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Perspective

Keywords: multi-hazard risk, early warning, urban climate governance, occupational security, Indigenous knowledge, Pakistan, Canada

Posted Date: September 25th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10864982/v1>

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Additional Declarations: No competing interests reported.

Understanding warning chain failure in compounding urban climate hazards through an occupational security framework with comparative evidence from Pakistan and Canada

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Abstract

Cities now face compounding and cascading weather and climate hazards, in which heatwaves, urban and flash flooding, wildfire smoke and air quality crises interact across space and time to overwhelm the institutions charged with forecasting, warning and preparedness. This paper asks a single question of that convergence: why do forecastable urban compound hazards become mass casualty events despite warning information existing within the institutional system? Taking the warning chain, the sequence of translations through which a forecast becomes protective action at the household scale, as its unit of analysis, the paper argues that recurrent warning chain failure is not primarily technical but ideological: three mutually reinforcing formations, neoliberalism, colonialism in its contemporary continuations, and anthropocentrism, structure the institutional arrangements through which the chain holds or is severed. Drawing on occupational security, a values-based framework grounded in sustainability, justice, peace, compassion, and authenticity with accuracy, and on Actor-Network Theory and transectional analysis, the paper examines two urban systems selected on a dual comparative logic: most-different on the capacity dimensions conventionally invoked to explain governance performance, and most-similar on the theorized cause, a shared British colonial administrative and planning inheritance whose contemporary continuations the cases trace along divergent settler-colonial and extraction-colonial paths. In Pakistani cities, colonial planning inheritance and neoliberal structural adjustment produced the conditions under which the 2015 Karachi heatwave, the 2022 and 2025 monsoon floods, and the 2024 Lahore smog crisis became mass casualty events despite forecastable hazards. In Canadian cities, settler-colonial dispossession of Indigenous fire and land stewardship and neoliberal jurisdictional fragmentation produced the 2021 British Columbia heat dome mortality and the 2023 wildfire smoke emergency.

Comparative analysis shows that identical governance logics generate warning chain failure across divergent national contexts. A five-phase methodology offers a pathway toward people-centred, multi-knowledge and ecologically grounded preparedness, with nature-based solutions identified as its most accessible entry point.

Keywords: multi-hazard risk; early warning; urban climate governance; occupational security; Indigenous knowledge; Pakistan; Canada

1 Introduction: warning chain failure as the central problem of urban multi-hazard governance

Urban environments have become the primary site at which weather and climate hazards compound. Cities concentrate the majority of global greenhouse gas emissions, the greatest densities of climate-vulnerable populations, and the most complex intersections of institutional authority and ecological risk. More than four billion people now live in cities, and the United Nations projects this number will approach seven billion by 2050 [1]. Cities contribute approximately seventy percent of energy-related global carbon dioxide emissions [2] while bearing the sharpest impacts of the hazards they help drive: heat mortality, urban and flash flooding, wildfire smoke intrusion, coastal inundation, and the cascading public health burdens that compound these events. Contemporary hazard scholarship rightly frames these as multi-hazard futures in which events interact across space and time, and in which the decisive question is how weather and climate information is produced, translated, communicated and acted upon within real decision contexts marked by uncertainty and inequality.

This paper takes that decisive question and gives it a precise object. In every case examined here, the hazard was forecast or forecastable, and warning information existed somewhere in the institutional system: the 2015 Karachi heat, the 2021 British Columbia heat dome, the 2024 Lahore atmospheric inversion, the 2025 monsoon rains and Khyber Pakhtunkhwa flash floods. What failed, in each case, was the warning chain: the sequence of translations through which a forecast must pass, from meteorological product to impact assessment to institutional assignment to targeted outreach to protective action at the household scale, before it can protect anyone. The paper’s single question is why these chains are severed, recurrently and at structurally similar points, across maximally different national contexts. Its single answer, developed through the occupational security framework, is that the severance points are determined not by forecast skill but by the ideological configuration of the institutions along the chain. Figure 1 presents this argument schematically.

The failure to govern this convergence adequately is not, as dominant technocratic framings suggest, primarily a problem of insufficient forecast skill, fragmented institutional mandates, or inadequate financial mechanisms, though all of these are real. This diagnosis aligns with an emerging body of scholarship on leverage points for sustainability transformations, which identifies interventions at the level of underlying values, worldviews, and ideological paradigms as the highest-leverage pathways to systemic change, above technical fixes, institutional reforms, or policy instruments operating within existing paradigmatic assumptions [3, 4, 5, 6]. The present paper operates explicitly at this level, arguing that naming and displacing the ideological formations that structure governance is a necessary precondition

for warning, preparedness and adaptation reforms of any other kind to achieve durable effect.

