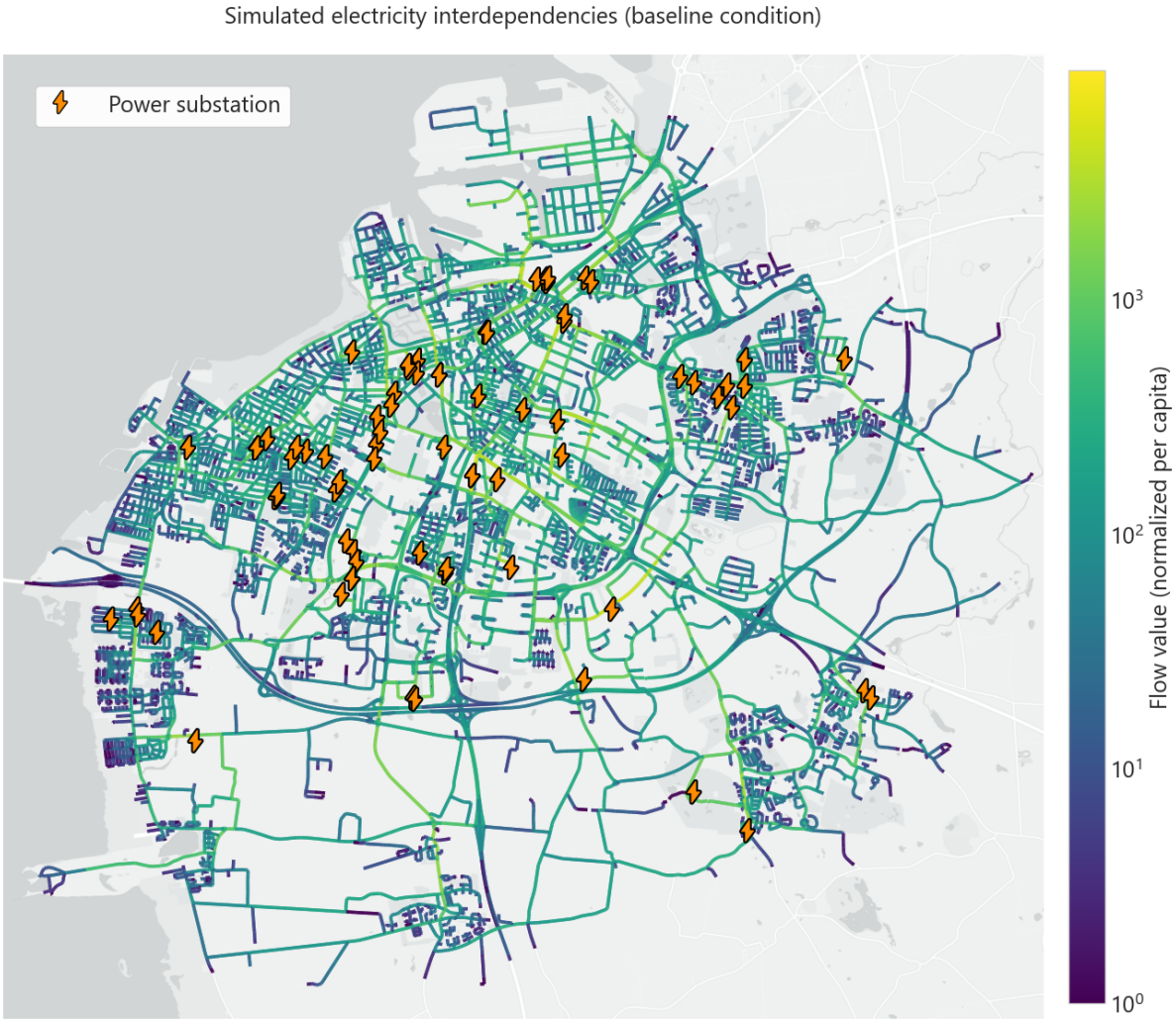


Figure B-1: Simulated electricity interdependencies for the baseline scenario.

1.2 Scenario: MHW

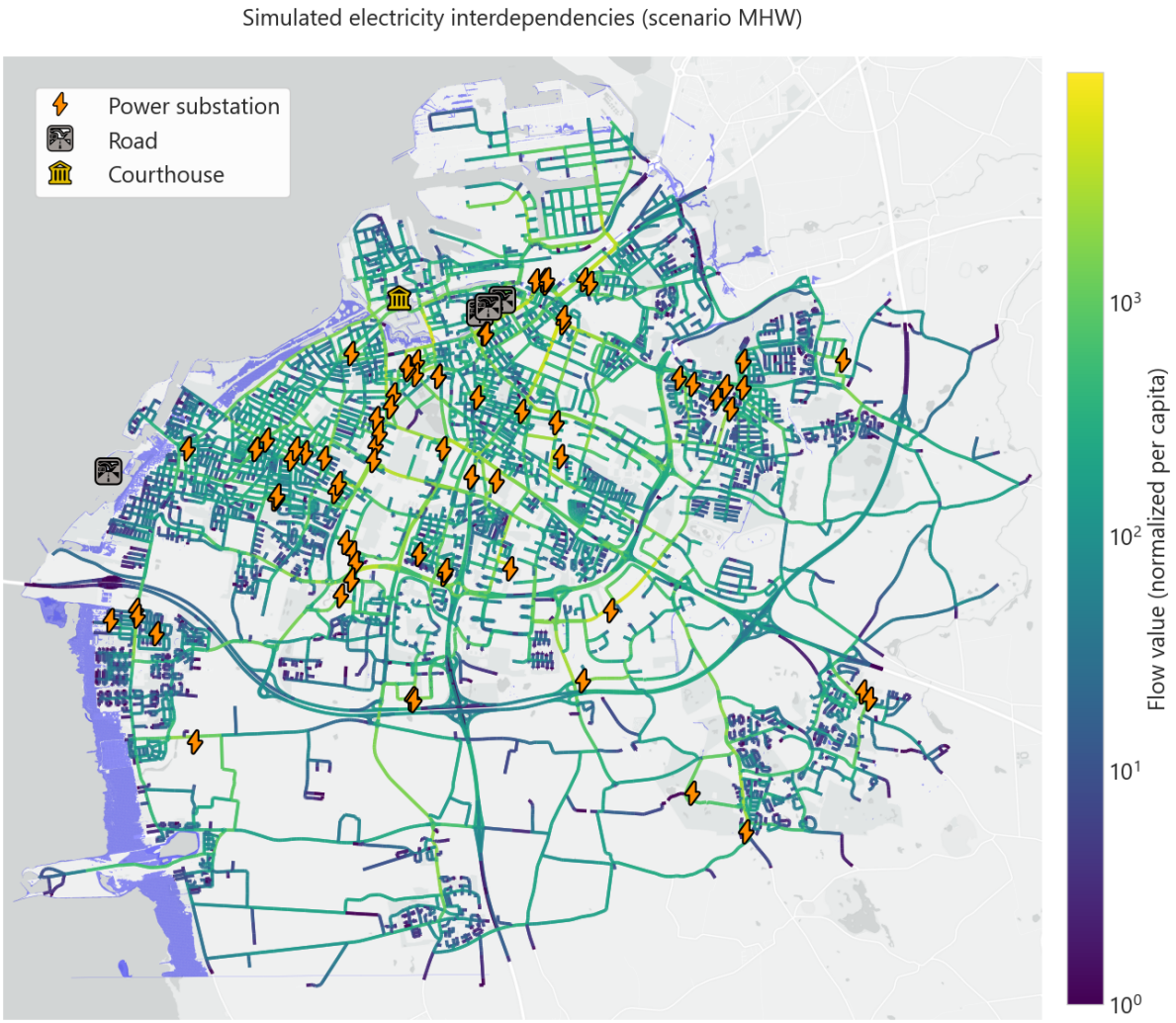


Figure B-2: Simulated electricity interdependencies for the MHW scenario.

Automated Impact Analysis The MHW scenario presents a high risk of widespread power outages, disproportionately affecting residential areas and critical societal infrastructure, specifically impacting thousands of individuals.

Under the MHW hazard scenario, the electricity infrastructure in Malmö exhibits significant vulnerabilities, resulting in high levels of unmet demand concentrated in residential areas, a courthouse, and supermarkets. Analysis of the top 1 percentile of unmet demand reveals a severe impact on social welfare, with residential areas RO000224, RO003439, RO010584, and RO003419 experiencing high unmet demand values of 127, 105, 100, and 93 per capita demand units, respectively. These values indicate power outages directly affecting an estimated 127, 105, 100, and 93 individuals in those specific residential areas. The high unmet demand at the Courthouse (SA00004) with a value of 149 represents a high impact on public safety and governance, as power disruptions hinder the proper functioning of the judicial system. Furthermore, the unmet demand of 82 observed at each of the two supermarkets (F00029 and F00049) signals a significant impact on economic activity and social welfare due to potential disruptions in food supply and essential goods availability.

Table B-1: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
SA00004	149	No Name	Courthouse
RO000224	127	Korsgatan	Residential area
RO003439	105	Lilla Kvarngatan	Residential area
RO010584	100	Bryggövägen	Residential area
RO003419	93	Södra Promenaden	Residential area

Table B-2: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
ES00002	75	1722 Bronsåldersgatan nätstation	Power substation
ES00051	75	No Name	Power substation
ES00058	75	No Name	Power substation
ES00057	75	No Name	Power substation
ES00056	75	No Name	Power substation

1.3 Scenario: EV

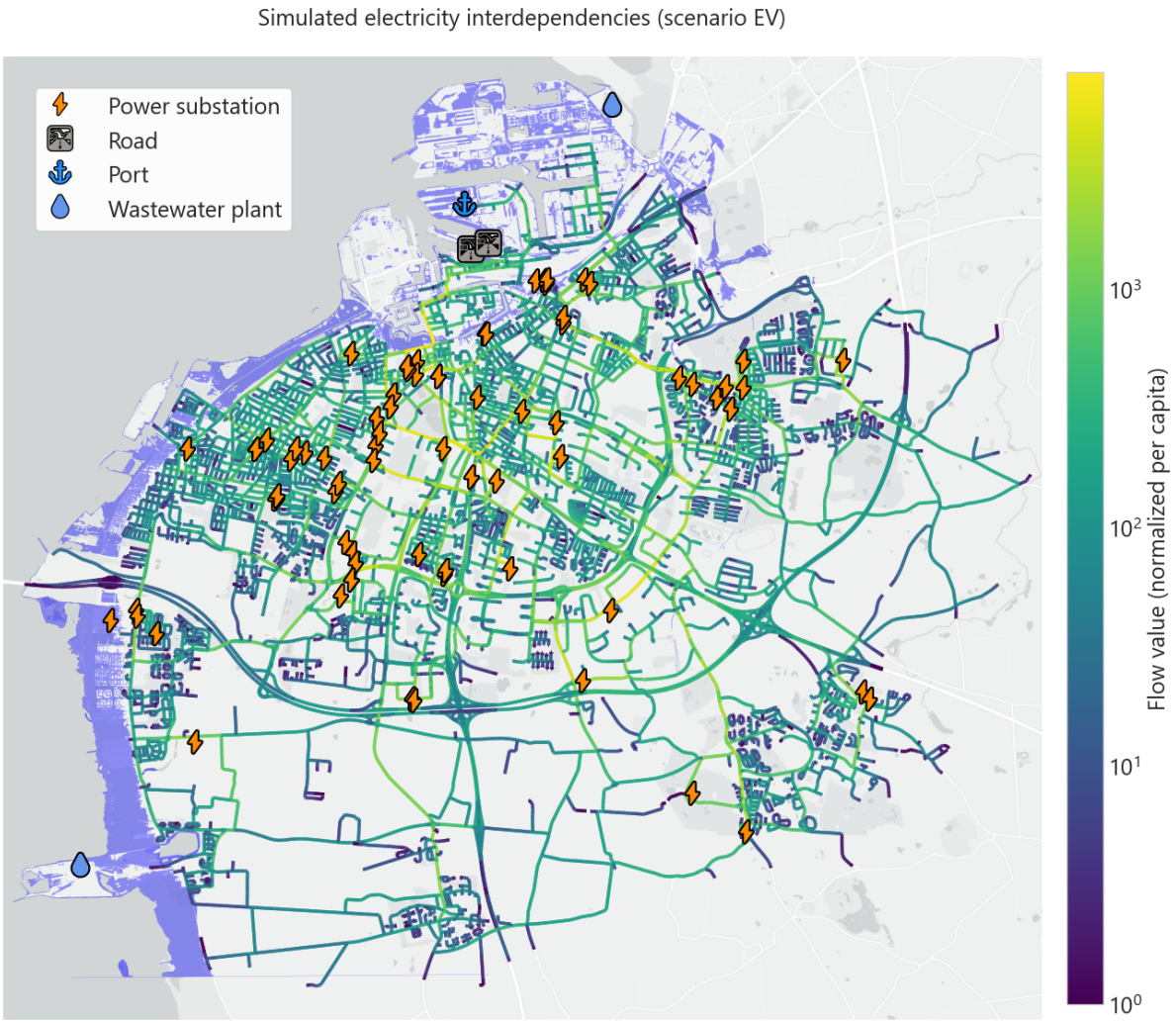


Figure B-3: Simulated electricity interdependencies for the EV scenario.

Automated Impact Analysis The EV hazard scenario in Malmö's 2125 infrastructure model reveals extreme vulnerabilities in the power grid, with the port and wastewater plants facing catastrophic disruptions, while residential areas experience widespread high-impact outages affecting thousands of people.

The analysis of the top 1 percentile of unmet demand in Malmö's power infrastructure under the EV (storm surge) scenario highlights critical vulnerabilities with significant implications for public safety, economic activity, and social welfare. The data reveals two primary clusters of concern: extreme disruptions to critical infrastructure (CI) nodes and high-impact outages in residential areas.

The port (PO00001) and two wastewater plants (MT00007 and MT00006) exhibit extreme impacts, with unmet demand values exceeding 1,000 units. These disruptions pose severe risks to public safety and economic stability. The port's failure could paralyze logistics, trade, and emergency supply chains, while the wastewater plants' collapse would threaten sanitation, increasing health risks and exacerbating flood damage. The cascading effects of these failures could further strain the power grid, compounding the crisis.

Residential areas account for the majority of high-impact disruptions, with unmet demand values ranging from 173 to 331 units, each representing an estimated population of affected individuals. This suggests that thousands of residents would face prolonged power outages, jeopardizing essential services such as heating, medical equipment, and communication. The concentration of these outages indicates systemic vulnerabilities in the power distribution network, particularly in densely populated zones. While the exact geographic distribution is not specified, the sheer number of affected residential nodes underscores the need for targeted resilience planning to mitigate cascading

social and economic consequences.
In summary, the EV scenario exposes Malmö's power infrastructure to extreme and high-impact disruptions, with the port and wastewater plants as critical failure points and residential areas bearing the brunt of widespread outages. The human toll is substantial, with thousands of residents at risk of prolonged service loss, emphasizing the urgency of fortifying the grid against storm surge-induced cascading failures.

