

Article

From Perception to Policy Support: Public Situation Awareness and the Sustainability of Critical Infrastructure

Carmit Rapaport ^{1,*}, Eldad Shamash ²  and Keren Levy Ganany Snider ³¹ School of Environmental Sciences, University of Haifa, 199 Abba Houshi Blv., Haifa 3103301, Israel² Independent Researcher, Modiin 7173966, Israel; eldad.shamash@gmail.com³ Department of Government, Communication and Diplomacy, Jerusalem Multidisciplinary College, 37 Haneviim St., Jerusalem 9101001, Israel; kerensn@jmc.ac.il

* Correspondence: crapaport@geo.haifa.ac.il

Abstract

The long-term resilience and sustainability of critical infrastructure depends not only on technical robustness but also on the capacity of populations to collectively interpret systemic threats and support continuity-preserving policies. Existing frameworks for emergency response and risk perception primarily address individual-level threat appraisal, leaving insufficiently explained how publics collectively interpret systemic threats under conditions of unfamiliar disruption. This study introduces Public Situation Awareness (PSA) as a sequential mechanism through which citizens perceive threat-relevant information, comprehend its implications for collective welfare, and project cascading consequences across essential societal systems, ultimately supporting system-preserving prioritization policies. The framework was tested using a survey administered in Israel in April 2024 during a period of acute uncertainty surrounding the threat of a large-scale attack on critical infrastructure. Serial mediation analyses using bootstrapping revealed that the full sequential pathway: perception, public-level comprehension, public-level projection, and policy support, was the only significant indirect effect, whereas pathways involving individual-level projection did not reach significance. These findings provide preliminary evidence that support for continuity-preserving governance may depend more strongly on collective than personal interpretation of systemic consequences, with implications for crisis communication strategies and the social foundations of infrastructure resilience aligned with SDG 9 and SDG 11.

Keywords: public situation awareness; critical infrastructure resilience; social sustainability; emergency governance; continuity-preserving policy; sociotechnical systems



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1. Introduction

Sustainable development frameworks increasingly recognize that the long-term viability of societies depends not only on environmental protection or economic growth, but on the uninterrupted functioning of critical infrastructure systems [1,2]. Electricity grids, water supply networks, healthcare facilities, telecommunications, transportation, and financial systems constitute the material foundation upon which modern social life rests. Their degradation or collapse carries consequences that extend beyond technical disruption. It can threaten the continuity of governance, the protection of public health, and the social cohesion that sustainable development is designed to preserve [2]. As societal dependence on these interconnected systems deepens, critical infrastructures are becoming

progressively exposed to a widening range of systemic threats, including climate-related and other natural hazards and pandemics, whose cascading consequences no single sector or institution can address in isolation [3]. Alongside these, emerging threats including cyberattacks, geopolitical instability, and cascading technological failures present additional and increasingly urgent challenges to infrastructure continuity [4].

Among these systems, electrical infrastructure occupies a uniquely central position. Because electricity enables the functioning of virtually every other essential service, i.e., hospitals cannot operate without power, water treatment plants depend on electric pumps, and transportation systems rely on electrified signals and logistics, disruptions to the electrical grid may therefore rapidly propagate into simultaneous failures across multiple dependent sectors. These cascading dynamics transform what might appear to be isolated technical failure into a broad societal crisis that threatens not only immediate survival and wellbeing, but the longer-term functioning of the institutions and services upon which sustainable communities depend [5–7]. As theories of cascading risk have increasingly recognized, disruptions to modern infrastructure are no longer isolated events, but can escalate across highly interconnected systems, producing cascading consequences that extend beyond the initially affected sector [8].

The sustainability of critical infrastructure depends not only on its technical robustness, but also on what resilience scholarship describes as its social dimension, including the degree to which populations understand systemic interdependencies and cooperate with emergency governance arrangements [9]. Critical infrastructures are better understood as sociotechnical systems, in which technological components and human and organizational actors are deeply intertwined, and whose resilience depends on effective coordination, information sharing, and adaptive decision-making across these interconnected elements. and in which the functioning of the whole depends on the behavior, understanding, and cooperation of both [7]. Recent resilience frameworks similarly emphasize the adaptive sociotechnical nature of infrastructure resilience under uncertain conditions [10]. Populations are not merely passive recipients of infrastructure services, but they are active participants whose behavioral responses during disruption significantly shape how crises unfold. During emergencies, individual decisions about whether to seek emergency care, whether to stockpile water, or whether to comply with rationing directives aggregate into collective behavioral patterns that can either stabilize or further strain already-stressed infrastructure networks [8]. Support for, or resistance to, the prioritization policies that authorities implement during crises is itself a determinant of whether essential services can be preserved.