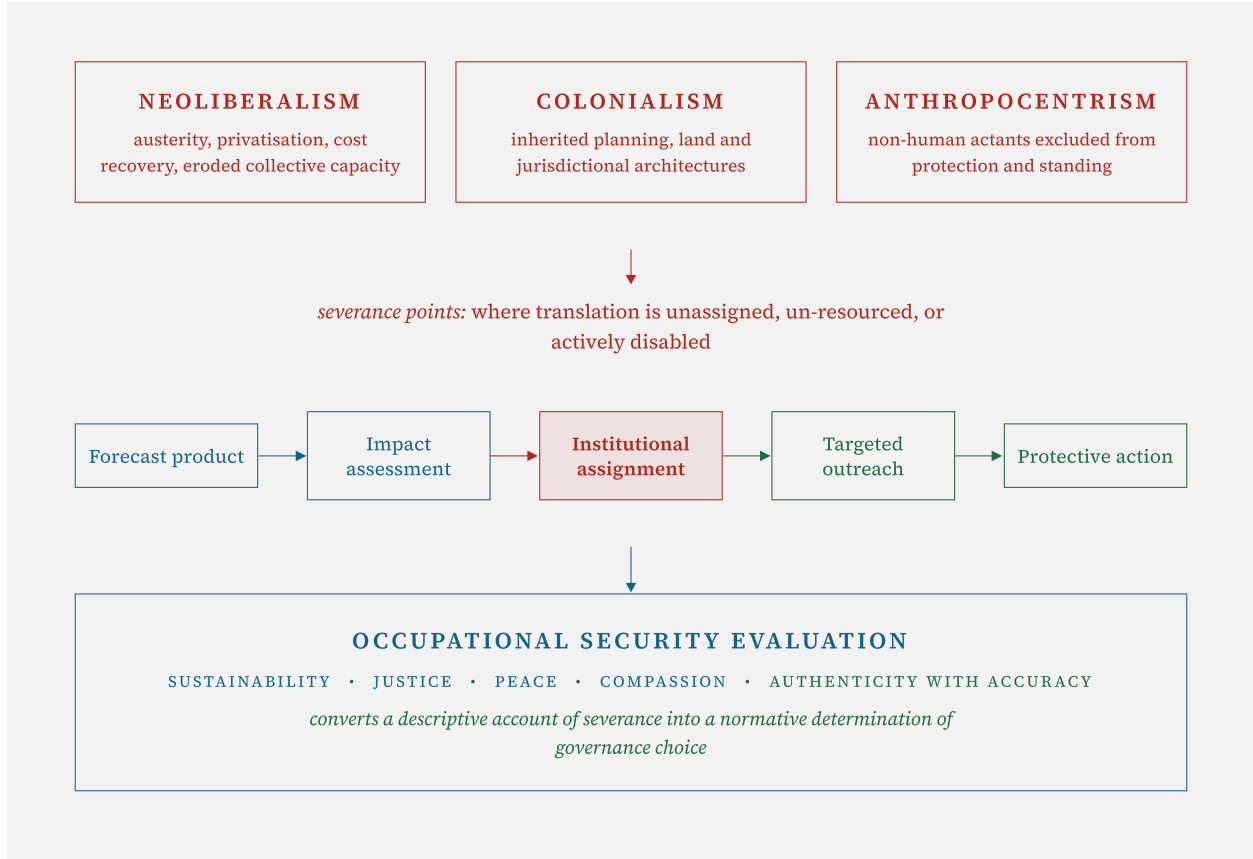


Figure 1: The warning chain as unit of analysis. A forecast becomes protective action only by passing through a sequence of institutional translations. The three ideological formations act on the chain by determining where translation is institutionally unassigned, assigned but unresourced, or actively disabled; institutional assignment is highlighted as the severance point common to the cases examined here, where a forecast and an impact assessment exist but no actor is mandated to convert them into targeted outreach. The occupational security values then evaluate each documented severance. Transectional tracing, per Section 3.3, connects the chain across scales and admits non-human actants as participants.

Three deeply entangled ideological formations constitute, on the argument developed here, the answer to the warning chain question. The first is neoliberalism. Since its consolidation as global economic doctrine in the 1980s through the programmes of the International Monetary Fund, the World Bank, and the governments of the United States and United Kingdom, neoliberalism has restructured urban governance around the primacy of market mechanisms, private property rights, cost recovery and competitive resource allocation, systematically eroding the collective institutions on which warning and protective response depend [7, 8]. The second is colonialism in its contemporary continuations: the planning systems, land tenure frameworks, jurisdictional architectures and knowledge hierarchies inherited from colonial administration and reproduced in present governance, in extraction-colonial form in Pakistan and settler-colonial form in Canada [13, 14, 15]. The

third is anthropocentrism, the assumption that governance owes protection only to humans, which renders invisible the non-human actants, tree canopies, wetlands, hydrological systems, atmospheric processes, on whose integrity human hazard buffering depends, and forecloses the Indigenous knowledge systems whose relational epistemologies represent more ecologically sound governance [9, 16, 17, 18, 19, 20].

The comparison of Pakistan and Canada is designed, not incidental, and its logic is worth stating at the outset since it carries the paper’s inferential weight. The design is dual. On every dimension conventionally invoked to explain hazard governance performance, gross domestic product per capita, depth and continuity of democratic institutions, meteorological and forecasting capacity, administrative capability, and position within global emission and wealth-extraction histories, the two countries are close to maximally different, which is the most-different-systems logic of comparative inquiry [68]: if warning chain failure of the same structural form appears in both, explanations resting on capacity or wealth alone are insufficient. But the two countries are simultaneously most-similar on precisely the variable this paper theorizes: both inherited British colonial administrative, legal and planning systems, whose contemporary continuations the cases trace along divergent paths, extraction-colonial inheritance amplified by structural adjustment in Pakistan, settler-colonial dispossession and jurisdictional subordination of municipalities in Canada. Most-different on the rival explanations and most-similar on the theorized cause is a deliberate case-selection architecture [69], and it is completed by a practical consideration: the author’s documented empirical grounding in both countries, including published transectional analyses spanning Khyber Pakhtunkhwa and North America [22] and sustained institutional context in British Columbia. Section 2 specifies the design’s procedures, evidence base and inferential limits.

Occupational security [9] provides the framework through which the analysis proceeds, integrating an explicit ethical architecture of five values, sustainability, justice, peace, compassion, and authenticity with accuracy, with Actor-Network Theory and transectional analysis as its tracing method. The framework has been applied to seismic hazards [21] and flash flood disasters [22], extended into economic analysis through ethical security economics [23], and its theoretical foundation in Actor-Network Theory and the mobilities paradigm has recently been formalised [24]. To keep the framework’s application disciplined, the paper distinguishes its core from its extensions. The core comprises the warning chain as unit of analysis, the transectional tracing method, and the occupational security values evaluation. Necropolitics [10] operates as a labelled interpretive lens applied at specified points, the five-phase methodology of Section 7 is the framework’s constructive extension, and nature-based solutions are treated as its most accessible implementation instruments. Claims are classified throughout by evidential type: descriptive findings from the documentary record, interpretive readings labelled as such, and normative evaluations performed through the five values and separately flagged.

The paper proceeds as follows. Section 2 sets out the analytical approach and case selection logic. Section 3 develops occupational security as a governance architecture for multi-hazard cities. Section 4 examines Pakistani cities. Section 5 examines Canadian cities. Section 6 conducts a comparative analysis of warning chain failure. Section 7 proposes a five-phase methodology with nature-based solutions as its entry point. Section 8 discusses implications, limitations and scope conditions. Section 9 concludes.

2 Analytical approach and case selection

The analysis proceeds through structured comparative case analysis combined with actor-network and transectional methods, an approach standard within critical governance scholarship and political ecology and applied here with explicit specification of its procedures, evidence base and inferential limits.

Case selection. The two cases were selected on a dual comparative logic stated in the introduction and specified here. The first component is a most-different-systems design [68]. Pakistan and Canada diverge on nearly every dimension conventionally invoked to explain hazard governance performance: gross domestic product per capita, depth and continuity of democratic institutions, meteorological and forecasting capacity, administrative capability, and position within global emission and wealth-extraction histories. If warning chain failure of the same structural form appears in both, then explanations resting on capacity or wealth alone are insufficient, and a common structural logic becomes the more parsimonious account. The second component is a most-similar anchor on the theorized cause [69]: both countries administer cities through direct inheritances of British colonial planning, land and jurisdictional law, so the comparison holds the hypothesized structural variable in common while varying nearly everything else. This dual construction is what permits the analysis to attribute shared failure forms to the shared inheritance and its neoliberal amplification rather than to capacity, wealth or institutional depth. Within each country the analysis concentrates on urban and peri-urban events between 2015 and 2025 that were compound or cascading in character and for which forecast or warning information demonstrably existed prior to impact: the 2015 Karachi heatwave, the 2022 and 2025 monsoon floods, the August 2025 Khyber Pakhtunkhwa flash floods, and the 2024 Lahore smog crisis; and the June 2021 British Columbia heat dome and the 2023 wildfire and smoke season. Events without a prior forecast were excluded, since the analytical question concerns translation rather than prediction.

Evidence base. The analysis draws on four classes of documented evidence: official mortality and casualty determinations, including the British Columbia Coroners Service death review panel findings [54]; quantified physical and emission data, including satellite-derived inverse modelling of wildfire carbon emissions [29] and formal attribution analyses [41]; governance and implementation documents, including national adaptation strategies, municipal adaptation plans, multilateral finance project assessments, and coronial recommendations [56, 52, 47]; and peer-reviewed empirical scholarship on planning inheritance, urban heat island dynamics, adaptation infrastructure and Indigenous stewardship [14, 43, 55, 17]. No new primary data were generated; the contribution lies in the analytical architecture applied to this documented evidence.