Table B-3: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
PO00001	2150	Malmö Port	Port
MT00006	950	VA SYD	Wastewater plant
MT00007	950	VA SYD	Wastewater plant
RO019691	331	Frihamnsallén	Residential area
RO002349	320	Grimsbygatan	Residential area

Table B-4: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
ES00002	539	1722 Bronsåldersgatan nätstation	Power substation
ES00051	539	No Name	Power substation
ES00058	539	No Name	Power substation
ES00057	539	No Name	Power substation
ES00056	539	No Name	Power substation

1.4 Scenario: EN

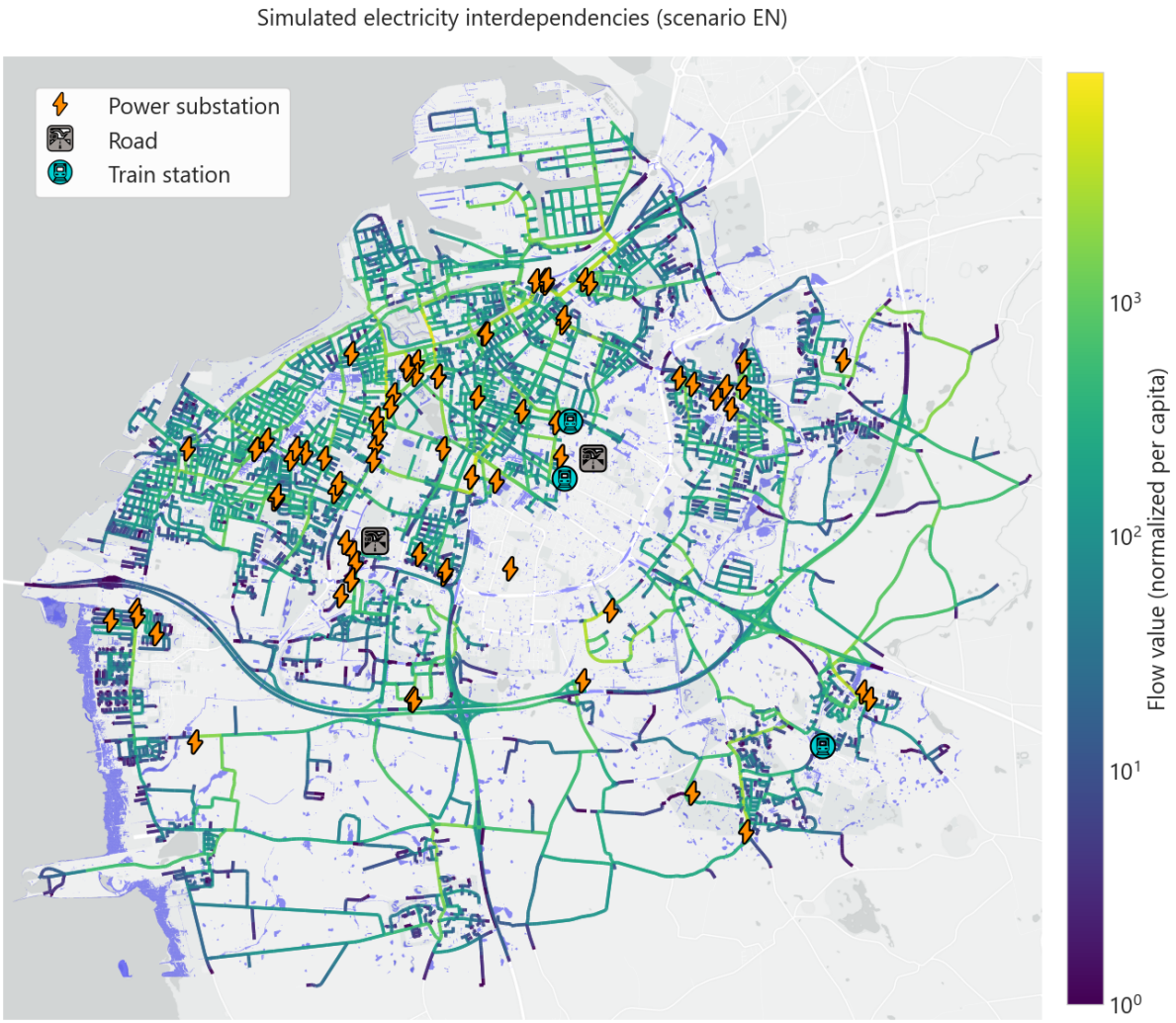


Figure B-4: Simulated electricity interdependencies for the EN scenario.

Automated Impact Analysis The analysis reveals that under the severe cloudburst scenario (EN), Malmö's power infrastructure faces extreme and high-impact disruptions, with residential areas bearing the brunt of service losses, affecting an estimated 731 to 181 individuals per affected node.

The data highlights a pronounced vulnerability in Malmö's power distribution network under the EN hazard scenario, with residential areas experiencing the most severe consequences. The top 1 percentile of unmet demand is dominated by residential nodes, indicating a significant risk to social welfare and public safety. The highest unmet demand is recorded at RO008348, with an extreme impact of 731 per capita demand units, translating to an estimated 731 individuals affected by power outages. This is followed by multiple residential areas with high impacts, including RO005252 (502) and RO010028 (358), further emphasizing the widespread disruption to households.

Train stations also feature prominently in the top 1 percentile, with three nodes (T00006, T00003, T00004) each experiencing an unmet demand of 625 units. This suggests a high impact on economic activity and public transportation, potentially stranding commuters and disrupting regional mobility. Water reservoirs (MT00005, MT00004) are similarly affected, with unmet demands of 456 units, raising concerns for water supply reliability and public health.

The concentration of high-impact residential areas suggests geographic clustering of vulnerability, though the exact locations are not specified in the data. The consistent presence of residential nodes across the top 1 percentile underscores the scenario's potential to destabilize community welfare, with cascading effects on healthcare, emergency services, and daily life. The absence of commercial or industrial nodes in the top 1 percentile may indicate either their relative resilience or a data limitation, but the focus on residential and transportation infrastructure points

to a scenario where basic human needs and mobility are most at risk.
In summary, the analysis underscores that under the EN scenario, Malmö's power infrastructure faces severe disruptions with extreme and high impacts on residential populations and critical transportation hubs, necessitating urgent attention to mitigate cascading social and economic consequences.

Table B-5: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO008348	731	Snödroppsgatan	Residential area
T00006	625	Oxie	Train station
T00004	625	Rosengård	Train station
T00003	625	Persborg	Train station
RO005252	502	Hårds väg	Residential area

Table B-6: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
ES00002	1412	1722 Bronsåldersgatan nätstation	Power substation
ES00051	1412	No Name	Power substation
ES00058	1412	No Name	Power substation
ES00057	1412	No Name	Power substation
ES00056	1412	No Name	Power substation

2 Water System

2.1 Scenario: BASELINE

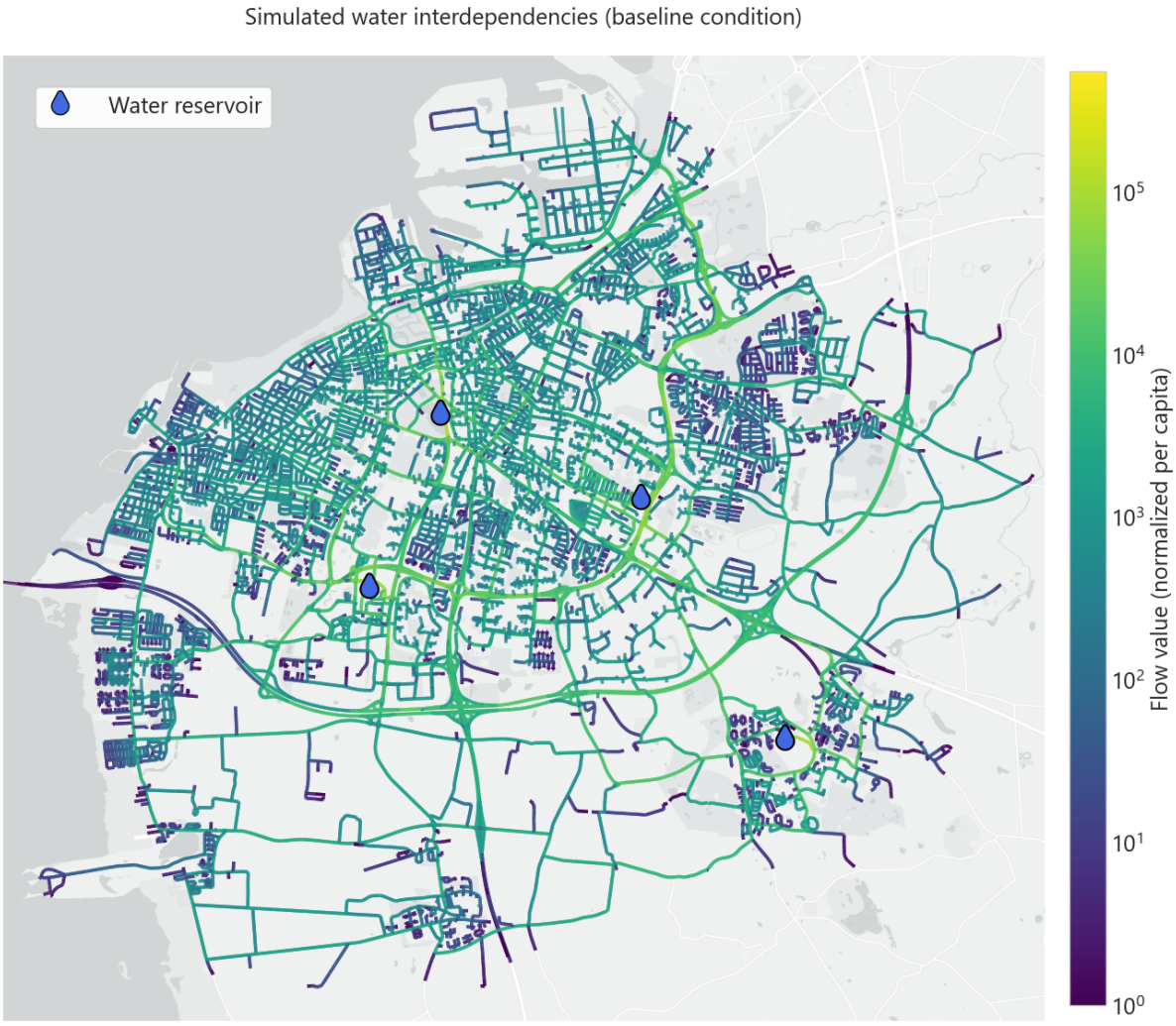


Figure B-5: Simulated water interdependencies for the baseline scenario.

2.2 Scenario: MHW

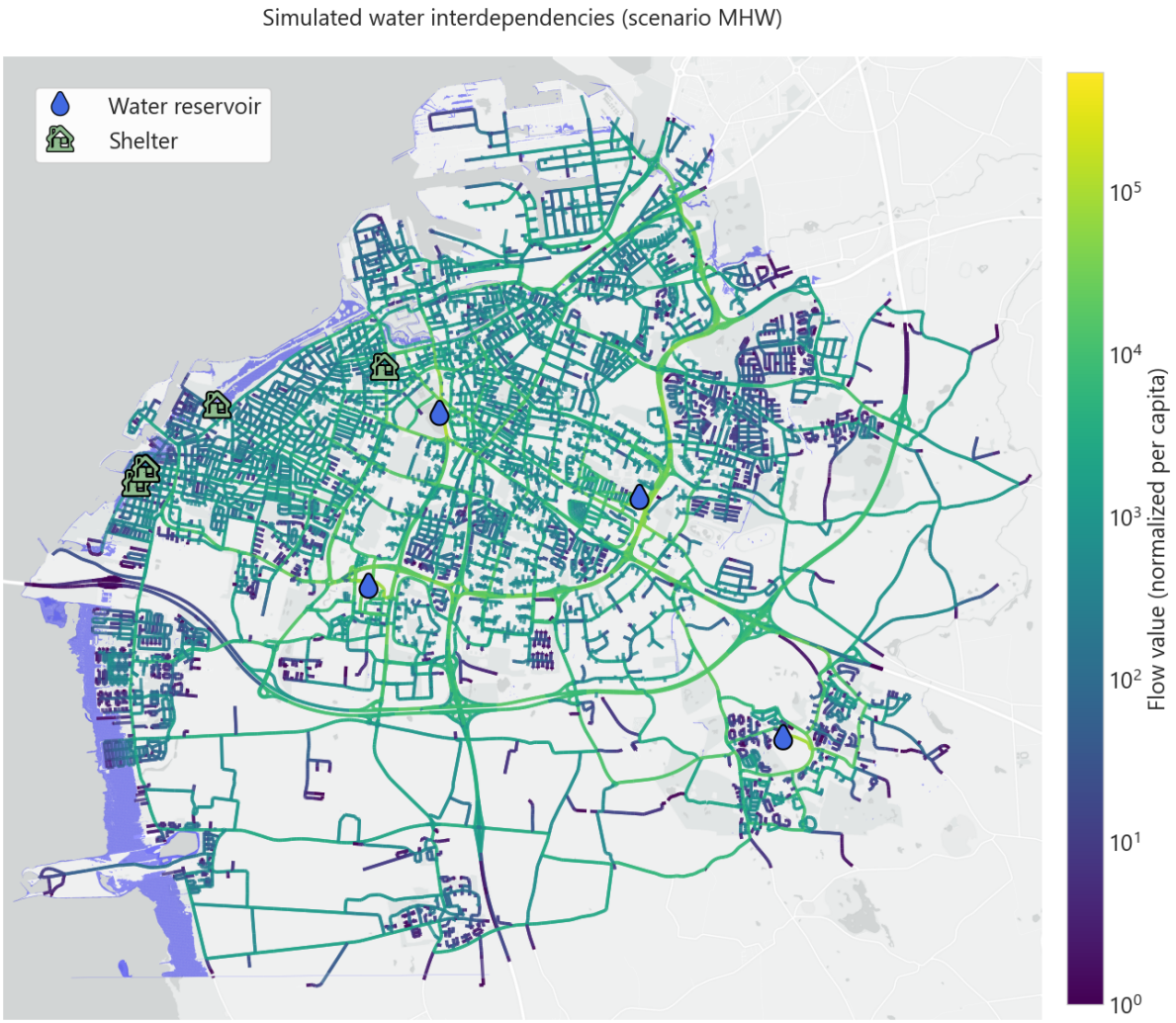


Figure B-6: Simulated water interdependencies for the MHW scenario.

Automated Impact Analysis The MHW hazard scenario reveals that two critical infrastructure nodes (SA00037 and SA00038) within Malmö's drinking water system face a high unmet demand of 515 normalized units, exclusively concentrated in shelter facilities, indicating a significant vulnerability in emergency service resilience under extreme flood conditions.

The analysis of the MHW scenario highlights a critical vulnerability in Malmö's drinking water infrastructure, with two shelter nodes (SA00037 and SA00038) experiencing an unmet demand of 515 units—a value classified as a "high" impact (exceeding 100 but below 1000). The concentration of these disruptions within shelter facilities underscores a direct threat to public safety, as shelters are essential for emergency response and community resilience during flood events. The loss of drinking water supply in these nodes would impair the ability to provide critical services to vulnerable populations seeking refuge, exacerbating the humanitarian impact of the hazard.

While the data does not indicate direct residential exposure, the reliance of shelters on uninterrupted water supply suggests indirect risks to social welfare. Shelters often serve as temporary housing for displaced individuals, and prolonged water outages could lead to health crises, compounding the effects of the flood. The uniformity of the unmet demand values (515) across both nodes suggests a systemic vulnerability, potentially linked to shared infrastructure dependencies or geographic clustering of critical assets.

The absence of other infrastructure types (e.g., commercial or transport) in the top 1 percentile implies that, under this scenario, shelters are the primary focal points of risk. However, the high unmet demand values signal that even localized disruptions could have cascading consequences, particularly if these shelters are integral to broader

emergency response networks. The analysis underscores the need for targeted resilience measures to safeguard these nodes, given their outsized role in public safety during extreme weather events.