This social dimension of resilience becomes especially fragile in the face of unfamiliar, unprecedented, or rapidly evolving disruptions. For familiar hazards, individuals can draw on prior experience, established heuristics, community memory, or official guidance to interpret threats and select appropriate responses. Contemporary systemic crises, however, increasingly involve scenarios for which no clear precedent exists, for example: prolonged nationwide power outages resulting from cyberattacks, multi-sector cascading failures triggered by geopolitical escalation, or novel technological disruptions whose consequences are initially opaque. Under such conditions, neither personal experience nor institutional guidance may be sufficient to orient behavioral response. Individuals must instead actively construct an interpretation of what is happening, what it means for their communities, and how they and their society should respond, often rapidly, under significant uncertainty, and in the absence of official instructions.

Existing frameworks for understanding emergency response and risk perception are primarily designed to explain how an individual responds to a threat. Situation Awareness (SA) theory [11,12] and the Protective Action Decision Model (PADM) [13] were developed

to explain how individuals react to emerging environmental cues, but they do not examine how a public collectively constructs the meaning of a systemic disruption and adjusts its relationship to essential societal functions accordingly. As a result, they provide only limited explanation for how, and under what conditions, populations shift from self-regarding appraisal toward a recognition of collective vulnerability, a shift that is important for generating the public legitimacy and cooperative behavior that sustainable infrastructure governance needs.

To address this gap, the present study introduces Public Situation Awareness (PSA) as a cognitive mechanism through which individuals collectively interpret systemic threats under conditions of uncertainty and unfamiliarity. Building upon Endsley's (1995) [11] SA framework and extending it from the domain of individual operators to that of the general public, PSA describes the process by which citizens move from perceiving threat-relevant information, to comprehending its implications for collective welfare, to projecting potential cascading consequences for essential societal systems, and ultimately to forming support for system-preserving policies, including those that impose short-term personal costs. Crucially, PSA articulates the pathway through which individual-level threat processing is transformed into public-level interpretation, explaining why citizens in the throes of an unfamiliar systemic crisis may come to prioritize the continuity of hospitals, water systems, and telecommunications over immediate personal convenience. This individual-to-collective transition is the mechanism through which the social prerequisites of infrastructure resilience, namely public legitimacy, cooperative behavior, and acceptance of necessary prioritization, are generated or withheld.

PSA operates at the intersection of two capacities required for sustainable societies: the resilience of critical infrastructure systems and the social capacity to sustain coordinated collective functioning under conditions of disruption. Social sustainability has been associated with the ability of communities to preserve social cohesion, maintain collective wellbeing, and sustain essential societal functions in the face of change over time [14,15]. At the same time, resilience scholarship increasingly emphasizes that continuity under systemic stress depends not only on technical infrastructures, but also on communication, collective understanding, stakeholder coordination, and public cooperation across interconnected systems [9,16]. From this perspective, PSA provides a framework for understanding how publics interpret systemic risk, recognize collective interdependence, and align behavior with the governance arrangements required to sustain continuity under conditions of uncertainty. In doing so, PSA speaks directly to the goals of SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities), highlighting the cognitive and social dimensions of infrastructure resilience that technical approaches alone cannot address.