Analytical procedure. Each case is traced through three sequential steps. First, network reconstruction identifies the human and non-human actants standing between a hazard forecast and protective action at the household scale, including meteorological authorities, municipal departments, housing providers, community organisations, and the atmospheric, hydrological and infrastructural systems that mediate exposure. Second, translation analysis, in the Actor-Network Theory sense of the term [35, 36], locates the specific junctures at which the chain was severed, distinguishing links that were institutionally unassigned from those assigned but unresourced and those actively disabled through political inter-

vention [22]. Third, values assessment evaluates each identified severance against the five occupational security criteria, converting a descriptive account of failure into a normative determination of whether that failure constituted a governance choice. The three steps carry distinct evidential statuses, and the analysis maintains the distinction explicitly: network reconstruction and translation analysis yield descriptive findings from the documentary record; readings that go beyond the record, including the necropolitical lens, are labelled interpretive; and the values assessment is normative, performed only on evidence the first two steps have established.

Inference and scope. Two cases cannot establish frequency or statistical generalisation, and no such claim is made. The inferential logic is analytical rather than statistical: the cases test whether a proposed structural explanation holds across maximally divergent institutional settings, and the framework’s scope conditions, stated explicitly in Section 8, specify the contexts in which its diagnostic architecture would require supplementation or revision. This specification is the appropriate analogue within framework-development methodology to falsifiability in predictive empirical science, and it is stated in advance rather than retrofitted.

3 Occupational security as an ethical governance framework against death-philic systems

3.1 Foundational concepts and critique

Occupational security, developed by Chishtie et al. [9], begins not with a technical description of governance gaps but with an explicit moral critique of the ideological systems that produce them. Three clarifications render the framework self-explanatory to readers outside occupational science. First, occupational security is defined as “the interrelated, sustainable, just, and compassionate protection of humans’ and non-humans’ right to a safe, peaceful, and dignified life including engagements in occupation with measures and solutions that are authentic and accurate” [9]. In this definition, occupation encompasses all life activities, not only paid work but the full range of purposeful engagements through which humans and non-humans sustain their existence, relationships, and meaning. Second, non-human extends to non-living actants including water systems, soils, atmospheric processes, urban ecological infrastructure, and governance instruments such as forecasts, warnings and plans that exercise real effects on occupational conditions. Third, the framework is collective in orientation: unlike human security frameworks that locate security primarily in the individual, occupational security requires the institutional architecture of the state to be reoriented toward collective protection, directly confronting the neoliberal tendency to privatise security and treat collective goods as market failures [9, 8].

This starting point is structural: it establishes that the reforms the framework proposes cannot be achieved by incrementally adjusting institutions whose foundational assumptions perpetuate the conditions they nominally address. Neoliberalism, Chishtie et al. [9] argue, has not merely failed as a framework for human security but has actively generated insecurity by privatising essential services, imposing austerity, promoting deregulation, and substituting market values for ethical values. Grayson [8] finds that the difficulties in operationalising human security lie precisely in the ways such policies have proven subordinate to the estab-

lished agenda of neoliberalism. Within occupational science, Frank [25], Gappmayer [26], and Huot [27] document governance that favours profit, division, and competition over the collective conditions under which meaningful occupation and genuine security are possible.

Anthropocentrism receives equally foundational critique. Existing frameworks, including United Nations human security, are built on anthropocentric notions of security [9]. This is a governance failure of the first order: it renders invisible the non-human actants upon whose health urban systems depend, and forecloses the integration of Indigenous knowledge systems whose relational understanding of interdependence represents a more ecologically sound governance epistemology. Occupational security’s critique goes beyond the reactive inclusion of non-humans that some post-anthropocentric proposals offer as responses to climate crisis [28, 18]: the primary motivation for including non-humans must be their intrinsic value, not their instrumental usefulness in addressing human-defined problems [9].

Colonialism in its contemporary continuations is identified through its manifestation in the governance of land, fire, water, and ecological systems. The systematic displacement of Indigenous fire stewardship through colonial suppression policies is a direct and traceable governance failure: global reviews show that Indigenous fire stewardship maintained the landscape heterogeneity and biodiversity that suppression regimes destroyed, and that the displacement of these practices produced the continuous fuel loads conducive to the high-intensity fires now consuming the boreal forest [17, 29]. Nunez et al. [16] document analogous processes in the Global South, showing how capitalist, colonial, and patriarchal domination disrupted collective occupations and community relations with nature.

3.2 Five core values as governance architecture

Occupational security’s constructive content is organised around five values that function as structural governance requirements, each prescribing a specific reorientation of hazard governance practice.

Sustainability challenges the neoliberal subordination of long-term ecological viability to short-term returns. Its three pillars of environmental, economic, and social sustainability, of which equity is one dimension alongside social cohesion, institutional capacity and intergenerational well-being [30], require governance systems to account honestly for the full hazard implications of urban systems, to plan on timescales that match ecological processes rather than electoral cycles, and to ensure that the distribution of both risks and adaptive resources reflects equity across groups and generations. In both contexts examined here, this requires challenging the tendency in neoliberal discourse to substitute private wealth metrics, property values, GDP growth, real estate investment volumes, for genuine sustainability accounting, rendering invisible the destruction of the collective ecological capital on which hazard buffering depends [14, 31].

Justice operates across social, climate, and occupational dimensions simultaneously. Social justice requires redistribution of governance authority, resources, and adaptive capacity to those most exposed. Climate justice requires recognition that those suffering the most severe impacts have typically contributed least to the emissions producing them [20]. Occupational justice requires protection of the right of all beings to engage in their occupations with security, extending this to the non-human urban inhabitants whose occupational disruption signals ecosystem collapse [32, 33]. It requires naming the colonial structures that

produced occupational injustice rather than addressing symptoms through technical interventions [15].

Peace challenges the competitive logics that pervade both climate finance and domestic hazard governance, where jurisdictions compete for resources, where Indigenous communities are engaged through adversarial legal processes rather than collaborative governance, and where conflicts over land, water and air are resolved in favour of those with capital [9]. Peace requires governance systems to build collaborative relationships across scales and between state and Indigenous authorities, recognising that restoration of Indigenous fire stewardship and water management is a matter of governance sovereignty rather than technical contribution.

Compassion provides the moral foundation for extending accountability to non-human urban inhabitants. Chishtie et al. [9] argue that the over-extraction and violence against nature since the industrial revolution has lacked compassion, and that care must now be extended to non-humans to achieve reciprocal and harmonious relationships. In hazard governance, compassion requires moving from instrumental valuation of urban ecology toward relational valuation that recognises trees, wetlands and riparian corridors as co-inhabitants whose occupational security is constitutive of the ecosystem on which human protection depends. Decisions about tree removal, wetland drainage and stream culverting are thereby reframed as governance decisions requiring justification against occupational security criteria rather than financial cost-benefit analysis alone.