Table B-7: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
SA00037	515	Shelter #25	Shelter
SA00038	515	Shelter #26	Shelter
SA01928	515	Shelter #2023	Shelter
SA00024	515	Shelter #12	Shelter
SA00807	515	Shelter #851	Shelter

Table B-8: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
MT00003	2831	No Name	Water reservoir
MT00004	2831	No Name	Water reservoir
MT00002	2831	No Name	Water reservoir
MT00005	2831	No Name	Water reservoir

2.3 Scenario: EV

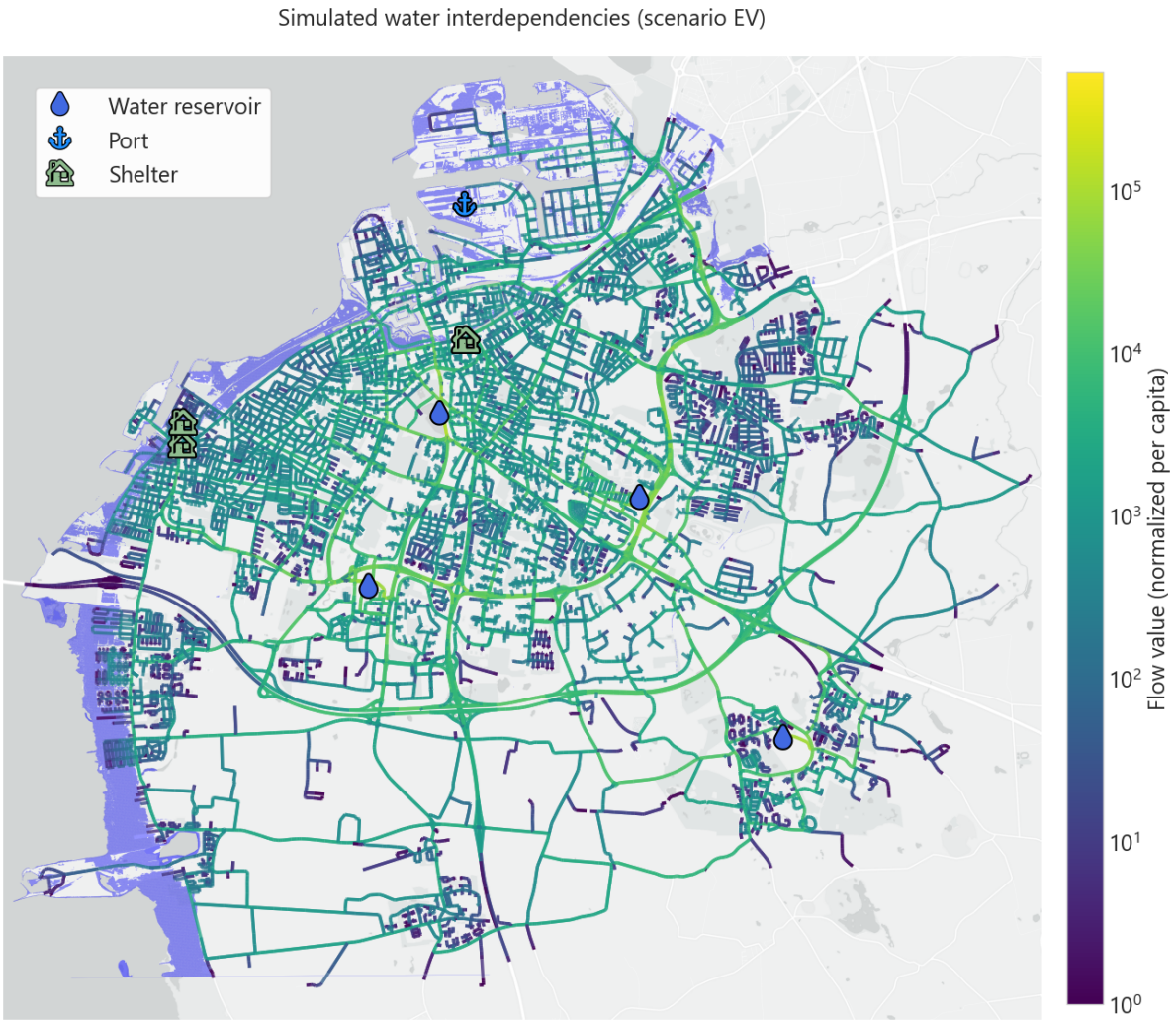


Figure B-7: Simulated water interdependencies for the EV scenario.

Automated Impact Analysis The EV hazard scenario reveals an extreme vulnerability in Malmö's drinking water infrastructure, with the port system experiencing an unmet demand of 2,451 units—indicating a cascading failure with severe implications for public safety and economic activity, while two shelters face high-impact disruptions.

The analysis of the top 1 percentile of unmet demand for drinking water under the EV (storm surge) scenario highlights critical vulnerabilities in Malmö's infrastructure, particularly at the port and shelter nodes. The port infrastructure (PO00001) exhibits an extreme impact, with an unmet demand of 2,451 units, suggesting a severe disruption to drinking water supply. Given the port's role as a critical node for logistics and economic activity, this failure would likely have cascading effects on trade, emergency response coordination, and regional supply chains. The magnitude of this disruption classifies it as an "extreme" impact, underscoring the port's systemic importance in the city's resilience framework.

Additionally, two shelter nodes (SA00184 and SA00185) each experience a high-impact unmet demand of 515 units. Shelters are typically designated for emergency housing and public safety, so this disruption would compromise the city's ability to provide refuge and essential services during the storm surge event. While the shelters themselves are not residential areas, their failure would indirectly affect vulnerable populations reliant on these facilities during crises, thus implicating social welfare and public safety.

The geographic and infrastructural clustering of these disruptions suggests that coastal and logistically central nodes are disproportionately vulnerable under the EV scenario. The absence of residential areas in the top 1 percentile

of unmet demand indicates that while direct residential water supply may not be the most severely affected, the indirect consequences of port and shelter failures could still strain the broader community's access to drinking water. The analysis strictly adheres to the provided data, avoiding speculation on root causes or mitigation strategies.

Table B-9: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
PO00001	2451	Malmö Port	Port
SA00185	515	Shelter #185	Shelter
SA00184	515	Shelter #184	Shelter
SA01916	515	Shelter #2011	Shelter
SA01945	515	Shelter #2040	Shelter

Table B-10: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
MT00002	16549	No Name	Water reservoir
MT00004	16549	No Name	Water reservoir
MT00003	16549	No Name	Water reservoir
MT00005	16549	No Name	Water reservoir

2.4 Scenario: EN

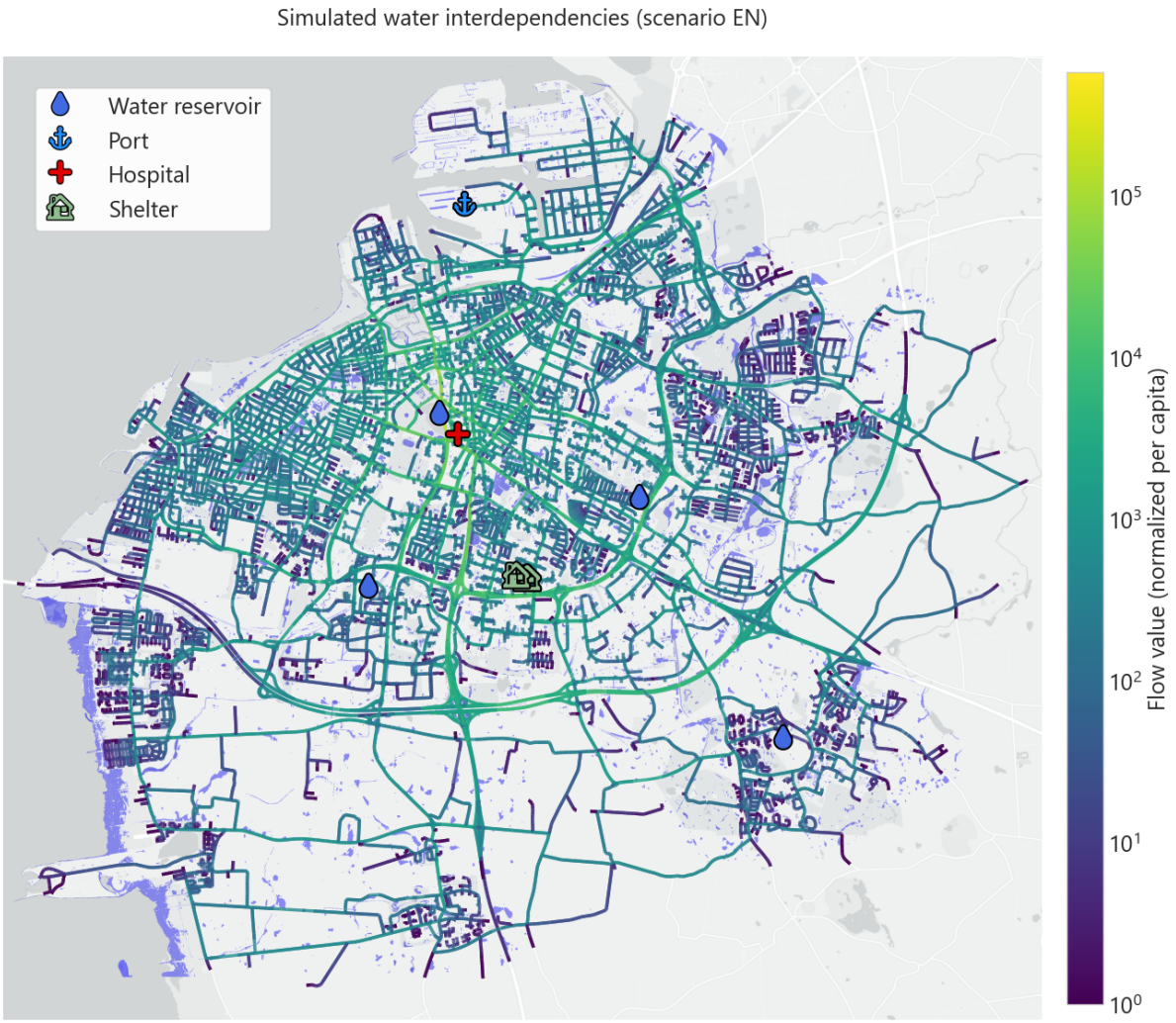


Figure B-8: Simulated water interdependencies for the EN scenario.

Automated Impact Analysis A severe cloudburst event (EN) in Malmö is projected to result in extreme water service disruptions to critical infrastructure, disproportionately affecting shelters and potentially leaving thousands vulnerable.

The simulation reveals a pattern of extreme and high impacts across Malmö's critical infrastructure due to unmet water demands under the EN hazard scenario. The Port (PO00001) experiences an extreme impact, with an unmet demand of 1456 units, disrupting critical port operations and negatively affecting economic activity. The Hospital(HA00001) faces a high impact with an unmet demand of 993, hindering its capacity to provide essential healthcare and impacting public safety. A significant cluster of Shelters (SA) experiences unmet demands of 515 units each encompassing SA01711 to SA00190, suggesting a widespread and uniform vulnerability across the shelter system and impacting social welfare. Each shelter represents a location unable to provide basic water sanitation for a considerable number of people, with model estimate each unmet need represents about 515 sheltered people affected. Train access(T00003) also sees an unmet need , also impacts potentially around 515 people as well. This widespread failure across shelters underscores a serious potential crisis in public health and safety for vulnerable populations relying on these facilities during a major storm event.

Table B-11: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
PO00001	1456	Malmö Port	Port
HA00001	993	No Name	Hospital
SA01711	515	Shelter #1806	Shelter
SA01703	515	Shelter #1798	Shelter
SA01704	515	Shelter #1799	Shelter

Table B-12: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
MT00003	248593	No Name	Water reservoir
MT00002	248593	No Name	Water reservoir
MT00005	248593	No Name	Water reservoir
MT00004	248593	No Name	Water reservoir

3 Hospital System

3.1 Scenario: BASELINE

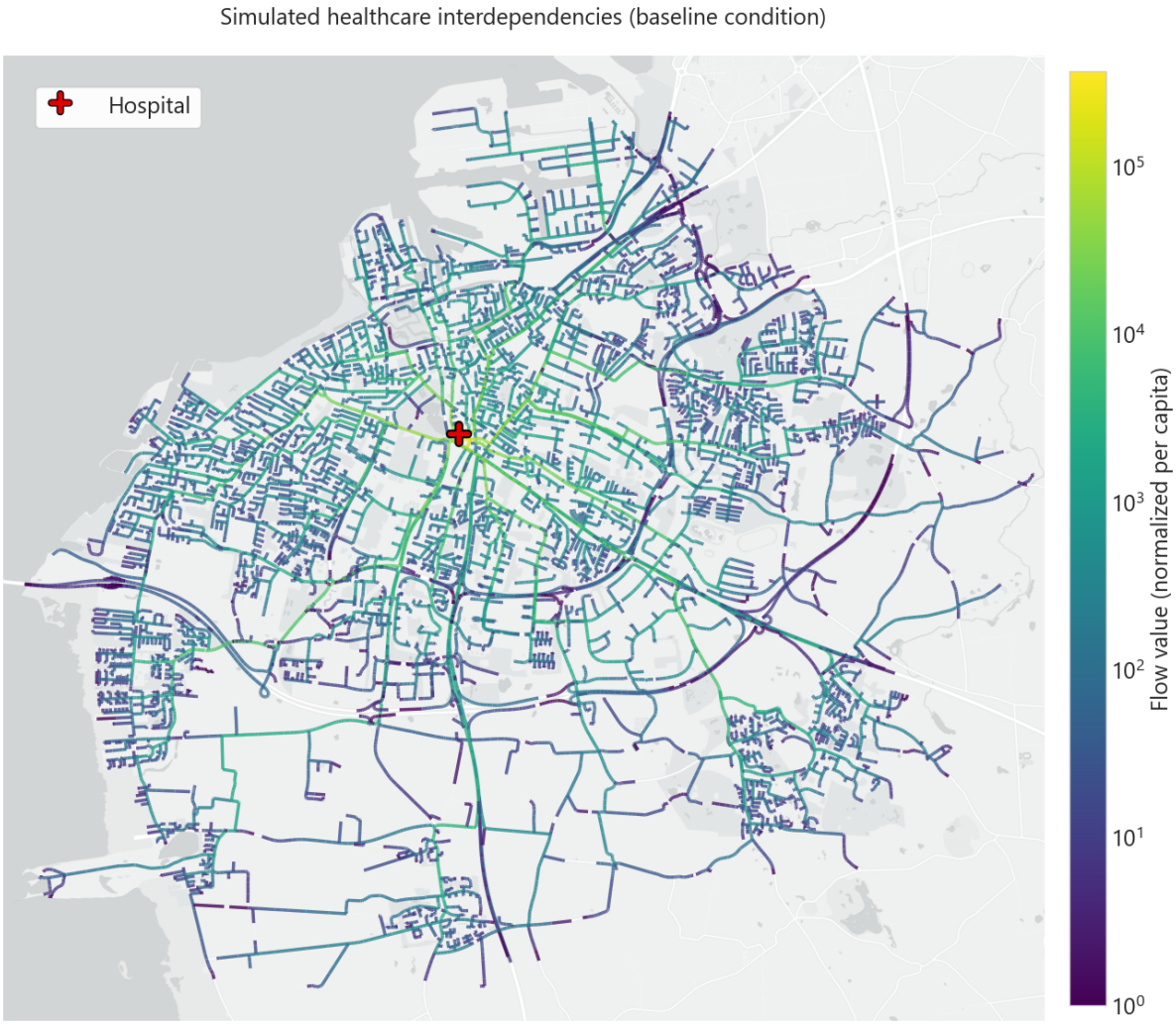


Figure B-9: Simulated healthcare interdependencies for the baseline scenario.