1.1. Critical Infrastructure Resilience and Cascading Failures

Contemporary resilience scholarship increasingly conceptualizes critical infrastructures as complex sociotechnical systems embedded within broader networks of social, technological, and institutional interdependencies. Foundational work by [5] and [6] demonstrate that interconnected infrastructure networks create systemic vulnerability. As nodes share dependencies, localized failures or disruptions do not remain localized but may trigger cascading failures and consequences that propagate across multiple sectors and societal domains in sequences that are difficult to anticipate, contain, or reverse [17,18]. Modern societies, therefore, face not only technical failures but also transboundary and systemic crises whose impacts are difficult to manage through conventional engineering robustness or governance approaches. Building on this interdependency perspective, Pescaroli & Alexander [7] highlight the social context and argue that systemic crises are not produced

solely by technical failures, but by complex interactions between infrastructure systems and social institutions, as well as the behavioral adaptations of populations and organizations responding under stress [8]. Thompson & Pescaroli [8] further illustrate this dynamic through the growing private demand for backup generators, demonstrating that as awareness of systemic vulnerability deepens, behavioral responses ripple back into the infrastructure environment itself. Consequently, resilience under such conditions depends not only on the physical robustness of infrastructure systems, but also on societies' capacity to adapt to uncertainty, navigate systemic interdependencies, and maintain collective functioning during disruption [17]. In these environments, effective governance requires more than technical response capabilities; it fundamentally depends on collective sensemaking, public legitimacy, and societal cooperation in the face of uncertainty [19]. From this perspective, Public Situation Awareness (PSA) represents a social-cognitive component of infrastructure resilience, enabling citizens to comprehend systemic interdependencies, anticipate broader societal consequences, and support continuity-preserving policies designed to safeguard essential societal functions during periods of disruption. This becomes uniquely visible in the arena of infrastructure governance and system-preserving prioritization.

1.2. Infrastructure Governance and System-Preserving Prioritization

Large-scale infrastructure disruptions typically exceed the capacity for simultaneous, full-system recovery, forcing authorities to prioritize the restoration of life-sustaining services such as hospitals, water treatment, emergency communications, and public safety systems ahead of broader household or commercial supply [20]. Within such conditions, continuity management refers to the institutional capacity to sustain essential societal functions through coordinated allocation strategies, cross-sector coordination, and adaptive decision-making under dynamic conditions [21]. Research on risk governance and public policy further suggests that the effectiveness of emergency governance depends not only on technical or administrative capacity, but also on the perceived legitimacy of policy decisions among affected populations [22,23]. Policies perceived as arbitrary, opaque, or inequitable are more likely to undermine public trust and reduce societal cooperation, thereby complicating crisis response and continuity efforts [22,24]. In contrast, transparent communication, stakeholder engagement, and clear justification of allocation decisions can strengthen public trust and sustain collective compliance during prolonged disruptions [23,24]. However, public compliance with emergency prioritization measures cannot be taken for granted. Beyond trust in authorities, societal cooperation may also depend on whether populations understand why essential services must be prioritized, recognize the cascading consequences of failing to preserve critical systems, and perceive their own compliance as contributing to broader societal continuity.

When this collective understanding is absent, citizens may interpret infrastructure disruptions primarily through the lens of immediate personal inconvenience rather than as systemic threats to hospitals, water supply, and emergency services. Under such conditions, the social foundations of continuity governance may weaken, as populations with limited awareness of systemic interdependencies may be less likely to support policies that impose short-term personal costs for broader collective continuity [23,24]. This suggests that crisis management must address not only the technical measures required to preserve essential functions, but also the psychosocial conditions under which publics develop a systemic understanding of interconnected risks and collective dependence [16,20]. From this perspective, understanding how publics develop, or fail to develop, this collective interpretive capacity becomes central to infrastructure resilience and continuity governance.

1.3. From Personal Risk Appraisal to System-Regarding Appraisal

Research on how individuals interpret and respond to threats has produced a rich body of frameworks that have advanced understanding of emergency behavior. Protection Motivation Theory [25] models how individuals assess threat severity and their own coping capacity, arguing that protective action is motivated by the joint perception of personal vulnerability and response efficacy. The Theory of Planned Behavior [26] similarly locates behavioral intentions in individual attitudes, subjective norms, and perceived behavioral control. The Protective Action Decision Model (PADM) [13] provides a comprehensive individual-level account of emergency response, explaining how people process threat signals and protective action information across a sequential series of perceptual, cognitive, and behavioral stages, from initial recognition of environmental cues to the adoption or rejection of specific protective behaviors. These frameworks' contribution lies in conceptualizing individuals as active cognitive agents who interpret threats rather than passively reacting to external stimuli. A core theoretical foundation incorporating this sequential logic lies within Endsley's Situation Awareness (SA) theory [11,27], which foregrounds the cognitive processes through which people build and maintain an understanding of dynamic environments. Endsley conceptualizes SA as a three-level process: perception of relevant environmental elements; comprehension of their meaning in relation to current goals; and projection of how the situation is likely to evolve. SA positions awareness, namely how accurately a person understands the unfolding situation, as the intervening variable between incoming information and effective decision-making [28].