Authenticity with accuracy directly challenges the deployment of crisis for private accumulation, what Klein [34] theorised as disaster capitalism. In an era of misinformation and spin, crisis is used as an opportunity to procure contracts, deregulation and market advantage while obscuring actual intent [9]. In hazard governance, this value requires full transparency about the distribution of risk and adaptive capacity, honest accounting of emissions including wildfire emissions currently excluded from national inventories [29], and resistance to greenwashing. Critically for warning chains, it also requires that hazard information be delivered without political interference: the Texas and Khyber Pakhtunkhwa flash floods of 2025 demonstrate how political denial of climate science and the defunding of forecasting agencies operate as disabling actors within disaster risk networks, a mechanism of anti-translation that severs the chain between forecast and protective action [22]. These five values are not proposed as exhaustive; as Chishtie et al. [9] acknowledge, they are those most pertinent to the failures identified here.

3.3 Actor-Network Theory, transectionality and the non-human urban

Occupational security integrates Actor-Network Theory [35, 36] and transectional analysis as embedded components of its post-anthropocentric architecture. ANT’s insistence on the agency of non-human actants directly operationalises the compassion value by making non-human urban inhabitants analytically visible as participants in governance processes. Its post-humanist relational ontology is, as Chishtie et al. [9] note, in harmony with Indigenous knowledge systems that have always understood non-humans as active participants in community life.

Invoking ANT requires care given its internal heterogeneity and the debates that have accumulated around it since Latour’s own acknowledged ambivalences [37]. This paper draws selectively on ANT’s principle of generalised symmetry, the refusal to grant humans analytical privilege over non-humans as actors in assemblages, and on its relational ontology, which treats agency as distributed across networks. It does not adopt ANT’s more apolitical tendencies, which critics identify as a tendency to describe networks without naming the power asymmetries that structure them [37]. Occupational security corrects this limitation by embedding ANT’s relational ontology within an explicit values framework that names neoliberalism, colonialism and anthropocentrism as the structuring ideologies of the networks it analyses.

Transectionality refers to the dynamic configuration of human and non-human actor-networks across spatial, temporal and organisational scales, and to the processes through which these networks co-constitute risk, vulnerability and governance outcomes in ways that no single-scale or single-actor analysis can capture. The concept originated in the author’s analysis of post-disaster rehabilitation networks following the 2005 Pakistan earthquake, where recovery emerged through interactions of caregivers, technologies, policy instruments and spiritual actors traced as actants producing observable network effects; this foundation has been formalised as the ANT-Mobilities framework [24]. Chishtie and Clague [21] then developed transectionality through seismic hazard research in the Pacific Northwest, demonstrating that earthquake risk emerges from translation processes through which monitoring systems, building codes, emergency protocols, geological formations and emerging artificial intelligence technologies mutually constitute one another across scales, and embedding this recognition within a five-phase methodology of network mapping, translation analysis, transectional vulnerability assessment, uncertainty quantification, and adaptive intervention design. Chishtie, Ali and Clague [22] extended the approach to flash flood disasters, tracing how political actors participate in constituting vulnerability through anti-translation: the active severing of the links between climate science, forecasting agencies, warning systems and the communities they should serve. The present paper constitutes a further application, directed at urban multi-hazard governance: it traces the transectional networks through which neoliberal, colonial and anthropocentric governance arrangements co-constitute the failure of warning chains and the differential exposure of urban populations and ecosystems.

A clarification of epistemological position is warranted. This paper does not adopt a scientific stance; it does not treat the methods of the natural sciences as the sole legitimate form of rigorous inquiry [38]. Scientism is itself an ideological position, one that has historically enabled the capture of science by unjust ends: the same epistemological narrowing that excludes Indigenous governance knowledge from environmental management also excludes the values analysis that would reveal when science is deployed in the service of extraction or dispossession. The paper is grounded in documented empirical evidence throughout, including mortality records, emission inventories, flood displacement data and implementation assessments, and applies to that evidence the standards appropriate to its domain: theoretical coherence, logical consistency, explanatory power across divergent cases, and transparent statement of scope conditions. The framework’s falsifiability is embedded in the scope conditions stated in Section 8.

Both ANT and Indigenous epistemology challenge the Cartesian subject-object dualism upon which anthropocentric and colonial governance rest, the same dualism that legitimises

treating nature as a resource to be managed and Indigenous peoples as stewards rather than as sovereign governance actors, when stewardship and sovereignty are complementary rather than alternative descriptions. Current arrangements deny Indigenous peoples the latter while instrumentalising the former. Transactional analysis is distinguished from conventional multi-level governance analysis [39] by its insistence that scales are co-constituted by actor-networks rather than being administratively pre-given containers within which actors operate. In urban hazard contexts, this reveals that no adequate response to heat mortality, flooding or smoke can be confined to within-city institutions: the atmospheric, hydrological and ecological processes that determine outcomes connect urban governance to hinterland land management, to global emission trajectories, and to the colonial and neoliberal arrangements that shape all of these.

4 Pakistan: colonial inheritance, compounding hazards and severed warning chains

4.1 Colonial planning and the structural impossibility of collective governance

Pakistan’s urban governance crisis cannot be understood without its colonial origins. The planning systems, land tenure frameworks and bureaucratic procedures governing Pakistani cities are, as Qadeer [14] documents, direct inheritances of colonial administration designed to facilitate revenue collection and population control rather than collective welfare. These systems were not fundamentally modified at independence in 1947; they were taken over by a post-colonial elite whose interests they served [40, 14].

The consequences are structural. Pakistani cities lack the collective governance infrastructure, competent municipal bureaucracies, transparent land administration, enforceable building codes and environmental regulations that equitable hazard governance requires, not because these are recent innovations not yet adopted, but because the colonial inheritance actively prevents their emergence. As Qadeer [14] observes, Pakistan has not lacked plans, having produced national housing policies in 1984, 1986 and 2001 and numerous master plans, but has consistently fallen short of institutions that can carry them through. Authority is vested in private landowners, developers and land mafias operating in complicity with public officials, what Haque [40] identifies as frustrated urbanisation rooted in colonial institutional inheritance.

This inheritance was compounded by successive waves of internationally imposed structural adjustment. Since the 1980s, Bretton Woods institutions have required recipient governments to align their economies with neoliberal thinking as a condition of support, compelling privatisation, deregulation of land markets and reduction of state capacity [7, 14]. As Qadeer [14] observes, Pakistan’s urban development has faithfully reflected whatever the current idiom was at the World Bank, even as its urban problems ballooned. The cost-recovery idiom of the 1990s removed what limited capacity for collective infrastructure had survived, leaving cities more populated, more unequal, and less able to provide the drainage, water supply and public cooling infrastructure on which hazard resilience depends.