3.2 Scenario: MHW

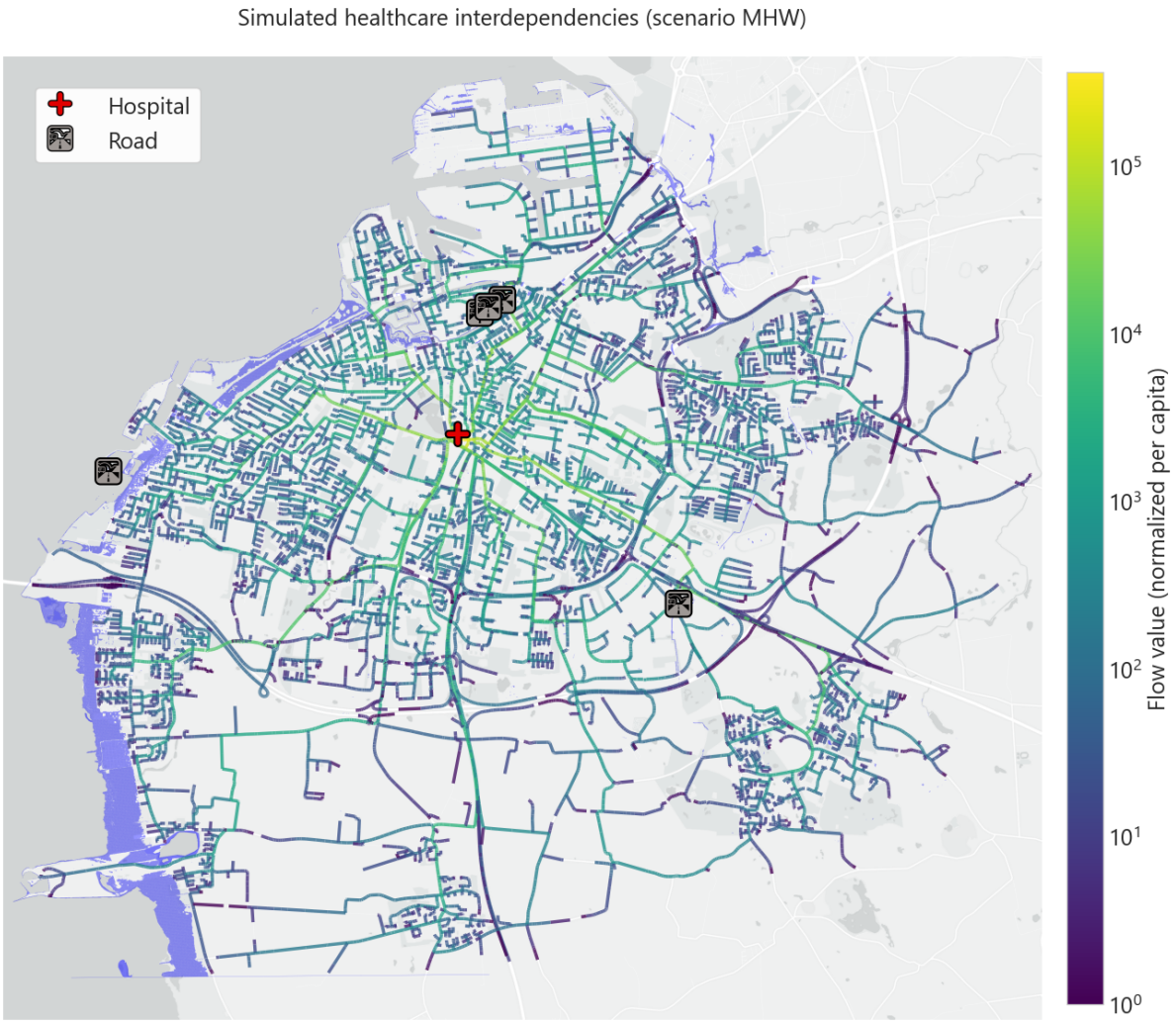


Figure B-10: Simulated healthcare interdependencies for the MHW scenario.

Automated Impact Analysis The analysis reveals that under the MHW hazard scenario, five residential areas in Malmö face a high impact of unmet demand for emergency health services, with the most severely affected area (RO000224) experiencing a disruption estimated to affect 127 residents.

The provided data highlights a concentrated vulnerability in Malmö's emergency health service infrastructure under the MHW scenario, with five residential areas experiencing unmet demand values exceeding 93 normalized units. These values, classified as 'high' impacts (all > 100), indicate significant disruptions to critical healthcare accessibility. The most affected area, RO000224, registers an unmet demand of 127, suggesting that approximately 127 residents would lose access to emergency medical services during a flood event. This pattern of high unmet demand across multiple residential zones underscores a systemic risk to public safety, as the inability to access healthcare during a disaster could exacerbate health crises and hinder recovery efforts.

The consistent presence of residential areas in the top 1 percentile of unmet demand suggests that flood-related disruptions disproportionately affect civilian populations, prioritizing public safety as the primary concern. While the data does not reveal geographic clustering or specific infrastructure failures, the uniformity of the impacted CI type (residential) implies that the underlying vulnerability may stem from shared dependencies, such as transportation networks or localized flood defenses. The absence of commercial or transportation nodes in this dataset further isolates the risk to residential communities, emphasizing the need for targeted resilience measures in these areas.

Each unmet demand value directly translates to an estimated number of affected individuals, reinforcing the human cost of infrastructure failures. For instance, RO003439 and RO010584, with unmet demands of 105 and 100

respectively, indicate that over 200 residents across these two areas would face critical gaps in emergency healthcare access. The severity of these disruptions, while not reaching 'extreme' thresholds (> 1000), remains substantial enough to warrant immediate attention to mitigate cascading public health risks.

Table B-13: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO000224	127	Korsgatan	Residential area
RO003439	105	Lilla Kvarngatan	Residential area
RO010584	100	Bryggövägen	Residential area
RO017145	98	Fredriksberg	Residential area
RO003419	93	Södra Promenaden	Residential area

Table B-14: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
HA00001	5114	No Name	Hospital

3.3 Scenario: EV

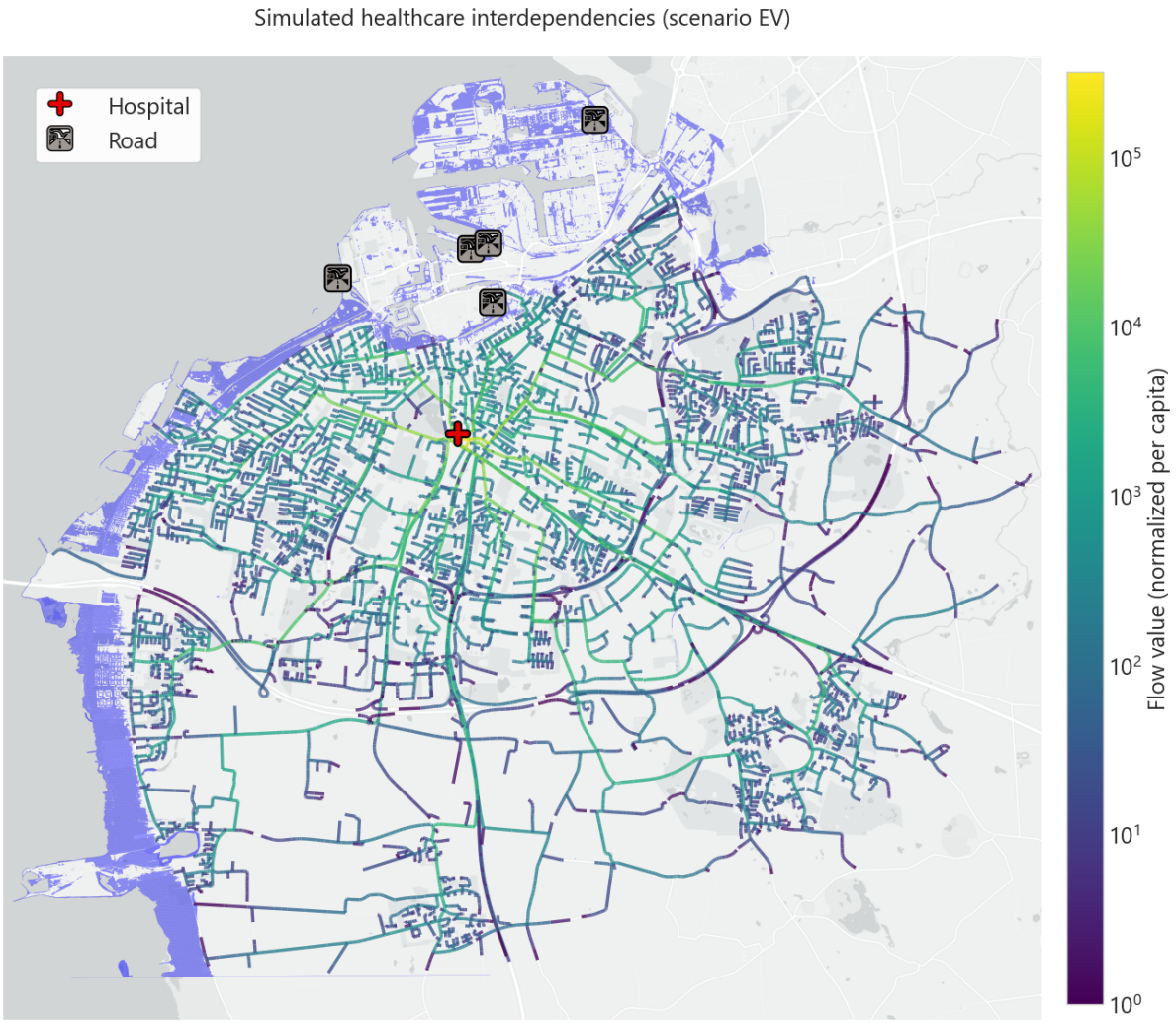


Figure B-11: Simulated healthcare interdependencies for the EV scenario.

Automated Impact Analysis A major storm surge event (EV) is projected to cause high disruption to emergency healthcare access, potentially impacting over 330 residents in the most vulnerable area of Malmö.
The analysis reveals that a storm surge event (EV) significantly impacts the accessibility of emergency healthcare services within Malmö, as indicated by the presence of numerous residential areas in the top 1 percentile of unmet demand. All identified infrastructure nodes experiencing high unmet demand (>100) are classified as residential areas, suggesting the impact is primarily on public safety due to the compromise of emergency service accessibility. The most vulnerable residential area (RO019691) experiences an unmet demand of 331 per capita units, representing an estimated 331 residents potentially losing access to emergency health services. Other highly impacted residential areas, such as RO002349 (320), RO002387 (314), and RO005775 (299), similarly demonstrate the widespread nature of this vulnerability, directly affecting an estimated 320, 314 and 299 residents, respectively. Several more areas fall within the 'high' concern bracket with values between 174, (RO003551) and 280 (RO021407). The clustered nature of residential area impact suggests the potential for localized strain upon remaining accessible services and the need for targeted mitigation strategies within these communities.

Table B-15: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO019691	331	Frihamnsallén	Residential area
RO002349	320	Grimsbygatan	Residential area
RO002387	314	Propellergatan	Residential area
RO005775	299	Spillepengsgatan	Residential area
RO021407	280	Porslinsgatan	Residential area

Table B-16: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
HA00001	50209	No Name	Hospital

3.4 Scenario: EN

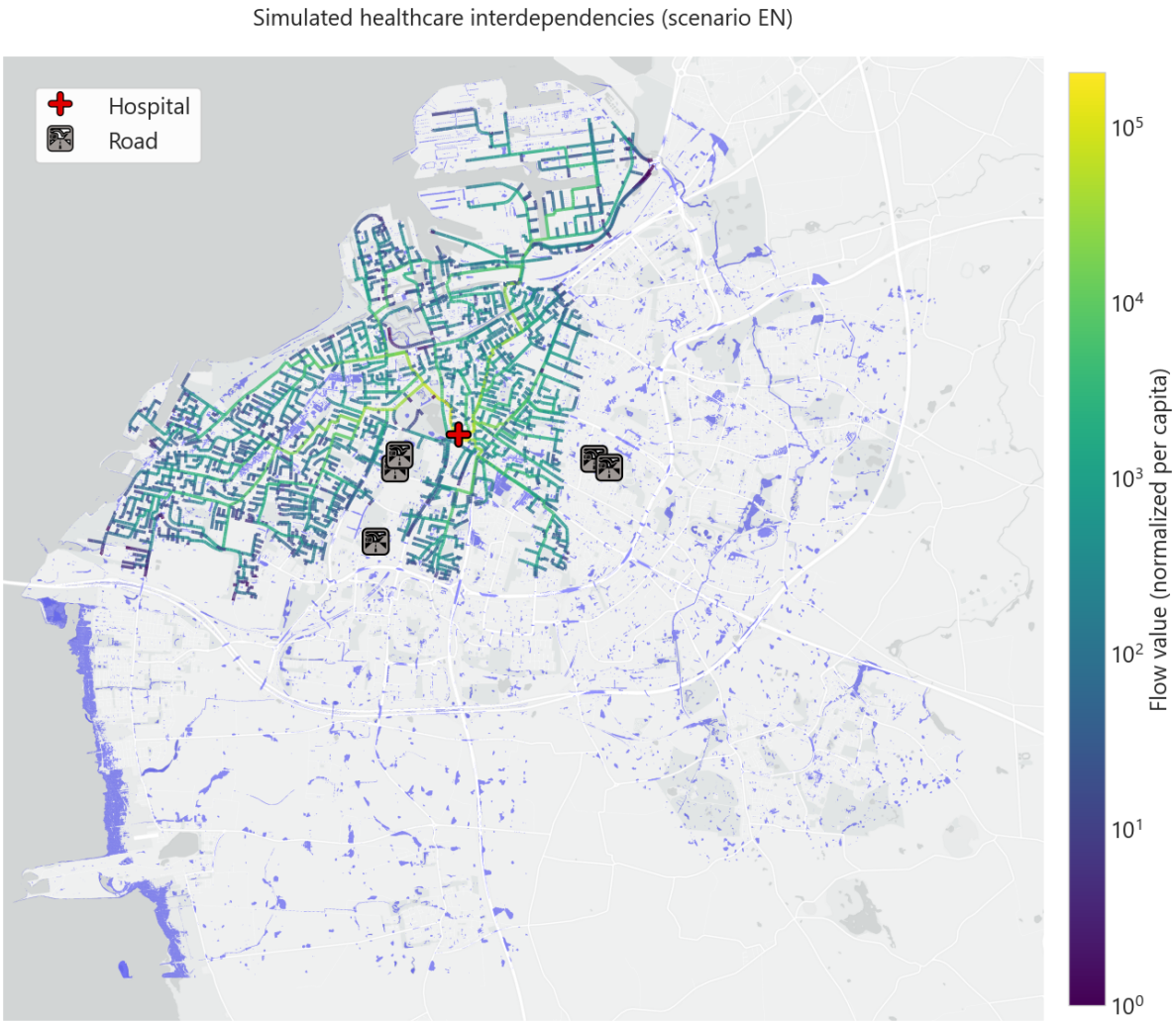


Figure B-12: Simulated healthcare interdependencies for the EN scenario.

Automated Impact Analysis The analysis reveals that under the severe cloudburst scenario (EN) in 2125, Malmö's emergency health services face extreme and high unmet demand across 50 residential areas, with the most

severely affected area (RO008348) experiencing an estimated 731 residents losing access to critical medical care.
The data highlights a concentrated vulnerability in Malmö's residential infrastructure, where 50 distinct areas experience unmet demand for emergency health services, all exceeding the 'high' impact threshold (>100 per capita demand units). Notably, one area (RO008348) reaches an 'extreme' impact (>1000), indicating a catastrophic loss of medical access for an estimated 731 residents. The remaining 49 areas exhibit high unmet demand, with values ranging from 502 to 135, collectively affecting thousands of residents.
The thematic pattern suggests a systemic risk to public safety, as the disruption of emergency health services directly threatens life-saving care. Residential areas, which constitute the sole CI Type in this dataset, are disproportionately vulnerable, emphasizing the cascading consequences of infrastructure failures on social welfare. The severity of the impacts underscores the critical need for resilient health infrastructure in Malmö, particularly in areas where unmet demand surpasses 100, indicating significant population-level risks. The absence of other CI Types (e.g., transport, commercial) in this dataset suggests that while the focus here is on residential health access, broader systemic interdependencies may further exacerbate these vulnerabilities in real-world scenarios.