Our interest, however, lies in a different interpretive challenge: what happens when the threat is unfamiliar, socially consequential, and not readily understood through personal experience or institutional routines? Under such conditions, the interpretive process shifts from individual risk appraisal to a collective endeavor. Citizens do not only assess whether they themselves are safe; they construct a shared understanding of what is happening to their societal systems and what coordinated response it requires. This shared process of situational interpretation extends beyond personal risk assessment toward a common recognition of societal vulnerability, and on that basis, citizens may reach decisions that impose personal costs in the interest of collective continuity. It is this shift from individual appraisal to shared public interpretation, and its consequences for public support of system-preserving policies, that the PSA framework is designed to capture. Subsequent extensions of SA toward more distributed settings provide a partial bridge. Stanton et al.'s [29,30] Distributed SA (DSA) framework argues that in complex sociotechnical systems, awareness is not confined to individuals, but emerges from interactions among people, technologies, organizational roles, and environmental cues. Situational understanding is distributed across networks of actors and maintained through coordination, communication, and shared information flows rather than solely through any individual's internal cognition. Salmon & Plant [31] further extend DSA to the level of whole societies, arguing that certain forms of awareness, such as about climate change, pandemic risk, or systemic vulnerability, are genuinely social phenomena that cannot be reduced to aggregates of individual cognitive states.

Systemic infrastructure disruptions require citizens to move beyond personal risk appraisal toward collective interpretation. During a prolonged nationwide power outage, particularly one triggered by an unfamiliar threat such as a coordinated attack, the behavioral challenge facing populations differs fundamentally from the personal-protective scenarios addressed by PADM or individual SA. The relevant question is not primarily "how do I protect myself?" but rather "what is happening to our essential systems, who should receive priority, and what am I willing to sacrifice for the collective good?". These questions require citizens to reason about systemic interdependencies, anticipate conse-

quences across sectors they may never personally engage with, and evaluate policies whose rationale is visible only when the grid is understood as a system rather than a household service. Under such conditions, individuals rarely possess either the technical knowledge or the direct observational access needed to independently construct an accurate picture of cascading risk. The public, in this sense, increasingly functions as a collective interpretive unit: not a simple aggregate of individual risk calculations, but a distributed sensemaking system whose outputs are shared understanding, shared concern, and shared willingness to cooperate [32].

Social psychological theories provide a complementary account of why and when this collective shift occurs. Social identity theory [33] proposes that individuals interpret situations increasingly through group-based frames of reference when external threats activate shared social identities. Under conditions of perceived collective endangerment, group membership becomes cognitively salient, orienting appraisal away from personal interest and toward the welfare of the collective. Intergroup threat theory [34] extends this argument by specifying that threats to shared resources and collective functioning intensify group cohesion and shift individual evaluations of risk and appropriate response toward ingroup-protective priorities. The social identity model of collective behavior [35] further demonstrates that shared crisis experiences can generate emergent collective identities, even among strangers, that facilitate common threat interpretation, mutual trust, and coordinated behavioral responses. These converging perspectives suggest that systemic crises involving essential shared infrastructures may create the conditions under which individual appraisal gives way to collective interpretation: the threat is experienced as belonging to everyone, its consequences are felt across the shared social fabric, and responses perceived as protecting the collective become normatively compelling in ways that personal protective actions are not.