4.2 Forecastable hazards, failed warning chains, and the necropolitical reading

Before presenting the events, we state the status of the interpretive lens this subsection applies. Necropolitics [10] is invoked here as a labelled interpretive reading layered on descriptive findings, not as an additional empirical claim: the descriptive findings are the documented severance points in each warning chain, and the necropolitical reading names the pattern those findings form. Necropolitical urban outcomes are, by definition, the direct negation of occupational security: where occupational security requires the interrelated, sustainable, just and compassionate protection of all beings' right to a safe life, necropolitics names the logic by which certain populations and ecosystems are exposed instead to premature death produced not by exceptional violence but by the ordinary operations of governance designed to serve other interests [10]. Kirk [11] theorises the entanglement of neoliberal and necropolitical ideology as producing the systemic disposability of certain populations. Every heatwave death in an unserviced informal settlement and every ecosystem collapse in a drained urban wetland is simultaneously a necropolitical outcome and an occupational security failure.

Pakistan is ranked among the most climate-vulnerable countries in the world, reflecting compound exposure to heat, flooding, glacier melt, water scarcity, and the governance incapacity that prevents effective adaptation [41, 42]. The 2015 Karachi heatwave killed more than 1,200 people, a toll generated not merely by ambient temperature but by the intersection of urban heat island intensification, water supply failure, electricity grid collapse under demand overload, and the absence of organised public cooling infrastructure [43]. The heatwave itself was forecast; what did not exist was any institutional mechanism to translate a temperature forecast into an impact-based warning and a coordinated protective response, particularly for the informal settlement residents and outdoor workers who died. Temperatures in Karachi now run approximately five to seven degrees Celsius above surrounding rural areas as a consequence of urban heat island dynamics, with the built-up area expanding by 286 percent between 1980 and 2020 and eliminating approximately 870 kilometres of natural drainage channels [43]. In 2024, temperatures exceeded 45 degrees Celsius across multiple cities in April, triggering mass hospitalisations and crop damage, in a pattern of simultaneous extreme heat and extreme flooding that continued throughout the year [44].

The 2022 floods inundated one-third of the country, affected 33 million people and caused damage exceeding 30 billion US dollars [45, 42]. The 2025 monsoon displaced approximately 3.5 million people and killed over 300 in northern Pakistan, 140 of them children, with deaths concentrated among those in structurally inadequate housing built without reference to flood risk [41]. World Weather Attribution confirmed that climate change substantially intensified both events [41]. The August 2025 flash floods in Khyber Pakhtunkhwa, in which more than 200 people died in Buner district alone, exposed the warning chain with particular clarity: Chishtie, Ali and Clague [22] trace how institutional dysfunction, the absence of localised flash flood warning capacity, and settlement in hazard-exposed terrain combined to render meteorological warnings ineffective at the community scale, and how these failures constitute violations of the occupational security values of justice and authenticity with accuracy rather than merely technical gaps.

These are not natural disasters overwhelming otherwise adequate systems. They are

the predicted outcomes of governance designed, through colonial inheritance and neoliberal restructuring, to serve private accumulation rather than collective survival. The informal settlement residents, approximately half of all urban Pakistanis [14], who bear the greatest burdens are those who have contributed least to emissions and whose exclusion from warning and response systems is structurally enforced by the same property arrangements that render their settlements illegal, unserviced and politically voiceless.

Air quality illustrates the compounding and anthropocentric dimensions with particular force. During the smog crisis of October through December 2024, Lahore’s PM2.5 concentrations reached 400 micrograms per cubic metre, ten times WHO guidelines, generating approximately 2,000 hospitalisations in Lahore alone [44, 46]. The crisis was generated by the convergence of industrial and vehicle emissions with crop residue burning in surrounding agricultural areas, itself a legacy of colonial agricultural intensification that replaced traditional intercropping with input-intensive monocultures requiring stubble burning at scale. It is a paradigmatic cascading hazard: an agricultural practice at the regional scale, an atmospheric inversion at the meteorological scale, and a public health emergency at the urban scale, governed by no institution operating at the scale of the problem. The economic cost of air pollution in Pakistan was estimated at three billion US dollars in 2024 [44], a figure that excludes the occupational disruption of millions unable to work or attend school outdoors, and excludes entirely the impacts on the non-human inhabitants of Pakistan’s degrading urban ecology.

4.3 Neoliberal climate finance and the limits of technocratic reform

Pakistan launched a National Climate Finance Strategy in 2024 and secured over 1.5 billion US dollars from sources including the IMF Resilience and Sustainability Facility and the Green Climate Fund [47]. The Asian Development Bank approved resilience projects worth 304.5 million US dollars in late 2025, and the World Bank approved 102 million US dollars for microfinance access among vulnerable populations [47, 48].

Authenticity with accuracy requires honest assessment of whether these mechanisms represent transformation or the entrenchment of neoliberal approaches in new language. The Sindh Resilience Project, launched with World Bank support in 2016 to strengthen flood and drought risk management, had completed only half of its planned works by 2024 to 2025, with the World Bank attributing delays to procurement bottlenecks, limited project management capacity and governance risks [47]: precisely the institutional failures generated by arrangements these projects do not address. The Greater Karachi Bulk Water Scheme remains only 60 to 65 percent complete as of 2025 despite initiation in the early 2000s [47]. These failures reflect the structural incompatibility between technocratic project design and the governance realities of cities whose capacity has been undermined by the same doctrine that finance institutions continue to prescribe. Authenticity with accuracy requires naming this contradiction rather than treating each implementation failure as a project management problem to be resolved through better procurement.

5 Canada: settler colonialism, neoliberal fragmentation and compounding urban hazards

5.1 Settler-colonial foundations

Canadian urban governance operates on a foundational illegitimacy that climate policy discourse obscures: Canadian cities are built on Indigenous territories whose governance systems were not ceded but dispossessed through colonial violence and legal chicanery, and the settler state continues to deny Indigenous peoples full sovereignty over the lands and waters of their territories [15, 49].

This is a governance failure of direct consequence for hazard resilience. The Indigenous peoples of what is now Canada developed over millennia governance systems for fire, water and ecological management of extraordinary sophistication, systems that maintained landscape heterogeneity, regulated fire frequency to prevent fuel accumulation, and sustained biodiversity [17, 50, 51]. The systematic destruction of these systems through colonial fire suppression, colonial forestry practices including monoculture replanting of clear-cut areas, and the imposition of provincial resource regimes that treat Indigenous territorial governance as a limitation on extraction represents one of the most consequential governance failures in Canadian history.

The consequences are now measured in hectares burned and carbon emitted. The 2023 wildfire season burned approximately fifteen million hectares, more than seven times the average annual area of the previous four decades, and released approximately 647 megatonnes of carbon, an amount exceeded by the annual fossil fuel emissions of only China, the United States and India, while generating smoke that degraded air quality across virtually every major Canadian city and prompting 232,000 evacuations [29]. These emissions are excluded from Canada's national greenhouse gas inventory, a governance decision whose failure of authenticity with accuracy is compounded by rendering invisible the contribution of colonial fire and forestry policy to national emission totals, and by marginalising the Indigenous fire stewardship that represents the most effective long-term intervention for reducing them [17].