Table B-17: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO008348	731	Snödroppsgatan	Residential area
RO005252	502	Hårds väg	Residential area
RO014373	414	Eric Perssons väg	Residential area
RO010028	358	Frölichs väg	Residential area
RO036897	333	Eric Perssons väg	Residential area

Table B-18: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
HA00001	165991	No Name	Hospital

4 Fire System

4.1 Scenario: BASELINE

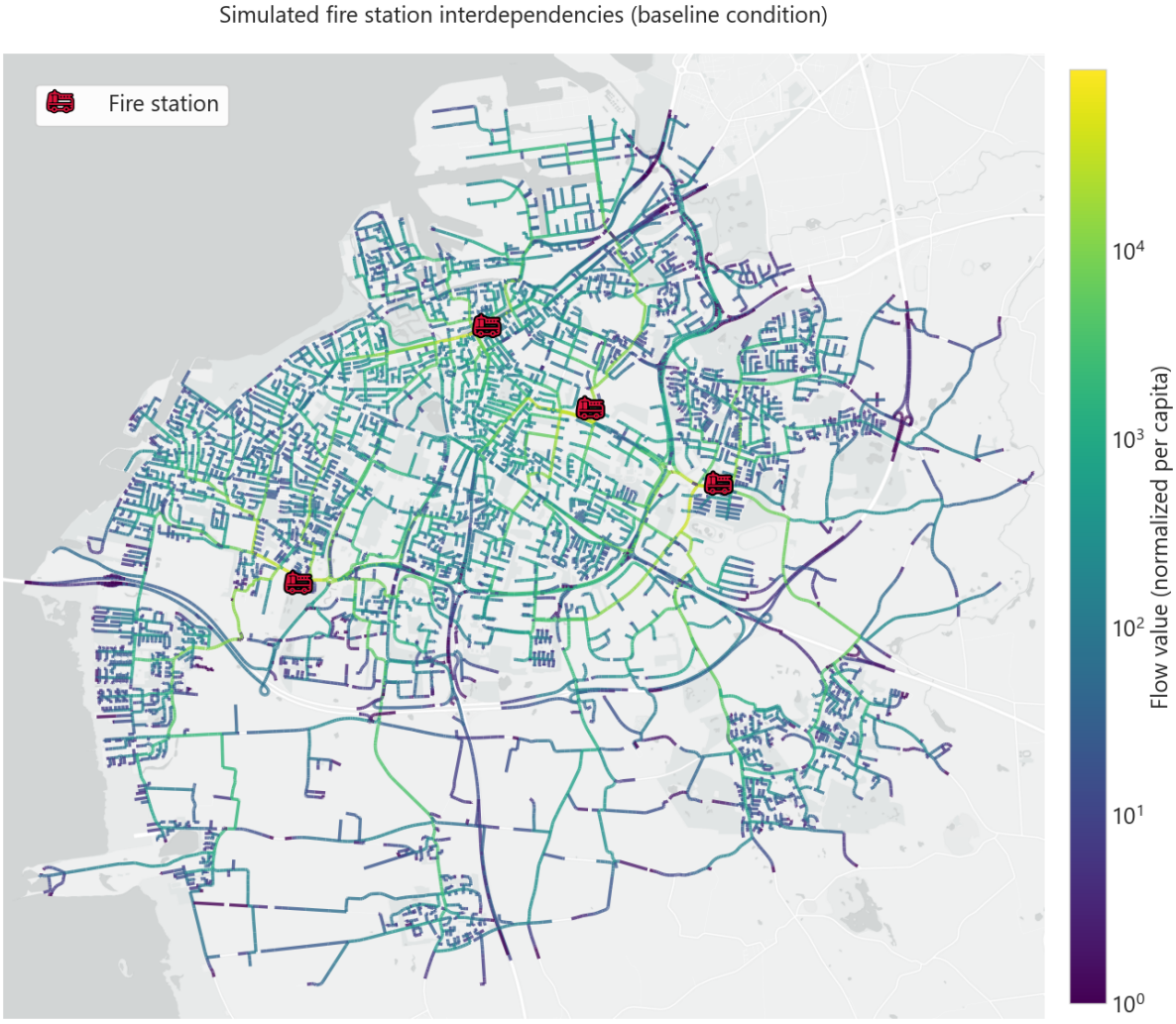


Figure B-13: Simulated fire station interdependencies for the baseline scenario.

4.2 Scenario: MHW

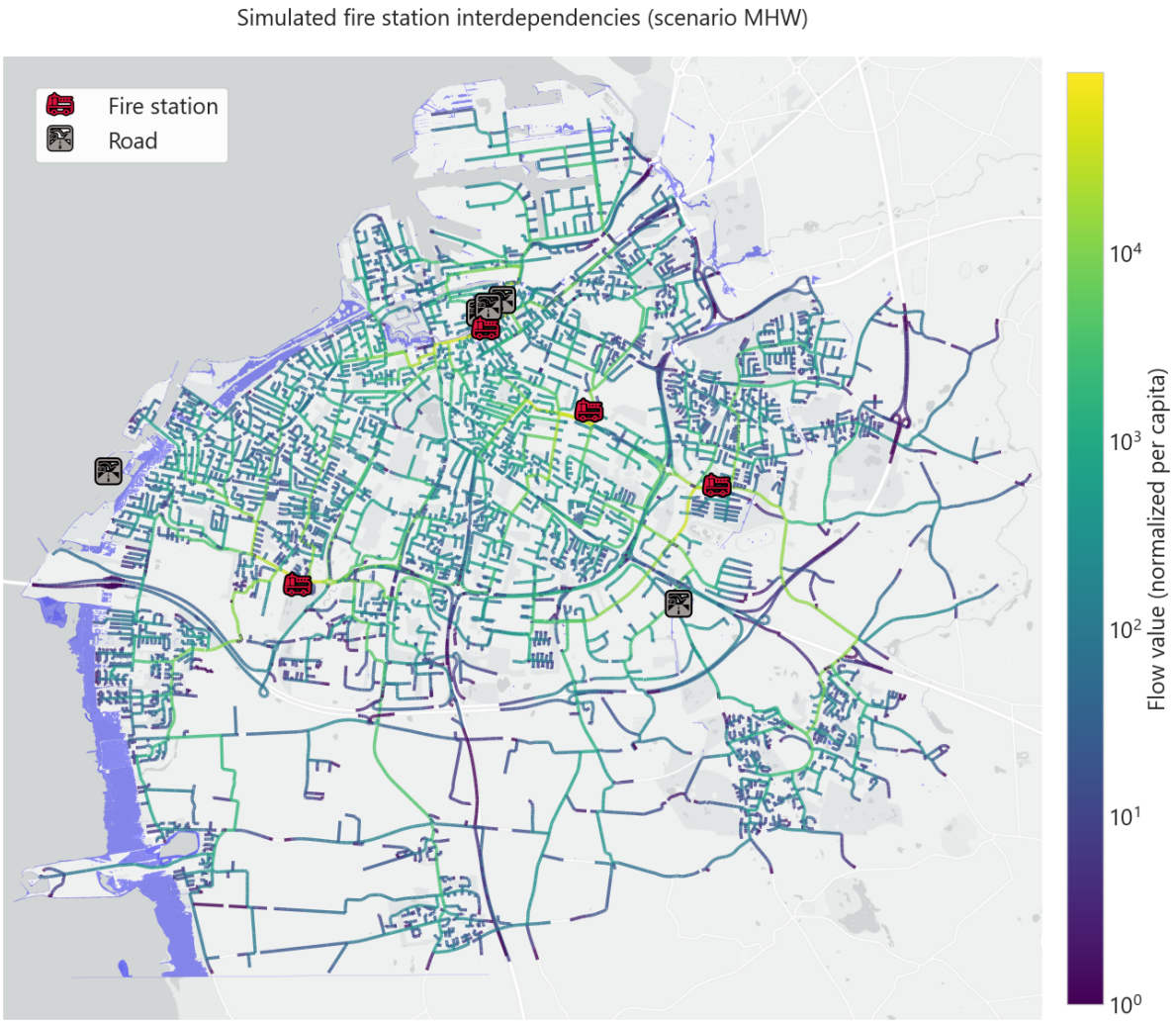


Figure B-14: Simulated fire station interdependencies for the MHW scenario.

Automated Impact Analysis A significant combination of high tide and heavy rain (MHW) is projected to severely compromise fire and rescue service accessibility within Malmö, with multiple residential areas facing high levels of unmet demand.

Under the MHW hazard scenario, the simulation reveals a pattern of high impact on fire and rescue service accessibility, specifically impacting residential areas in Malmö. The analysis identifies the top 1 percentile of infrastructure nodes based on unmet demand, indicating the points most vulnerable to disruptions in fire and rescue service provision. Specifically, residential areas RO000224, RO003439, RO010584, RO017145, and RO003419 demonstrate significant vulnerability. Residential area RO000224 exhibits a high unmet demand of 127 per capita demand units. This translates to approximately 127 people affected by a loss of emergency response accessibility. Similarly, RO003439 registers an unmet demand of 105, indicating approximately 105 affected residents. RO010584 registers 100 people affected by a loss of emergency response accesibility, while RO017145 exhibits an unmet demand of 98, thus indicating a marginal, but critical level of unmet demand. RO003419 shows a similar degree of vulnerability, with 93 affected citizens. For residential areas, this unmet demand directly threatens social welfare and public safety by reducing access to critical emergency services and potentially increasing response times in emergency situations. A high unmet demand in this system and context signifies a marked reduction in public safety.

Table B-19: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO000224	127	Korsgatan	Residential area
RO003439	105	Lilla Kvarngatan	Residential area
RO010584	100	Bryggövägen	Residential area
RO017145	98	Fredriksberg	Residential area
RO003419	93	Södra Promenaden	Residential area

Table B-20: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
SA00009	5114	Malmö Jägersro	Fire station

4.3 Scenario: EV

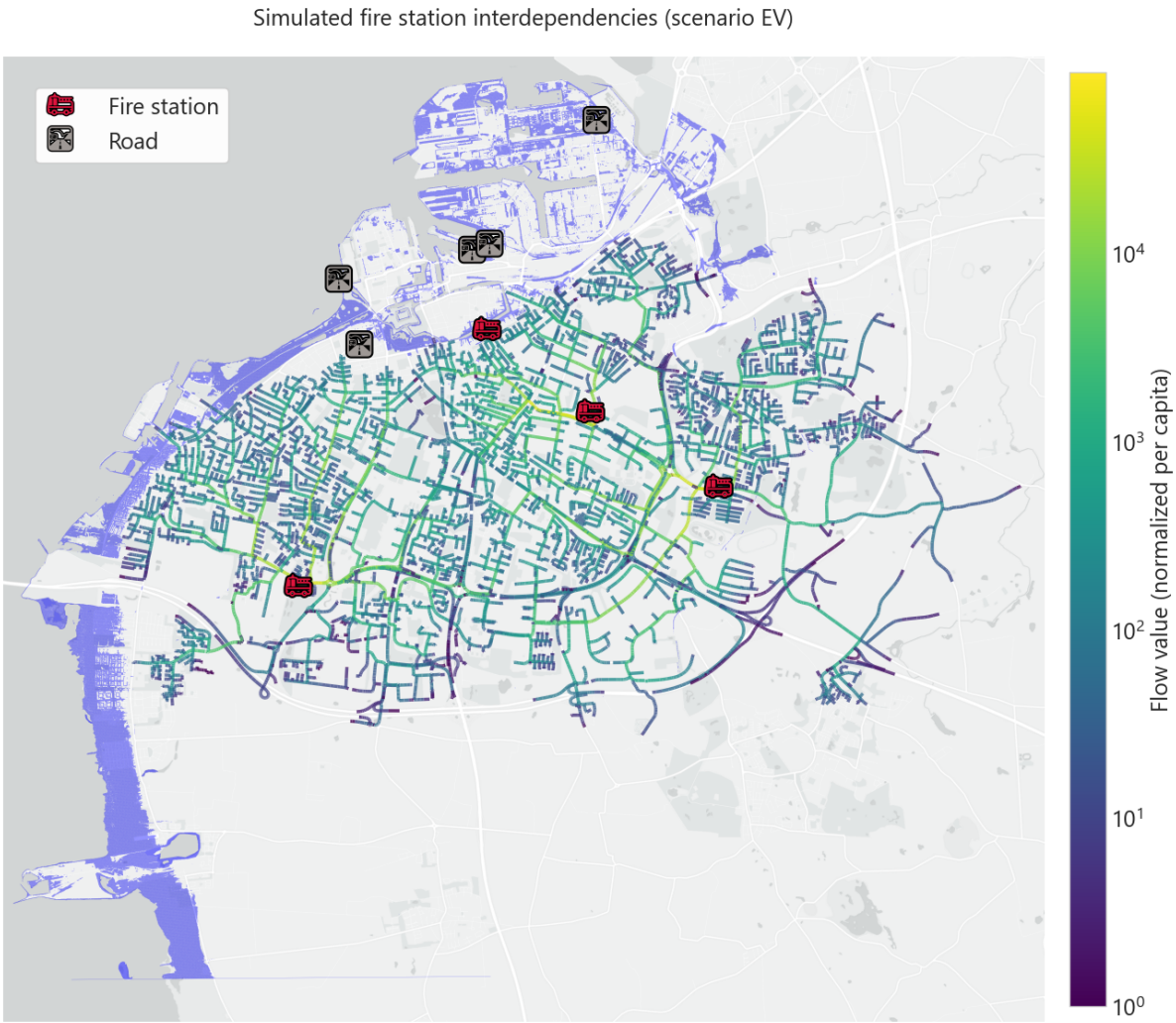


Figure B-15: Simulated fire station interdependencies for the EV scenario.

Automated Impact Analysis The analysis reveals that under the EV hazard scenario, Malmö's fire and rescue services face a high concentration of unmet demand in residential areas, with the top 1 percentile of infrastructure

nodes experiencing service losses affecting an estimated 367 to 144 individuals per location, underscoring severe public safety vulnerabilities.

The data indicates a critical vulnerability in Malmö's fire and rescue services during the EV (storm surge) scenario, with all top 1 percentile infrastructure nodes being residential areas. This suggests a geographically concentrated risk, where multiple neighborhoods could simultaneously face impaired emergency response capabilities. The unmet demand values—ranging from 367 to 144 per capita demand units—classify these impacts as "high" (since all values exceed 100 but fall short of the "extreme" threshold of 1000). For each residential area listed, the unmet demand directly translates to an estimated population affected, meaning hundreds of residents could experience delayed or unavailable emergency services during a flood event.

The primary significance of these service losses is their direct threat to public safety. Fire and rescue services are critical for mitigating life-threatening emergencies, and their disruption would exacerbate the hazards posed by flooding, particularly in scenarios where storm surges compound existing risks. The absence of non-residential infrastructure (e.g., commercial or transport nodes) in this dataset suggests that the model highlights a disproportionate vulnerability in densely populated areas, where the cascading effects of flood damage could leave communities without timely emergency assistance.

The absence of "extreme" impacts (unmet demand > 1000) does not diminish the severity of these findings; rather, it underscores that even "high" impacts, when concentrated in residential zones, pose significant human and operational challenges. The consistency of residential areas in the top 1 percentile further emphasizes the need for targeted resilience planning in these locations to ensure that emergency services remain accessible during extreme weather events.