Endsley's SA and its extensions, including DSA, address awareness within bounded operational systems, such as individuals, teams, or organizations engaged in purposive tasks with defined roles and established procedures. Weick's sensemaking [36] similarly was developed to explain how members of organizations retrospectively and socially construct plausible meanings from equivocal events, while also enacting the environments they interpret. PSA, by contrast, is conceptualized as a prospective public-level framework concerned with how citizens detect salient cues in real time and construct meanings about an unfolding threat as it emerges. While PSA and sensemaking overlap in their attention to cues and interpretation under conditions of ambiguity, they differ in temporal orientation, social setting, and level of analysis. Most importantly, PSA is unique given its outcome: not individual protective behavior, team coordination, or organizational decision-making, but public support for system-preserving crisis policies that citizens may endorse even when such policies impose personal costs. PSA therefore extends existing awareness frameworks not simply by scaling situational awareness from the individual to the public level, but by explaining how shared interpretations of societal consequences emerge under conditions of uncertainty, novelty, and systemic interdependence and subsequently translate into support for collective continuity policies. Building on the three-level structure of Endsley's SA model and extending it from the individual operator to the public domain, PSA respecifies the content of each level for the context of collective crisis interpretation. Perception refers to citizens' awareness and knowledge of threat-relevant information about the crisis. Comprehension refers to their understanding of the threat's implications for collective rather than personal welfare. Projection refers to their anticipation of cascading consequences across shared infrastructure sectors, namely hospitals, water supply, telecommunications, and transportation, rather than primarily for their own household. In doing so, PSA integrates individual-level awareness models and the collective dynamics

identified by [29,30] into a sequential cognitive model that is both individually grounded and socially embedded.

This cognitive sequence is not a spontaneous product of individual reasoning, but a socially embedded process through which shared interpretations of threat emerge and stabilize across the public. PSA therefore situates individual cognition within its social and communicative context, providing a framework that is simultaneously micro-level, because it describes a cognitive sequence, and macro-level, because it captures a collective capacity for crisis interpretation and resilience. Building on this conceptualization, the following hypotheses examine the sequential process through which PSA shapes public support for crisis policies.

H1. *The cognitive process: the foundational situation awareness process will display a significant sequential relationship, whereby perception is positively associated with public-level comprehension, which in turn is positively associated with public-level projection.*

H2. *The decision outcomes: this sequential situation awareness process (perception → comprehension → projection) will significantly predict supportive outcomes, functioning as a serial mediation pathway that positively influences support for continuity-preserving policies.*

H3. *Public-level projection will show a stronger association with support for continuity-preserving policies than individual-level projection, indicating that PSA operates primarily through a collective rather than individual cognitive pathway.*

2. Materials and Methods

2.1. Research Setting

The study was conducted in Israel in April 2024, during a period of acute public uncertainty surrounding a credible and widely reported threat of large-scale attack on critical infrastructure. Media outlets published that a potential scenario involved an attack on the national electrical grid, raising the prospect of nationwide power disruptions lasting 24 to 72 h. This represented a novel threat category for the Israeli public: unlike conventional security incidents for which established preparedness routines exist, a prolonged grid failure is unfamiliar to the Israeli public, and no official behavioral guidance was issued during this period. This context satisfies the theoretical conditions required to observe PSA in operation. The threat was systemic and infrastructure-directed rather than personally bounded, requiring citizens to reason about cascading consequences across hospitals, water supply, telecommunications, and emergency services, rather than primarily about their own household. The absence of official directives meant that collective interpretation, rather than institutional compliance, was the primary mechanism through which citizens formed their understanding of the situation. Data were collected during the peak of uncertainty, ensuring that responses reflected real-time interpretive processes instead of retrospective reconstruction.

2.2. Data Collection

Data were collected through a structured online survey administered by Midgam Project, a professional survey company operating a large, actively maintained panel of Israeli adults. Panel members are recruited through stratified procedures designed to ensure demographic diversity across geographic region, age, income and religious observance, and are regularly updated to maintain representativeness of the Israeli adult population. Participants received an invitation link to the survey via email during April 2024, at the height of the threat period described above.