The settler-colonial structure also shapes vulnerability through its distribution of fiscal and political authority. Under the Canadian constitution, municipalities are creatures of provincial legislation with no independent status, limited fiscal tools and authority bounded by provincial grant. This arrangement reflects a convergence of colonial administrative logics that subordinated urban populations to extraction priorities, the imperatives of nation-state formation that concentrated authority at provincial and federal levels, and the interests of propertied elites. Whatever the balance of these rationales, the outcome is the same: municipalities lack the authority to govern their own hazard futures at the pace the emergency requires. Vancouver's 2024 to 2025 Climate Change Adaptation Strategy explicitly acknowledges that the funding needed is beyond the City's capacity and will require sustained funding from senior governments [52]. This is not a technical funding gap; it is an expression of colonial administrative arrangements persisting in the governance architecture of a self-declared liberal democracy.

5.2 Neoliberal fragmentation and the 2021 heat dome warning failure

Canada’s neoliberal restructuring from the 1980s imposed on this colonial municipal framework an additional layer of fragmentation: devolution of service responsibility without fiscal authority, privatisation of infrastructure, and inter-jurisdictional competition as a substitute for coordination [31, 53]. The result is an architecture in which adaptation, mitigation, public health and emergency management are administered by separate actors with distinct funding streams and accountabilities, in which no integrative authority exists at the scale of the hazards being addressed, and in which the most vulnerable communities are systematically underrepresented.

The British Columbia heat dome of late June 2021 is the clearest Canadian case of warning chain failure. The BC Coroners Service attributed 619 deaths to the event, the great majority of them older adults living alone in housing without cooling, disproportionately in socially and materially deprived neighbourhoods of Metro Vancouver and the Fraser Valley [54]. The heat was forecast days in advance with high confidence. What did not exist was a provincial heat alert and response system capable of converting the forecast into targeted outreach to those known to be at risk. The coroners panel found a lag between the heat alerts issued by Environment and Climate Change Canada and the response of public agencies and the public, and recommended implementation of a coordinated provincial heat alert and response system [54]: there was no impact-based warning tier, no mandated wellness checks, and no mechanism connecting meteorological warnings to health authorities, housing providers and community organisations. The failure was located precisely at the point of translation, not at the point of prediction.

These deaths were the direct consequence of a housing market that had forced climate-vulnerable populations into dwellings with no thermal regulation, a public health system restructured to operate reactively, and a social support system hollowed by decades of austerity. The provincial Heat Alert and Response System introduced in 2022 addressed the warning tier but not the structural drivers of exposure. When cooling and cleaner air centres were established as an adaptation measure in Greater Vancouver, research found they operated in a reactive, fragmented and poorly coordinated manner, lacking sustained operational and financial frameworks that would enable proactive deployment [55]. That such basic infrastructure operates reactively in one of Canada’s most climate-progressive regions illustrates the gap between technically sophisticated planning and the governance capacity to implement it equitably.

5.3 Anthropocentrism in Canadian urban climate policy

Canadian urban hazard governance is structured predominantly around human impact metrics: mortality during heat events, property damage from flooding, economic costs of smoke. Non-human urban inhabitants, from tree canopies whose cooling function reduces heat mortality to riparian ecosystems whose integrity determines flood dynamics, appear primarily as contributors to these metrics rather than as inhabitants with their own occupational security requiring protection.

This has concrete consequences. When Vancouver considered eliminating or weakening

its climate and sustainability department in late 2025, the debate was framed in terms of human health and economic cost [31]; the non-human inhabitants whose security the department’s urban ecology programmes protected had no standing. When development encroaches on riparian corridors or mature canopy in Toronto or Calgary, the framework requires only human-centred cost-benefit analysis with ecosystem services monetised. Extending accountability to non-human urban inhabitants requires recognising that this encompasses non-living actants, including hydrological systems, soils, atmospheric conditions and governance instruments such as official plans and warning protocols whose configurations exercise real effects on occupational conditions. Emerging precedents, including the legal personhood accorded to the Whanganui River in Aotearoa New Zealand and Ecuador’s constitutional recognition of the rights of nature, demonstrate that such accountability is juridically actionable.

Canada’s National Adaptation Strategy [56] establishes Indigenous Climate Leadership as an objective and commits to distinction-based partnerships with First Nations, Inuit and Métis peoples. These represent genuine advances. However, occupational security requires asking whether this constitutes a substantive shift from consultation toward co-governance, or whether it reproduces the pattern Greaves [15] documents of settler governance accommodating Indigenous interests instrumentally while retaining substantive power. The evidence from wildfire governance, in which Indigenous fire stewardship remains marginal to the provincial and federal regimes that generated the current crisis [17, 57], suggests the distance between commitment and co-governance remains great.

6 Comparative analysis: common roots, divergent manifestations, shared warning chain failures

6.1 Neoliberalism, colonialism and anthropocentrism as shared roots

The comparison reveals that the same three formations generate governance failures whose scale and institutional expression differ enormously but whose structural logic is identical. In both contexts, governance systems are designed to serve private accumulation over collective well-being, to subordinate Indigenous and marginalised communities to propertied elites and extraction, and to treat non-human systems as resources rather than governance subjects.

In Pakistan the colonial inheritance is visible in the governance structures themselves, amplified by structural adjustment. The necropolitical outcome is that informal settlement residents are structurally consigned to premature death through land tenure that renders their settlements unserviceable, drainage designed for colonial administrative centres, and finance mechanisms that channel funds toward project types the institutional environment cannot absorb. In Canada the same formations operate through architectures that are formally sophisticated but structurally equivalent: settler dispossession laundered through constitutional arrangements that acknowledge Indigenous rights in principle and deny their exercise; neoliberal fragmentation that ensures each level of government can attribute failure to another; and anthropocentric framing that forecloses relational governance.

Climate coloniality, as Sultana [20] theorises, manifests differently but shares a common

logic: the propagation of fraudulent universalisms, such as the claim that market-based carbon pricing or voluntary corporate commitments constitute adequate responses, that maintain the arrangements of dispossession while accommodating their critique. The instability of these instruments is itself instructive. Chishtie and Mallick [23] analyse the abandonment of carbon pricing in North America through ethical security economics, showing that an instrument long presented as the technically optimal climate policy proved politically disposable the moment it imposed visible short-term costs, and that its retreat leaves the collective protective infrastructure that preparedness requires without a financing basis. The lesson for multi-hazard governance is that instruments designed to be compatible with market rationality inherit that rationality’s vulnerability to political reversal, whereas obligations grounded in the collective right to a safe and dignified life do not rest on the same contingency.

Credible comparison requires naming the structural differences as well. The depth of democratic institutions differs: Canada possesses established channels for legal challenge and electoral accountability, whereas Pakistan’s democratic institutions have been repeatedly interrupted and remain constrained by military influence and elite capture. Elite formations differ: Canadian elites operate primarily through market mechanisms within relatively robust regulatory frameworks, while Pakistani elite formations combine market, political, bureaucratic and land-mafia dimensions that more directly translate power into governance exemption. Religious and cultural orientations toward nature differ in ways that affect the moral vocabulary available for reform: Islamic ethical traditions present in Pakistan carry significant resources for stewardship through concepts such as *khalifa* (trusteeship of the earth) and *hima* (protected ecological areas), providing moral grounding that differs from the predominantly secular liberal frameworks of Canadian discourse, which draw on rights-based and market-compatible ethics that have proven more amenable to greenwashing than to structural reform. Stage of development generates different urgency profiles: in Pakistan, basic institutional capacity is a precondition for any reform, while Canada’s challenge is political will and jurisdictional coherence. These differences affect the specific instruments the framework recommends, not the diagnostic architecture that identifies the three formations as shared roots. On the dual case-selection logic of Section 2, these documented differences are what the most-different component of the design requires; the shared colonial-legal inheritance and its neoliberal amplification are what the most-similar component holds constant; and the recurrence of structurally identical warning chain severance across both is the finding the design was constructed to test.