Table B-21: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO000908	367	Nils Forsbergsgatan	Residential area
RO019691	331	Frihamnsallén	Residential area
RO002349	320	Grimsbygatan	Residential area
RO002387	314	Propellergatan	Residential area
RO005775	299	Spillepengsgatan	Residential area

Table B-22: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
SA00007	93010	Malmö Centrum	Fire station

4.4 Scenario: EN

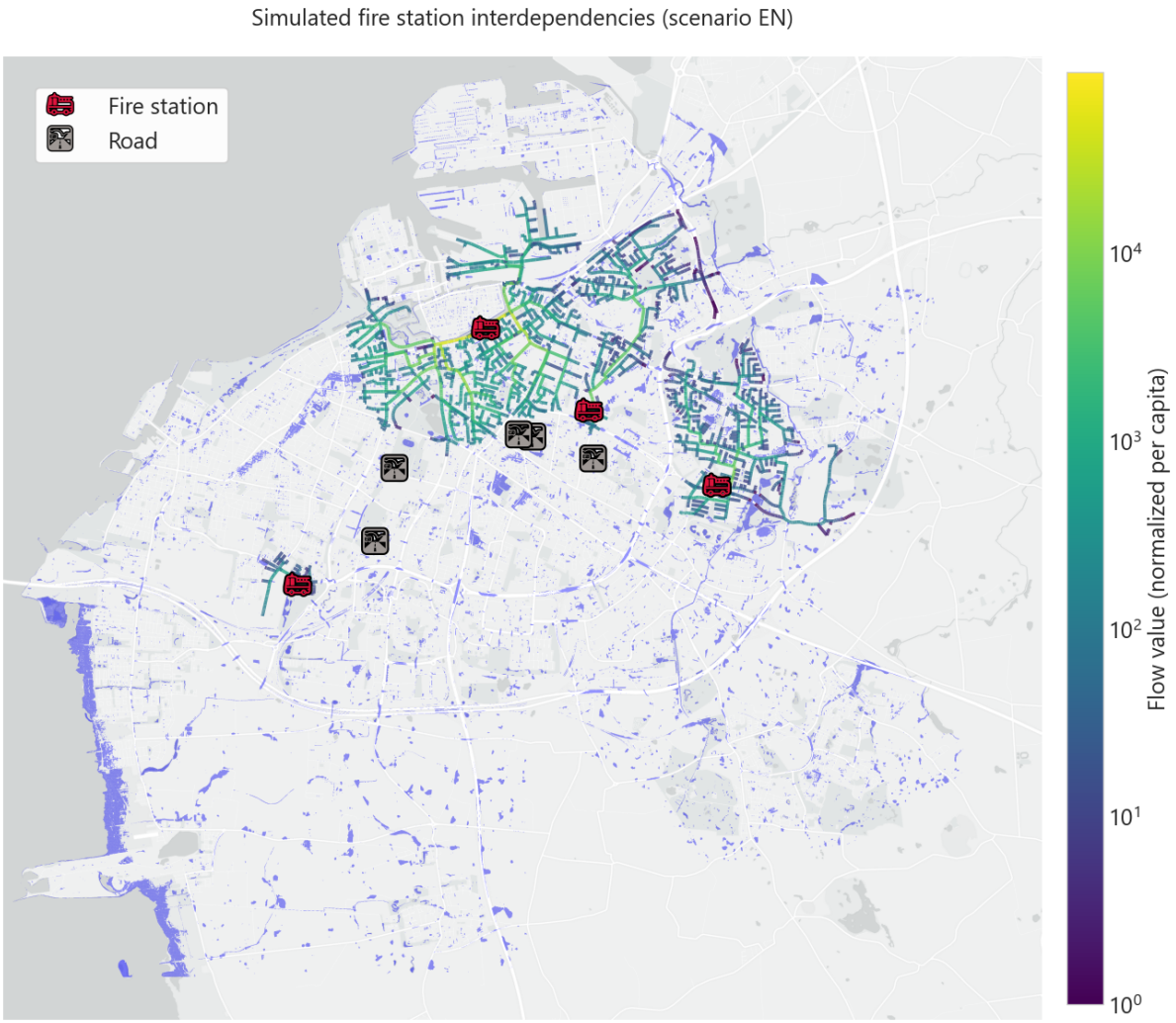


Figure B-16: Simulated fire station interdependencies for the EN scenario.

Automated Impact Analysis A severe cloudburst event (EN) reveals a pronounced vulnerability in fire and rescue service accessibility, affecting a significant number of residents across Malmö.
Under the EN hazard scenario, the fire and rescue service infrastructure system exhibits a 'high' degree of vulnerability, as evidenced by the large number of residential areas experiencing unmet demand within the top 1 percentile. The most extreme impact is observed at location RO008348, with an unmet demand of 731, indicating approximately 731 residents are affected by a loss of emergency response capability due to cloudburst-related disruptions. A further four locations, RO005252, RO036049, RO036050 and RO014373 exhibit unmet demand ranging from 414 to 502 residents, also classifying them as 'high' impact vulnerabilities. These disruptions indicate a geographical area with high potential emergency response challenges. The remaining locations in the top 1 percentile, with unmet demand values ranging from 158 to 358, represent further areas. The cumulative effect across all listed residential areas suggests a systemic issue where fire and rescue service accessibility is compromised under severe cloudburst conditions, which has public safety implications.

Table B-23: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO008348	731	Snödroppsgatan	Residential area
RO005252	502	Hårds väg	Residential area
RO036049	476	Kopparbergsgatan	Residential area
RO036050	446	Kopparbergsgatan	Residential area
RO014373	414	Eric Perssons väg	Residential area

Table B-24: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
SA00008	91881	Malmö Hyllie	Fire station
SA00006	85334	Malmö Rosengård (MFB)	Fire station
SA00009	81602	Malmö Jägersro	Fire station

5 Police System

5.1 Scenario: BASELINE

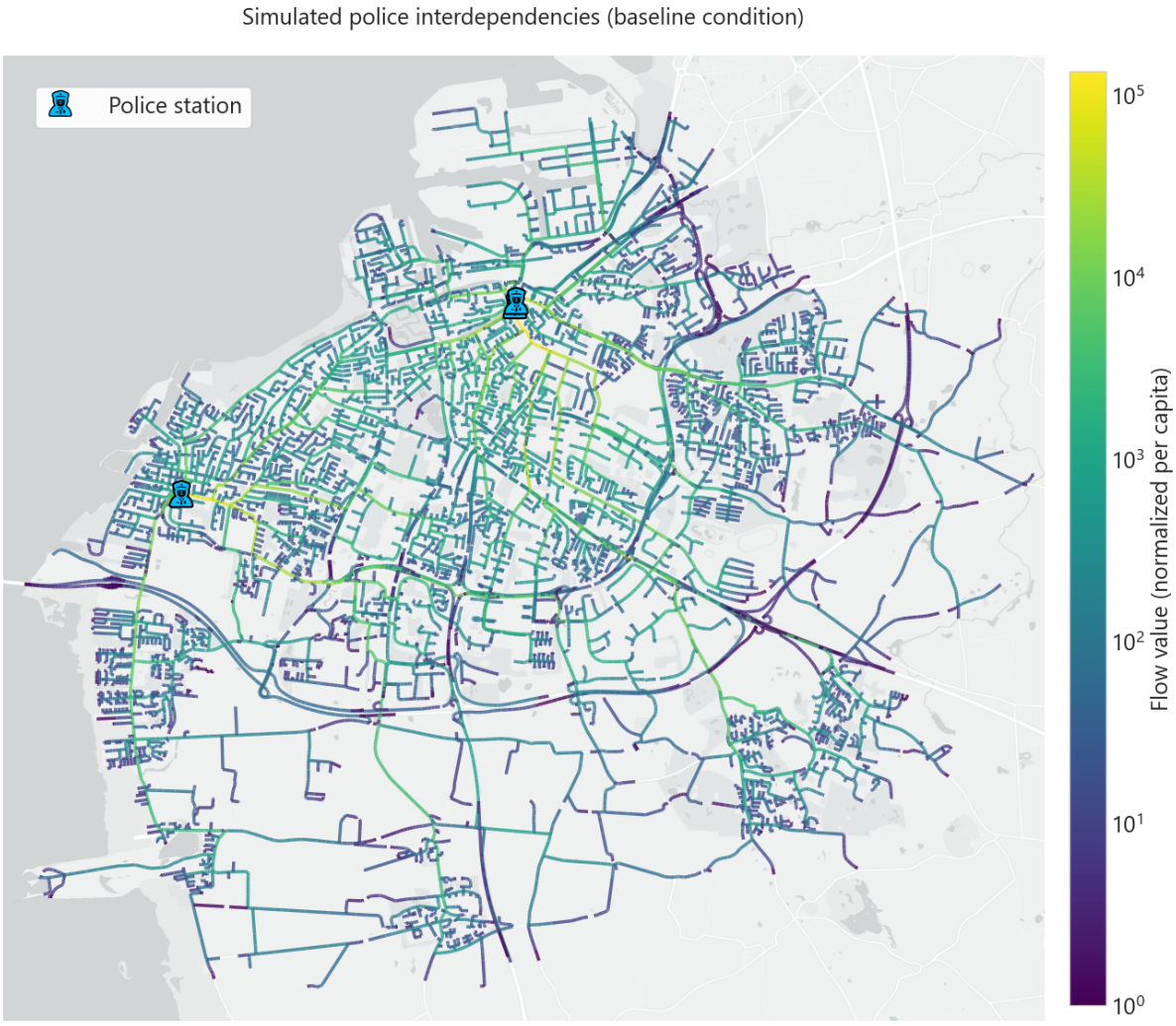


Figure B-17: Simulated police interdependencies for the baseline scenario.

5.2 Scenario: MHW

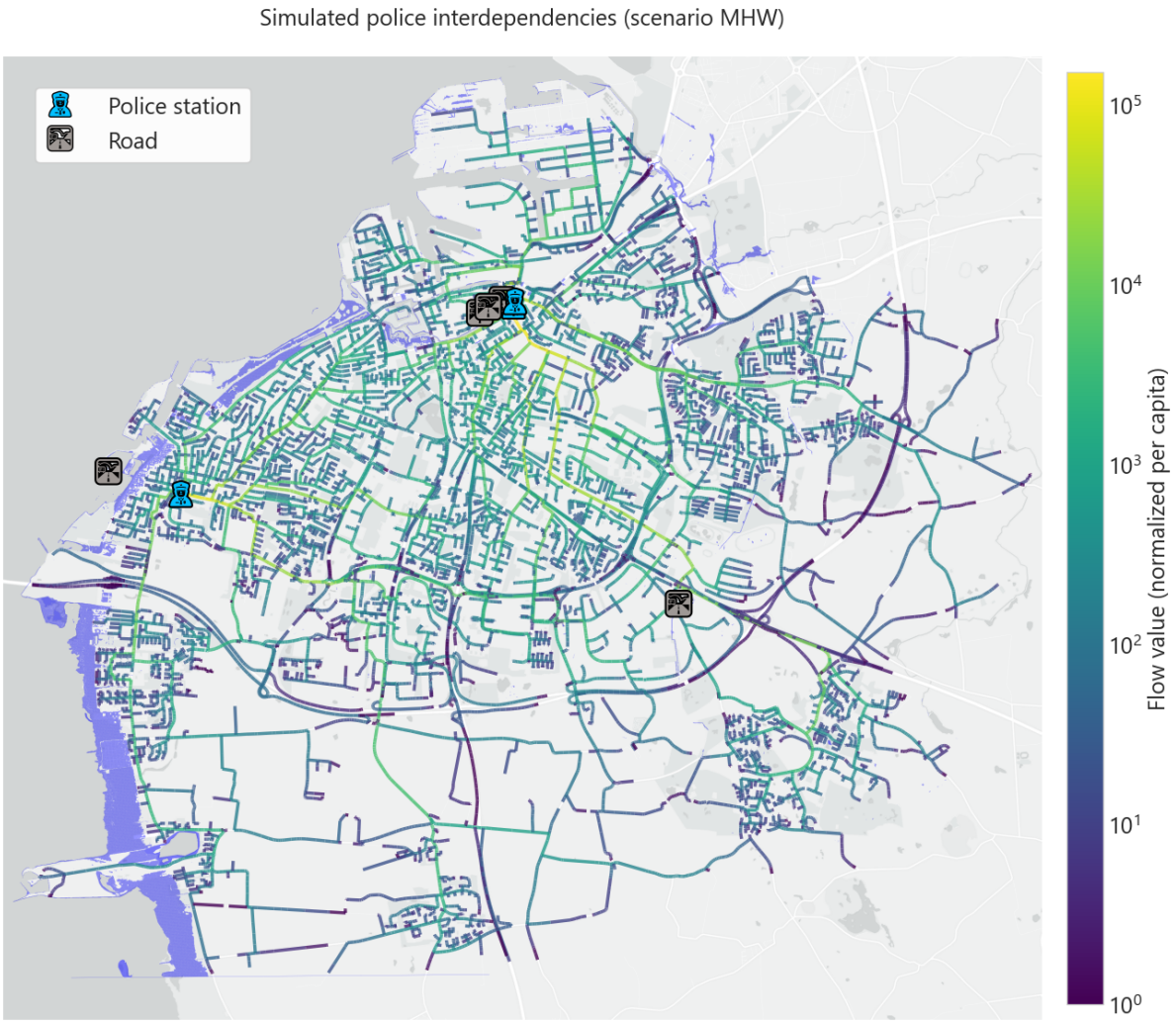


Figure B-18: Simulated police interdependencies for the MHW scenario.

Automated Impact Analysis The MHW hazard scenario reveals high unmet demand for police services in five residential areas, with the most severe impact affecting an estimated 127 residents, underscoring critical vulnerabilities in law enforcement accessibility during flood events.

The analysis of unmet demand for police services under the MHW scenario highlights significant vulnerabilities in residential areas, with all five top-percentile nodes experiencing high impacts. The most affected area (RO000224) exhibits an unmet demand of 127, translating to an estimated 127 residents without access to law enforcement. This is classified as a "high" impact, given the defined thresholds. The remaining areas (RO003439, RO010584, RO017145, and RO003419) also face substantial service disruptions, with unmet demand values ranging from 93 to 105, further emphasizing the widespread nature of this vulnerability.

The concentration of high unmet demand in residential areas signals a direct threat to public safety, as the loss of police accessibility could impede emergency response, crime prevention, and community security. The absence of non-residential infrastructure types (e.g., commercial or transportation hubs) in the top percentile suggests that the primary risk lies in residential zones, where the immediate human cost is most acute. While the unmet demand values do not reach the "extreme" threshold (>1000), the consistent "high" impacts across multiple nodes indicate a systemic issue that could compound during prolonged or cascading disruptions.

The data strictly reflects the consequences of the MHW scenario, with no evidence of geographic clustering or additional infrastructure types being affected within the top 1 percentile. The analysis underscores the need for targeted resilience planning in these areas to mitigate public safety risks during flood events.