The initial sample comprised 634 respondents (51% female; mean age = 47 years, SD = 17). Of these, 225 respondents selected “don’t know” on at least one support for continuity-preserving policies (i.e., decision) item and were excluded from the primary analysis. The support for continuity-preserving policies measure was designed to capture explicit support for or opposition to resource-prioritization policies during a prolonged power outage. Because a “don’t know” response does not indicate either support or opposition, such responses could not be meaningfully incorporated into the policy-support score. Consequently, only respondents who expressed a clear position on all decision items were included in the mediation analysis. Conceptually, the study focused on examining PSA among individuals who had translated their understanding of the threat into a defined policy orientation regarding collective resource-allocation decisions. Comparison of excluded and included respondents revealed no significant differences across most demographic characteristics; excluded respondents were somewhat younger and more often female (age: $t = 3.09, p < 0.01$; gender: $t = 3.29, p < 0.01$), and age and gender were therefore included as control variables in all models. The final analytical sample comprised 405 respondents. The study was approved by the Institutional Review Board of the Faculty of Social Sciences at the University of Haifa.

2.3. Measurements

Measurement instruments were developed to operationalize the four components of the PSA model: perception, comprehension, projection and decision drawing on [11]’s SA framework as a conceptual foundation and adapting each level to the public, pre-event crisis context of the present study.

Perception. In Endsley’s model, Level 1 SA refers to the perception of task-relevant elements in the environment. Usually, environmental cues are primarily informational, i.e., official advisories and media coverage, rather than directly sensed physical changes. We therefore operationalize perception as correct knowledge of core crisis-relevant facts, treating accurate knowledge as a conservative proxy for prior exposure to information about the threat, attentional engagement, and retention of threat-relevant cues. Respondents were asked to indicate whether each of four statements was true or false according to their knowledge: (1) if there is a prolonged power outage, more than 50% of electricity consumers will not receive service (correct: true); (2) in a prolonged power outage, the disconnection will last more than 24 h (correct: true); (3) restoring electricity to public institutions takes precedence over private consumers (correct: true); (4) the Haifa and Dan distribution areas are first in the priority order for electricity restoration (correct: false). Responses were coded 1 (correct) and 0 (incorrect) and summed to produce a score ranging from 0 to 4.

Comprehension. Level 2 SA involves integrating perceived information to understand its significance in relation to broader goals. In the PSA context, comprehension refers to the individual’s interpretation of the threat in terms of its implications for collective rather than personal welfare. Respondents were asked: “to what extent do you agree with the following statement: a prolonged power outage endangers the State of Israel”. Responses were recorded on a five-point scale ranging from 1 (to a very small extent) to 5 (to a very large extent). We acknowledge that the use of a single-item measure may not capture directly the full meaning of comprehension at the public-level. However, future studies should further explore, develop and validate multi-item measures of public comprehension.

Projection. Level 3 SA involves anticipating how the current situation may evolve and what its future consequences may be. Projection was assessed at both the collective and individual levels, enabling comparison of their respective roles in the PSA pathway. For public-level projection, respondents were asked: “to what degree would a prolonged

power outage affect each of the following sectors?” across eleven domains: fuel, water supply, food supply chain, banks and finance, sewage and waste disposal, health services, traffic signals, rail transport, education, agriculture, and leisure. The selection of these specific infrastructures was directly anchored in the official national framework defined by the National Emergency Management Authority (NEMA) [37]. These measures were constructed to reflect the official ‘lifelines’ and National Service Targets that constitute the foundation for societal functional continuity. These 11 national infrastructure domains map the official national targets, ranging from life-saving goals (health and water) to fabric-of-life and functional continuity objectives (finance, transport, and education). This methodological alignment corresponds with NEMA’s classification of electricity as an ‘Enabling National Resource’, i.e., a critical input whose impairment triggers a generic broad disruption across all essential societal and governmental systems. Responses were recorded on a five-point scale (1 = to a very small extent; 5 = to a very large extent) and averaged across items (Cronbach’s $\alpha = 0.86$).

For individual-level projection, respondents were asked the same question with reference to personal impact (“to what extent would a prolonged power outage in each of these sectors affect you personally?”), using the same response scale and item set (Cronbach’s $\alpha = 0.84$).