6.2 Warning chains as transectional networks

Read together, the cases show that warning chain failure is a transectional phenomenon. In each event, a forecast existed: the 2015 Karachi heat, the 2021 heat dome, the 2024 Lahore inversion, the 2025 monsoon rains. In each, the chain from forecast to protective action was severed at a point determined not by forecast skill but by the ideological configuration of the institutions along the chain. In Karachi, no institution was mandated to translate temperature into impact for informal settlement residents. In British Columbia, no institution connected meteorological warning to the housing and health actors who knew where vulnerable people lived. In Khyber Pakhtunkhwa, warnings did not reach communities settled in hazard-exposed terrain by the same governance failures that left them without alternatives

[22]. The early warning literature’s emphasis on how information is translated and acted upon is, in the language of ANT, an emphasis on translation and its failure; occupational security adds the normative criteria by which failures of translation are judged not as accidents but as governance choices that violate the values of justice and authenticity with accuracy.

Necropolitics provides the interpretive bridge, applied per the labelling convention of Section 2. De Freitas Sampaio and Pauvret’s [12] study of urban necropolitics among immigrant populations in Paris, showing how environmental neglect, socioeconomic disadvantage and restricted healthcare converge to create death zones, is directly applicable to informal settlement residents in Karachi, to older residents of Vancouver who died in 2021, and to Indigenous communities whose exposure to smoke and fire has been intensified by colonial forestry. The analytical move that necropolitics enables, from describing poor outcomes to naming the governance logic that produces them as a choice, is precisely what authenticity with accuracy demands.

7 A five-phase urban occupational security methodology

The transectional methodology developed for seismic hazards [21] and flash floods [22] is adapted here to urban multi-hazard governance, generating a five-phase process that operationalises the framework’s critical and constructive dimensions. The methodology proceeds by identifying the actor-networks, human and non-human, living and non-living, that constitute governance at each scale; tracing the pathways through which decisions at one scale propagate through all others; and locating the points of ideological inscription at which neoliberal, colonial and anthropocentric assumptions are embedded in practice. It is self-referentially applicable, serving both to diagnose existing arrangements and to design reformed ones.

Phase one: ideological and actor-network mapping. Before designing interventions, this phase requires identification of the formations that structure existing arrangements: which actors benefit, which structures reproduce colonial, neoliberal and anthropocentric assumptions, and which actors, including non-human actants such as atmospheric and hydrological systems, are systematically excluded. In warning chain terms, it maps every actor between forecast and protective action and identifies where translation is institutionally unassigned.

Phase two: transectional vulnerability assessment. This phase maps how impacts propagate from the individual body through neighbourhood, city, region, nation and global scales, distinguishing direct impacts such as heat mortality from indirect impacts of colonial arrangements such as smoke from suppressed Indigenous stewardship, and from downstream systemic impacts of neoliberal erosion such as the absence of public cooling during compound events. It explicitly incorporates multi-hazard interaction: heat during smoke events, flooding during power failure, air quality crises during agricultural burning seasons.

Phase three: values-based governance assessment. This phase evaluates existing frameworks against each of the five values. Sustainability assessment examines whether governance accounts for the full consequences of neoliberal development and colonial land management. Justice assessment maps the distribution of authority, risk and adaptive capacity. Peace assessment evaluates relationships across scales and between state and Indigenous authorities. Compassion assessment examines how non-human inhabitants are considered. Authenticity with accuracy assessment reviews the transparency of risk disclosure and warning communication, and the integrity of the chain from science to public.

Phase four: integrative decolonial governance design. This phase develops proposals addressing all three formations simultaneously: Indigenous co-governance frameworks for urban and peri-urban land and fire management in Canadian cities; institutional reform replacing colonial inheritance with community-accountable administration in Pakistani cities; and planning frameworks in both that give non-human systems substantive standing. For warning systems, it designs impact-based warning tiers co-produced with the communities most at risk, and assigns institutional responsibility for every link in the chain.

Phase five: adaptive implementation and learning. This phase establishes monitoring and adaptation mechanisms drawing on adaptive management [58] but embedded within the values architecture, giving climate-vulnerable communities and Indigenous governance bodies ongoing voice in assessing whether responses achieve occupational security outcomes, and rebalancing accountability relationships that are currently skewed such that communities bear the burdens of failure while institutions retain the authority to define adequate response.

7.1 Scale differentiation and sequencing

Because the three formations operate at different scales, actors implementing the five phases must attend to where leverage is available. Neoliberal restructuring is most entrenched at national and international scales, in fiscal arrangements, finance conditionalities and trade regimes, and most resistant to local action alone; progress requires national engagement and, for countries subject to conditionality, coordinated international advocacy. Colonial inheritance and anthropocentrism have proven more amenable to regional and local reform: Indigenous co-governance agreements, planning frameworks giving standing to non-human inhabitants, and municipal rights-of-nature ordinances represent demonstrated precedents at sub-national scales. This provides a practical rationale for prioritising nature-based solutions and Indigenous co-governance as the most accessible entry points, even where broader restructuring remains constrained.

7.2 Nature-based solutions as the most accessible entry point

Nature-based solutions, understood not in their neoliberal instrumentalist framing as market-compatible green infrastructure but as relational interventions that restore the occupational integrity of urban ecological systems, represent the most practically available class of instruments in both contexts, drawing on IPCC findings that urban NbS are among the

highest-confidence, lowest-regrets adaptation and mitigation options available at city scale [59, 60, 61].

The transectional character of urban NbS is their defining advantage. A restored riparian corridor does not merely attenuate downstream flooding; it sequesters carbon, supports the occupational security of its non-human inhabitants, reduces urban heat island intensity, and reconnects the hydrological cycle to landscape processes disrupted by colonial and neoliberal expansion. Pan et al. [60] estimate that NbS can reduce urban carbon emissions by up to 25 percent under maximum implementation, with spatially prioritised deployment achieving average reductions of 17.4 percent, and that coupling NbS with other measures could reduce urban emissions by 57.3 percent by 2030. These estimates encompass direct pathways of sequestration and indirect pathways through thermal regulation and reduced cooling demand [61]. Systematic reviews of urban climate finance confirm that NbS remain structurally underfunded relative to grey infrastructure with clearer private returns [59, 62]; the justice value requires that this imbalance be named as a governance choice.

In Pakistan, NbS governance must contend with a drainage inheritance that eliminated 870 kilometres of natural channels in Karachi alone. Transectional NbS governance connects urban green space restoration to peri-urban watershed management, to hinterland agricultural mosaics, and to the traditional knowledge of communities whose practices maintained the functions colonial urbanisation destroyed. In Canada, the reconnection of urban ecological corridors to Indigenous-managed hinterlands through co-governance with First Nations represents the most coherent pathway. Reed et al. [57] document how dominant NbS frameworks reproduce colonial knowledge hierarchies by treating Indigenous ecological knowledge as supplementary input rather than as primary governance epistemology, and Nelson and Reed [63] formalise Indigenous critiques and recommendations for reclaiming NbS from their instrumentalist framing.