Table B-25: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO000224	127	Korsgatan	Residential area
RO003439	105	Lilla Kvarngatan	Residential area
RO010584	100	Bryggövägen	Residential area
RO017145	98	Fredriksberg	Residential area
RO003419	93	Södra Promenaden	Residential area

Table B-26: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
SA00012	5114	Police station #5	Police station

5.3 Scenario: EV

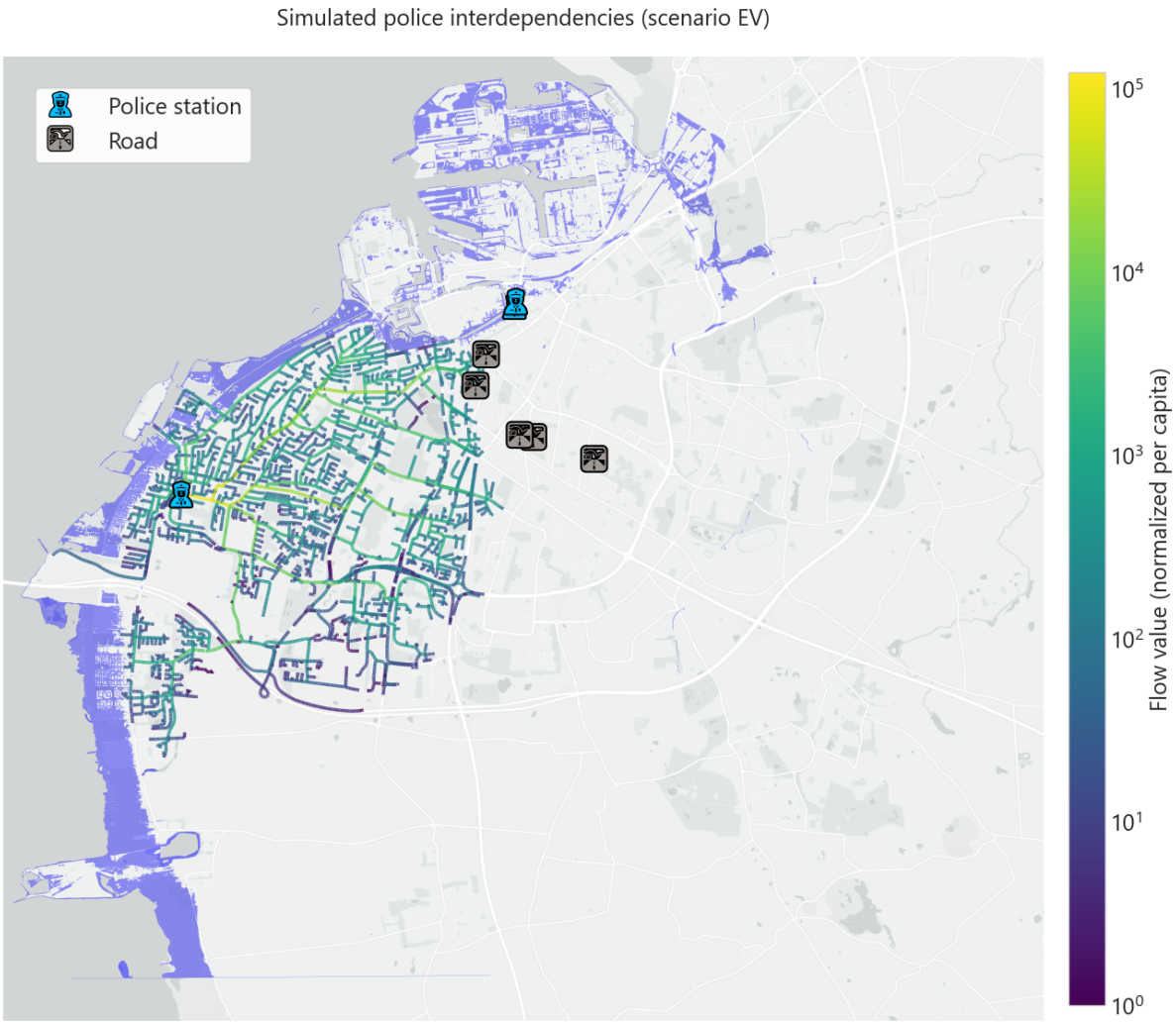


Figure B-19: Simulated police interdependencies for the EV scenario.

Automated Impact Analysis The analysis reveals that under the EV (storm surge) scenario, Malmö's residential areas face a high risk of significant law enforcement service disruptions, with the top 1 percentile of unmet

demand affecting an estimated 502 to 191 individuals per affected area, underscoring critical public safety vulnerabilities.

The data highlights a concentrated pattern of high unmet demand for police services across multiple residential areas in Malmö under the EV scenario, indicating a severe strain on public safety infrastructure. All 60 identified nodes fall within the 'high' impact threshold (unmet demand > 100), with the most severe case (RO005252) registering an estimated 502 individuals without access to law enforcement. This suggests that while no single area experiences an 'extreme' impact (>1000), the cumulative effect across these nodes could pose significant challenges for emergency response and community safety.

The consistent appearance of residential areas in the top 1 percentile underscores the scenario's disproportionate effect on public safety, as these values directly translate to the number of residents potentially left without immediate law enforcement support. The lack of non-residential infrastructure (e.g., commercial or transportation nodes) in this dataset further emphasizes that the primary consequence of this disruption is the erosion of public safety rather than economic or social welfare services. The geographic concentration of these nodes—though not explicitly mapped—implies potential clusters of vulnerability that could exacerbate cascading failures if adjacent areas are also affected.

The absence of values exceeding 1000 suggests that while individual areas face substantial disruptions, the city's police infrastructure may retain partial functionality elsewhere. However, the sustained 'high' impact across all nodes raises concerns about the system's resilience under prolonged or compounded hazards. The data strictly reflects the modeled consequences of the EV scenario, leaving the underlying causes (e.g., flood-induced road closures, station inundation) to further investigation.

Table B-27: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO005252	502	Hårds väg	Residential area
RO036049	476	Kopparbergsgatan	Residential area
RO036050	446	Kopparbergsgatan	Residential area
RO002857	404	Henrik Smithsgatan	Residential area
RO004910	391	Friisgatan	Residential area

Table B-28: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
SA00011	124013	Police station #4	Police station
SA00010	124009	Police station #3	Police station

5.4 Scenario: EN

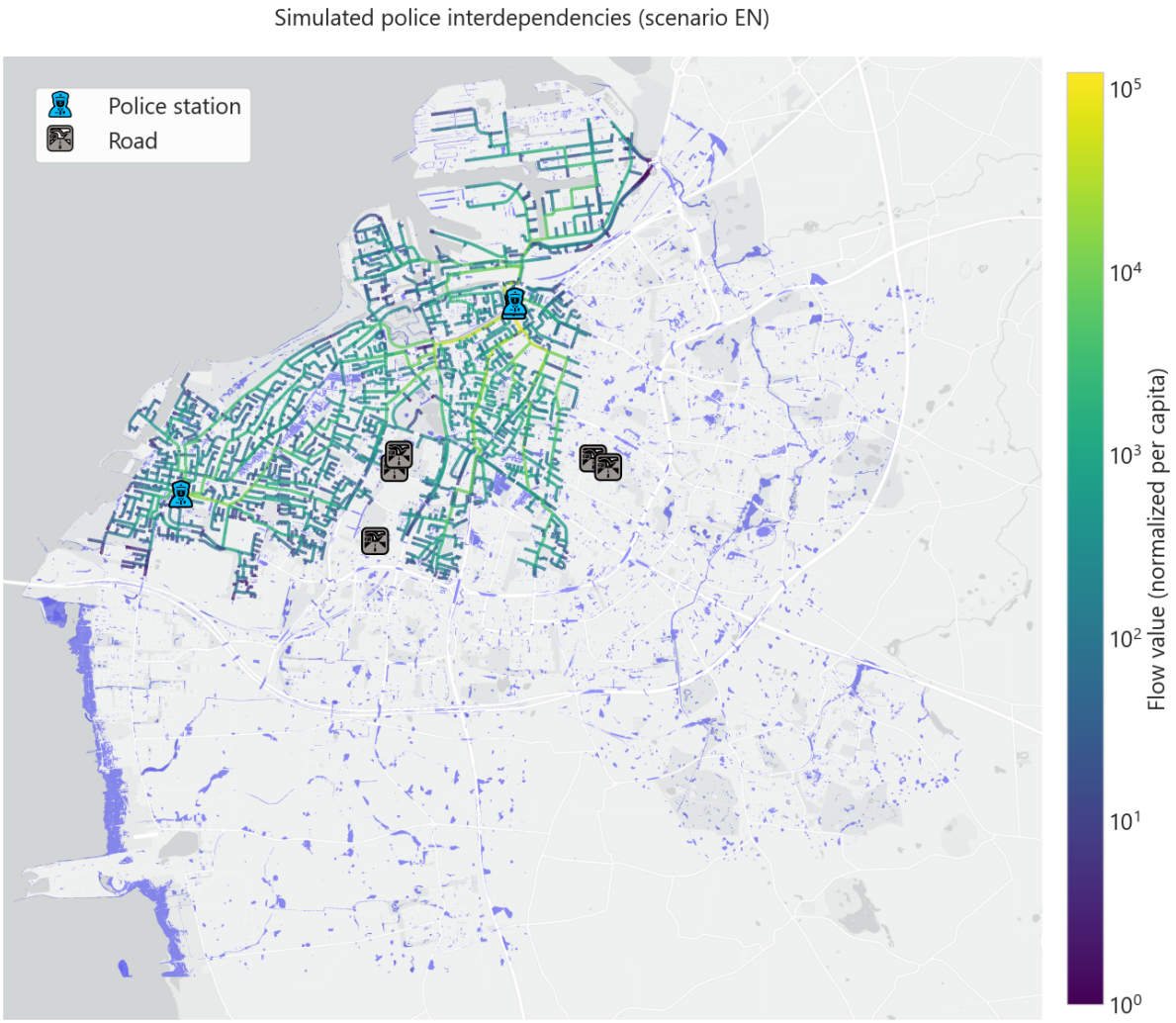


Figure B-20: Simulated police interdependencies for the EN scenario.

Automated Impact Analysis The analysis reveals that under the EN (severe cloudburst) scenario, Malmö's police service infrastructure faces extreme and high unmet demand in 50 residential areas, with the highest impact affecting an estimated 731 residents, underscoring severe disruptions to public safety access.

The data indicates that the EN hazard scenario triggers significant disruptions in police service accessibility across Malmö's residential areas, with all 50 identified nodes falling within the top 1 percentile of unmet demand. The most severe impact is observed in residential area RO008348, where the unmet demand reaches an extreme level of 731 per capita demand units, translating to an estimated 731 residents deprived of law enforcement access. This is followed by RO005252 (502 affected residents) and RO014373 (414 affected residents), both of which also exhibit extreme impacts. The remaining 47 residential areas experience high impacts, with unmet demand values ranging from 135 to 229, affecting between 135 and 229 residents per area.

The thematic pattern suggests a widespread vulnerability across the city's residential infrastructure, with no apparent geographic clustering in the provided data. The primary consequence of these disruptions is a critical compromise to public safety, as the loss of police services directly impedes emergency response capabilities, crime prevention, and community security. Given that all affected nodes are residential areas, the implications are predominantly centered on social welfare and public safety, rather than economic or commercial activity.

The classification of impacts reveals that while only one node (RO008348) qualifies as an extreme impact (>1000), the remaining 49 nodes represent high impacts (>100), collectively affecting thousands of residents. This widespread high impact underscores the systemic vulnerability of Malmö's police service infrastructure under severe cloudburst

conditions, highlighting the need for robust contingency planning to mitigate cascading failures in public safety services.

Table B-29: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO008348	731	Snödroppsgatan	Residential area
RO005252	502	Hårds väg	Residential area
RO014373	414	Eric Perssons väg	Residential area
RO010028	358	Frölichs väg	Residential area
RO036897	333	Eric Perssons väg	Residential area

Table B-30: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
SA00012	84321	Police station #5	Police station
SA00011	81670	Police station #4	Police station

6 Ambulance System

6.1 Scenario: BASELINE

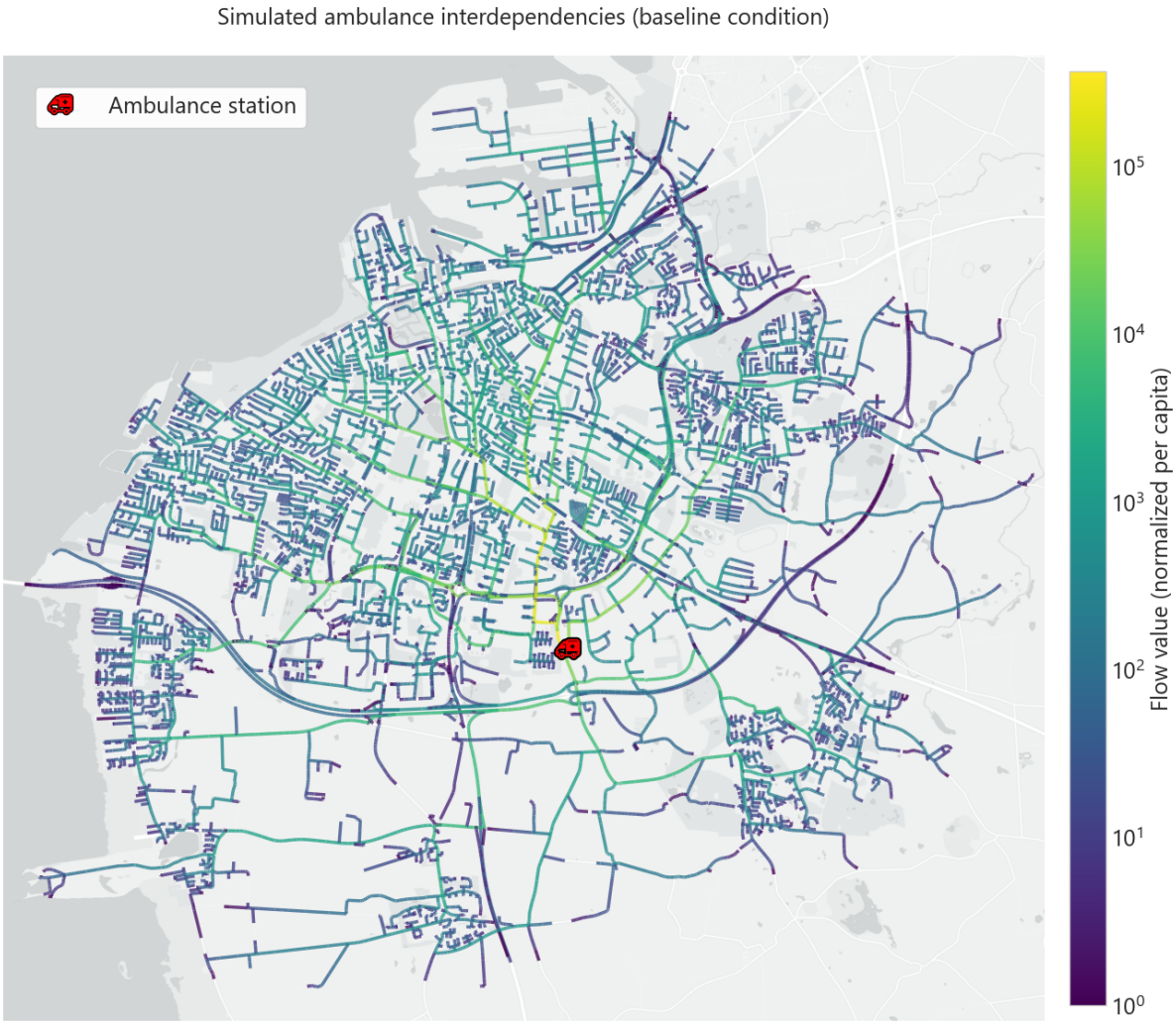


Figure B-21: Simulated ambulance interdependencies for the baseline scenario.