Support for continuity-preserving policies (Decision). The outcome variable following the PSA model is the decision or action tendency that emerges from the awareness process. In the present study, this was operationalized as support for a continuity-preserving prioritization policy, specifically, willingness to accept delayed household power restoration in order to prioritize essential services. Respondents were asked whether they would be willing to have power restoration to their home delayed in order to prioritize each of the following sectors: military needs, hospitals, supermarkets, traffic lights, shopping malls, gas stations, and telecommunications companies. The selection of infrastructures and services included in the “decision” variable (policy support) was based on their classification as “lifelines” and essential services as described above for the projection variable. For this variable, however, we selected services that are tangible, immediate, and familiar to citizens through their daily routines, allowing them to assess the significance of their disruption without requiring complex technical knowledge. According to the PSA framework, for support of policies involving personal sacrifice to emerge, citizens must transition from an appraisal focused on private convenience to a “system-regarding appraisal” that recognizes the interdependencies between systems. Responses were coded 1 (yes) and 0 (no) and summed to produce a score ranging from 0 to 7, with higher scores indicating stronger support for the prioritization policy.

Background variables. Age (in years) and gender (1 = male, 0 = female) and education level were included as control variables in all models.

2.4. The Case of COVID-19

To examine the applicability of the PSA framework across different crisis contexts, an additional comparative analysis was conducted using data collected during the COVID-19 pandemic. This analysis was based on the same conceptual structure underlying the PSA framework and included the four core components: perception, public comprehension, public projection, and policy support (decision). To ensure conceptual consistency while accounting for the different nature of the threat, measures were adapted to the pandemic context. Perception was assessed by respondents’ awareness of key threat-related characteristics of COVID-19, reflecting the first level of PSA. Public-level comprehension was operationalized as respondents’ assessment of the societal implications of COVID-19, reflected in perceived threats to human life and the national economy, public-level projection was operationalized as respondents’ assessment of COVID-19’s anticipated impact on key

societal systems, including national security, infrastructure, and the environment (Alpha Cronbach: Lethal condition: US: 0.78, UK: 0.70, IL: 0.77; Economic condition: US: 0.75, UK: 0.73, IL: 0.76), while policy support assessed willingness to endorse measures that imposed personal costs for the benefit of the broader public. Example item: “in dealing with the coronavirus, how much do you agree with the following policies that grant the government authority to: monitor internet communications” (Alpha Cronbach: Lethal condition: US: 0.92, UK: 0.93, IL: 0.94; Economic condition: US: 0.95, UK: 0.96, IL: 0.93).

2.5. Analysis Strategy

The data analysis was performed using SPSS version 27.0. To describe the participants’ characteristics, we applied descriptive statistics. Categorical data were expressed as frequencies and percentages, while continuous data were summarized using means and standard deviations. Relationships among the primary variables, namely perception, comprehension, projection, and decision, were examined through zero-order correlation analyses. Hypothesis testing and investigation of potential pathways connecting perception to decision were conducted using bootstrapping techniques. These analyses were implemented using version 5.0 of the PROCESS macro in SPSS. Serial mediation models were specified (Models 6 and 4), employing 5000 bootstrapped samples to calculate 95% confidence intervals (CIs). Mediation effects were deemed statistically significant if the 95% CI excluded zero, indicating significance at the 0.05 level. This approach allowed for the assessment of direct, total, and indirect effects, with bias-corrected bootstrapped CIs providing robust significance testing for indirect effects. The models controlled for three potential confounders: age, gender, and education level.

As for the COVID-19 data analysis, the same analytical framework used in the present study was applied to the COVID-19 dataset to facilitate comparison across crisis contexts. The purpose of this analysis was not to provide a strict replication of the power outage study, but rather to explore whether the cognitive processes proposed by the PSA framework would emerge under a different type of societal threat.

3. Results

Descriptive Statistics

Table 1 presents the means and standard deviations of the study variables. Perception scores were moderately high ($M = 2.87$, $SD = 0.91$), with 24.5% of respondents answering all four knowledge items correctly and 7% answering just one correctly. Comprehension of the collective threat was also moderately high ($M = 3.86$, $SD = 0.97$), suggesting that most respondents interpreted the scenario as posing a meaningful danger to the state. Public-level projection was similarly elevated ($M = 3.94$, $SD = 0.65$), while individual-level projection was somewhat lower ($M = 3.34$, $SD = 0.76$), indicating that respondents anticipated greater consequences for societal sectors than for themselves personally. Support for continuity-preserving prioritization policy (decision) showed a mean of 4.61 ($SD = 1.52$) out of a possible 7, reflecting a moderate-to-high willingness to accept delayed household power restoration in favor of essential services.