Measurement is a constitutive requirement of authenticity with accuracy, and phase five accordingly requires that NbS deployment be monitored against all five values rather than short-term ecological indicators alone, a shift the empirical monitoring literature independently supports: analysis of 750 indicators across 74 urban NbS projects finds current practice favouring short-term ecological measures while neglecting longer-term social and justice dimensions [62]. At minimum, such monitoring integrates multi-scalar carbon and hazard-buffering accounting [64, 65], justice and compassion indicators covering the distribution of co-benefits and non-human occupational security, and Indigenous and community-based monitoring, which generates accountability that remote sensing cannot [57]. Emerging mechanisms including rights-of-nature recognition and Indigenous guardian programmes indicate that accountability to non-human actants is juridically actionable. The full specification of an occupational security measurement framework for urban NbS exceeds the scope of this paper and is developed in ongoing work.

8 Discussion: toward ethical multi-hazard governance

The framework’s fundamental contribution is its insistence that the inadequacy of current governance is not primarily technical but ideological, and that technical reforms implemented within frameworks that remain neoliberal, colonial and anthropocentric will reproduce in-

adequacy regardless of sophistication. Many scholars and practitioners implicitly recognise this, but few frameworks explicitly name it, because naming it requires challenging the foundations of the institutions in which they work.

The identification of institutional failure as a driver of inadequate response is not novel: the IPCC, a vast institutional economics literature following Ostrom [66], and decades of governance scholarship have documented how fragmentation, fiscal incapacity and coordination failure impede action [67]. What remains underexplored is the ideological substratum of these failures. The transformation levers literature [4, 5, 3] and critical political ecology [20, 15] have begun to name it, but rarely within frameworks that simultaneously provide operational methodology. Occupational security’s contribution is this integration: a framework that names the roots of failure at the level at which they operate while providing the values architecture and methodological phases that practitioners require.

For the early warning community specifically, the paper’s implication is that the Early Warnings for All agenda cannot succeed through improved forecast dissemination alone. The last mile of the warning chain is not a communications problem; it is the point at which the ideological configuration of governance determines whether a warning reaches a person the system has already decided not to serve. People-centred warning requires, at minimum, that every link in the chain be institutionally assigned, that impact-based thresholds be co-produced with those most at risk, and that political interference in the scientific basis of warnings be recognised as the anti-translation it is [22].

The necropolitical analysis establishes that the differential death experienced by informal settlement residents in Karachi, older Vancouver residents during the heat dome, and Indigenous communities in fire-affected hinterlands is not a regrettable incidental consequence of adequate governance but a predictable outcome of systems designed to serve other interests. The comparative cases demonstrate that this naming is not geographically specific: the same formations produce necropolitical outcomes in Global South and Global North contexts, with differences of scale reflecting institutional capacity and historic wealth extraction rather than governance logic. This cross-context applicability refuses the binary that allows wealthy-country actors to treat failure as a developing-country capacity problem while ignoring identical roots in their own governance.

8.1 Limitations

Four limitations bound the claims of this paper. The comparison relies on publicly available governance documents, academic literature and international assessments that may not capture informal practices, community-based strategies and Indigenous governance activities operating outside formal channels. Future research should integrate ethnographic, participatory and community-based methods, including sustained dialogue with institutional actors whose practical knowledge of constraints is rarely documented but frequently decisive. The five-phase methodology requires empirical testing, attentive to the scale differentiation identified above: pilot applications are most feasible at local and regional scales. The two-case design supports analytical rather than statistical inference, per Section 2, and extension of the comparison to further most-different pairs sharing the colonial-inheritance anchor, and to contrast settings where warning chains have held, is the appropriate next step. Finally, the necropolitical reading is interpretive by design; its warrant is the documented severance

pattern, and readers who decline the lens retain the descriptive findings intact.

8.2 Scope conditions

The framework’s scope conditions are stated explicitly, as the appropriate analogue within framework development to falsifiability in predictive science. Occupational security provides strongest traction where neoliberalism, colonialism and anthropocentrism constitute the dominant structural logic of hazard governance failure, as both cases demonstrate. In contexts where capacity deficits are so acute that ideological critique must be preceded by foundational state-building, or where other formations such as authoritarian nationalism or theocratic governance constitute the primary constraint, the three-formation diagnostic requires supplementation. Identifying these boundaries is not a concession of weakness; it is the specification of scope that distinguishes rigorous framework development from unfalsifiable assertion. Values are not a substitute for evidence in this framework; they are what keep evidence accountable to justice, sustainability and life rather than to the interests that have historically oriented both governance and science away from collective wellbeing.

9 Conclusions

Urban multi-hazard governance faces a crisis that cannot be resolved by better forecasts, improved coordination or increased finance alone, though all are necessary. It faces the deeper challenge of governing compounding hazards through institutional architectures whose foundational assumptions prevent the collective, ecologically grounded and justice-oriented response the emergency requires. Neoliberalism, colonialism in its contemporary forms, and anthropocentrism together constitute a governance system that is not merely inadequate but structurally generative of the vulnerability and occupational insecurity it nominally addresses.

Occupational security proposes an alternative grounded in sustainability, justice, peace, compassion, and authenticity with accuracy, extending accountability to non-human urban inhabitants, centring Indigenous governance sovereignty, and demanding transparency about the formations that produce differential death. Its application to Pakistan reveals how colonial inheritance and structural adjustment combine to produce lethal compound crises in cities incapable of protecting their most vulnerable residents. Its application to Canada reveals how settler dispossession and jurisdictional fragmentation prevent adequate governance despite sophisticated institutions. The comparison, constructed to be most-different on capacity and most-similar on the theorized colonial-legal inheritance, establishes that these are manifestations of the same pathology in different environments, and that warning chain failure is its most visible symptom. The five-phase methodology provides a pathway toward governance that is life-affirming rather than death-producing, collectively accountable rather than privatised, ecologically grounded rather than anthropocentric, and decolonial rather than colonial in its foundational logic.

Every monsoon season, every heatwave, every smoke event that overwhelms systems designed to serve accumulation rather than life confirms that incremental reform within existing frameworks is not an adequate response. Adequate response requires the courage to

name what must be displaced and the ethical clarity to govern toward something different.

Data availability

No new data were created or analysed in this study.

Author contributions

F.A.C.: conceptualisation, methodology, formal analysis, investigation, writing (original draft, review and editing).

Acknowledgements

The author gratefully acknowledges colleagues for insightful discussions which enriched this work.

Declarations

Ethical approval

This article is conceptual and concerns framework development and documentary analysis only; it did not involve human or animal participants or any associated data collection, and ethics review was therefore not required.

Consent to participate

Not applicable.

Consent to publish

Not applicable.

Competing interests

The author declares no competing interests.

Funding

No funding was received for conducting this study.

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