6.2 Scenario: MHW

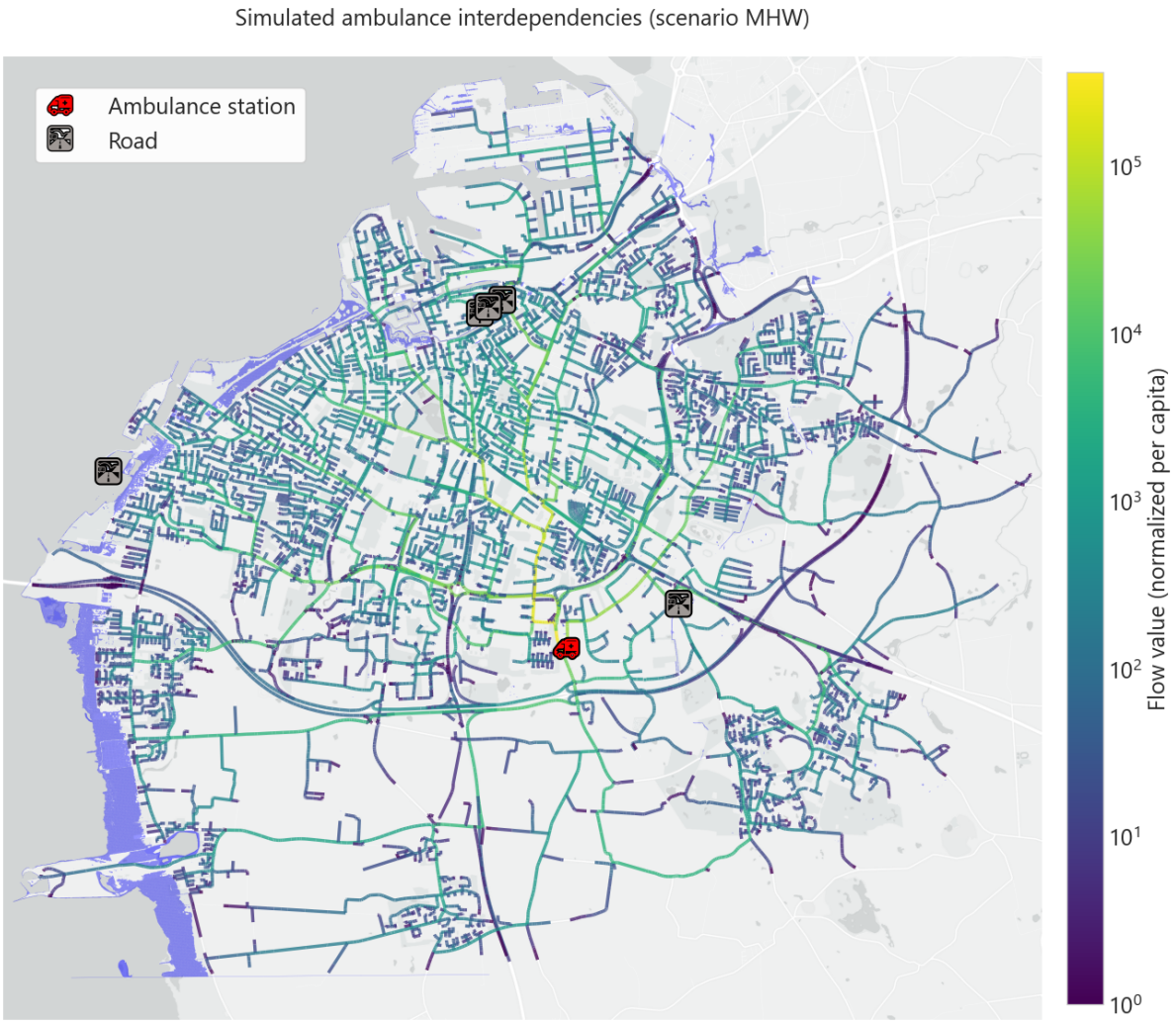


Figure B-22: Simulated ambulance interdependencies for the MHW scenario.

Automated Impact Analysis The MHW hazard scenario reveals significant vulnerabilities in Malmö's ambulance service accessibility, with five residential areas experiencing high unmet demand, collectively affecting an estimated 523 people due to flood-related disruptions.

The analysis of the top 1 percentile of unmet demand for ambulance services under the MHW scenario highlights critical vulnerabilities in Malmö's emergency medical transport infrastructure. The data reveals a concentrated impact on residential areas, with all five high-risk nodes classified as such, indicating a direct threat to public safety and social welfare. The unmet demand values, while not exceeding the 'extreme' threshold (>1000), are uniformly classified as 'high' (>100), underscoring a severe disruption to emergency medical services.

The most affected residential area, identified by code RO000224, faces an unmet demand of 127, translating to an estimated 127 individuals at risk of delayed or inaccessible ambulance services. This is followed closely by RO003439 (105 affected), RO010584 (100 affected), RO017145 (98 affected), and RO003419 (93 affected). The consistent high values across these nodes suggest a systemic vulnerability in the ambulance service network, likely exacerbated by flood-induced disruptions to critical infrastructure pathways.

The primary implication of these findings is the heightened risk to public safety, as residential areas are directly dependent on timely emergency medical transport. The loss of ambulance services in these areas could lead to severe consequences, including delayed medical interventions and increased morbidity or mortality rates during flood events. The geographic concentration of these impacts, though not explicitly detailed in the data, implies potential clusters of vulnerability that could overwhelm remaining operational resources.

In summary, the data underscores the need for robust flood mitigation strategies to protect ambulance service accessibility, particularly in residential zones, to ensure public safety and social welfare during extreme weather events.

Table B-31: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO000224	127	Korsgatan	Residential area
RO003439	105	Lilla Kvarngatan	Residential area
RO010584	100	Bryggövägen	Residential area
RO017145	98	Fredriksberg	Residential area
RO003419	93	Södra Promenaden	Residential area

Table B-32: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
SA02054	5114	Ambulansen Malmö	Ambulance station

6.3 Scenario: EV

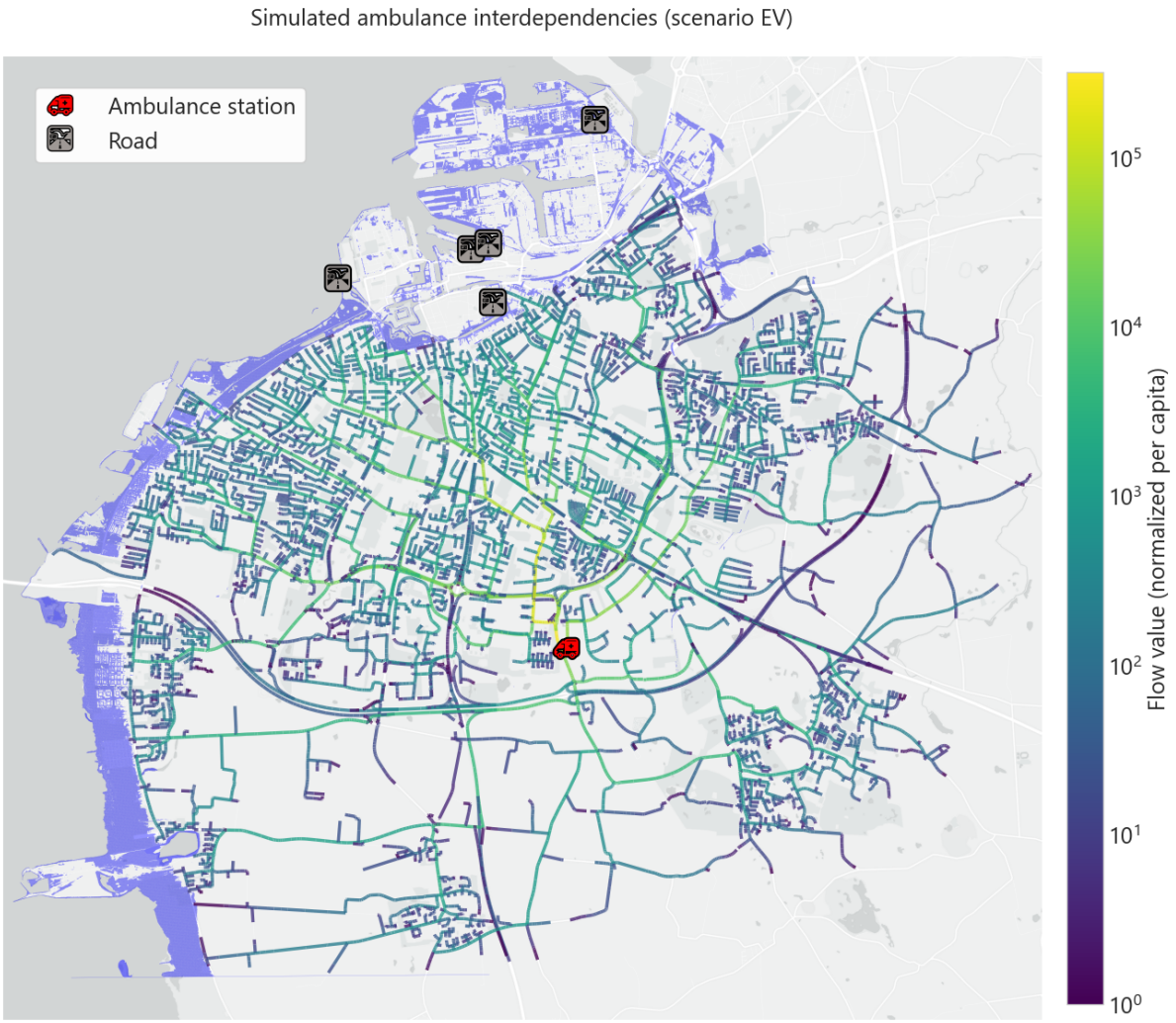


Figure B-23: Simulated ambulance interdependencies for the EV scenario.

Automated Impact Analysis A major storm surge event (EV) poses a high risk to ambulance service accessibility, with multiple residential areas experiencing significant unmet demand due to flood-related disruptions.
The simulated storm surge event (EV) reveals a critical vulnerability in the ambulance service infrastructure, resulting in 'high' impacts across numerous residential areas. Specifically, the top 1 percentile of unmet demand for this scenario consists exclusively of residential areas, indicating a systemic risk to public safety. The most severely impacted location, RO019691, experiences an unmet demand of 331, translating to an estimated 331 people affected by the loss of emergency medical transport. Similarly, RO002349 and RO002387 experience unmet demands of 320 and 314, respectively, highlighting substantial populations vulnerable to delayed or absent ambulance services. Other residential areas, including RO005775, RO021407, RO024672, RO003559, RO002348, RO014584, RO032918, RO029725, RO034616, RO014597, RO005773, RO006398, RO036825, RO006359, RO005774, RO036789, RO029743, and RO003551, also demonstrate 'high' impacts, ranging from 257 to 174 in unmet demand, and thus represent a vulnerable collective impacting public safety due to the estimated number of undelivered services.

Table B-33: Top Infrastructure with Unmet Demand

Code	Unmet demand (norm)	CI Name	CI Type
RO019691	331	Frihamnsallén	Residential area
RO002349	320	Grimsbygatan	Residential area
RO002387	314	Propellergatan	Residential area
RO005775	299	Spillepengsgatan	Residential area
RO021407	280	Porslinsgatan	Residential area

Table B-34: Top Infrastructure with Supply Restrictions

Code	Supply loss (norm)	CI Name	CI Type
SA02054	50209	Ambulansen Malmö	Ambulance station

6.4 Scenario: EN

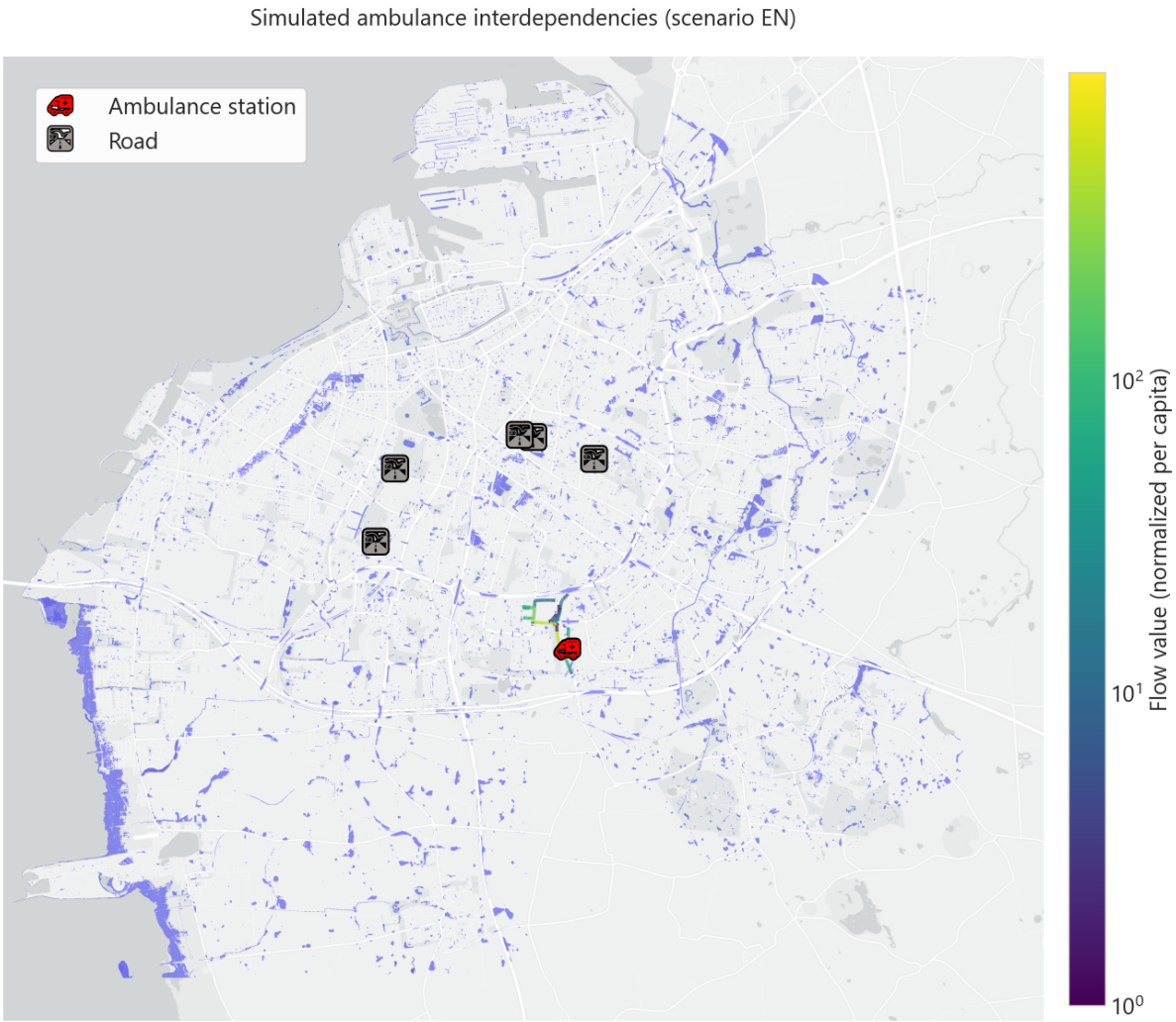


Figure B-24: Simulated ambulance interdependencies for the EN scenario.

Automated Impact Analysis The severe cloudburst scenario (EN) in Malmö's 2125 RCP 8 projection reveals an extreme vulnerability in ambulance service accessibility, with one residential area facing an estimated 731 people

unable to access emergency medical transport, alongside widespread high-impact disruptions across 75 residential nodes.

The simulation of a severe cloudburst (EN) in Malmö's 2125 infrastructure model highlights a critical failure in the city's ambulance service network, with cascading consequences for public safety. The most severe disruption occurs in residential area RO008348, where an extreme impact (unmet demand of 731) suggests that an estimated 731 individuals would be unable to access emergency medical transport—a direct threat to life and health. This is followed by high-impact disruptions (unmet demand > 100) in 75 other residential areas, with the next most affected node, RO005252, experiencing an estimated 502 people without ambulance access.

Geographically, the data suggests a concentrated vulnerability in residential zones, indicating that cloudburst-induced flooding may disproportionately isolate these areas from critical emergency services. The uniform classification of all impacted nodes as "Residential area" underscores that the primary consequence of this infrastructure failure is a severe degradation of public safety. The loss of ambulance accessibility in these regions would exacerbate medical emergencies, delay critical care, and potentially lead to preventable fatalities, particularly in scenarios where immediate transport is life-saving.

The magnitude of these disruptions is uniformly high, with no instances below the 100-person threshold, reinforcing the systemic nature of the risk. While the model does not specify the underlying causes (e.g., road flooding, station inaccessibility), the consistency of residential area impacts suggests that the city's emergency transport infrastructure may be inadequately resilient to extreme precipitation events. The absence of other critical infrastructure types (e.g., commercial or transport hubs) in the top 1 percentile further narrows the focus to a public safety crisis, where the primary concern is the direct human toll of unmet demand for emergency medical services.

Table B-35: Top Infrastructure with Unmet Demand

Code	**Unmet demand (norm)**	**CI Name**	**CI Type**
RO008348	731	Snödroppsgatan	Residential area
RO005252	502	Hårds väg	Residential area
RO036049	476	Kopparbergsgatan	Residential area
RO036050	446	Kopparbergsgatan	Residential area
RO014373	414	Eric Perssons väg	Residential area

Table B-36: Top Infrastructure with Supply Restrictions

Code	**Supply loss (norm)**	**CI Name**	**CI Type**
SA02054	371065	Ambulansen Malmö	Ambulance station