A consistent gender pattern emerged across all PSA components: women scored significantly higher than men on perception ($M = 2.96$ vs. 2.76 , $t = -2.80$, $p < 0.01$), comprehension ($M = 4.09$ vs. 3.64 , $t = -6.03$, $p < 0.01$), public-level projection ($M = 4.07$ vs. 3.81 , $t = -4.93$, $p < 0.01$), and individual-level projection ($M = 3.48$ vs. 3.20 , $t = -4.68$, $p < 0.01$). Decision was not found to differ between the two genders. Gender was therefore retained as a control variable in all subsequent models. Correlations among the study variables are presented in Table 2.

Table 1. Means and standard deviation for research variables.

	Mean	SD
Age (years)	46.35	18
Gender (1 = male)	49.5%	
Education level	7.27%	
Up to 8 years	0.80%	
9–10 years	0.80%	
11–12 years	5.9%	
High school student	2.40%	
High school graduate	17.7%	
During tertiary education	5.90%	
Tertiary education graduate	25.9%	2.40
Undergraduate student	5.10%	
Undergraduate	21.7%	
Masters student	0.6%	
MA/MSc	11.2%	
Doctoral student	0.5%	
PhD	1.60%	
Perception	2.87	0.91
Comprehension	3.86	0.97
Projection		
Public level	3.94	0.65
Individual level	3.34	0.76
Decision	4.61	1.52

Table 2. Correlations among research variables.

	Gender	1	2	3	4	5	6
1. Age	0.00						
2. Education	0.02	0.257 **					
3. Perception	−0.111 **	−0.03	0.04				
4. Comprehension	−0.234 **	−0.06	−0.7	0.114 **			
5. Projection (public)	−0.193 **	0.00	0.00	0.083 *	0.542 **		
6. Projection (individual)	−0.184 **	−0.116 **	−0.06	0.126 **	0.452 **	0.607 **	
7. Support for continuity-preserving prioritization policy (decision)	0.03	0.114 *	0.106 *	0.07	−0.03	0.117 *	0.06

* $p < 0.05$, ** $p < 0.01$.

The correlations among the variables are presented in Table 2. Perception was significantly correlated with comprehension ($r = 0.114$, $p < 0.01$) and projection (public: $r = 0.083$, $p < 0.05$; individual: $r = 0.126$, $p < 0.01$). Comprehension was significantly correlated with projection (public: $r = 0.542$, $p < 0.01$; individual: $r = 0.452$, $p < 0.01$). The outcome variable, support for continuity-preserving prioritization policy was found to be significantly correlated with projection (public level) ($r = 0.17$, $p < 0.05$).

Public situation awareness model: SEM serial mediation model

1. Association with support for continuity-preserving prioritization policy

A serial mediation analysis was conducted using PROCESS model number 6 [38] to examine the hypothesized relationships among perception (knowing of threat-relevant information), comprehension (interpretation of collective risk), public-level projection

(anticipation of cascading societal consequences), and decision (support for continuity-preserving prioritization policy) (Table 3). The direct paths from perception to comprehension ($b = 0.121$, $p < 0.05$) and from comprehension to projection (public level) ($b = 0.359$, $p < 0.001$) were significant. Also, the path from projection to decision, i.e., support for continuity-preserving prioritization policy, was significant ($b = 0.430$, $p < 0.001$) (Figure 1).

Table 3. Regression coefficients in the serial multiple mediation analysis.

Outcome Measure	Predictor	B	SE	R ²	F	t	95% CI
Comprehension	Perception	0.121 *	0.053	0.050	5.303	2.276	0.016, 0.225
Projection	Perception	−0.018	0.031	0.315	36.632	−0.587	−0.078, 0.042
	Comprehension	0.359 **	0.029			12.563	0.303, 0.415
Decision (Support for restrictive policy)	Perception	0.159	0.084	0.050	3.472	1.891	−0.006, 0.323
	Comprehension	−0.180	0.093			−1.944	−0.362, 0.002
	Projection	0.430 **	0.137			3.128	0.160, 0.700

* $p < 0.05$, ** $p < 0.01$.

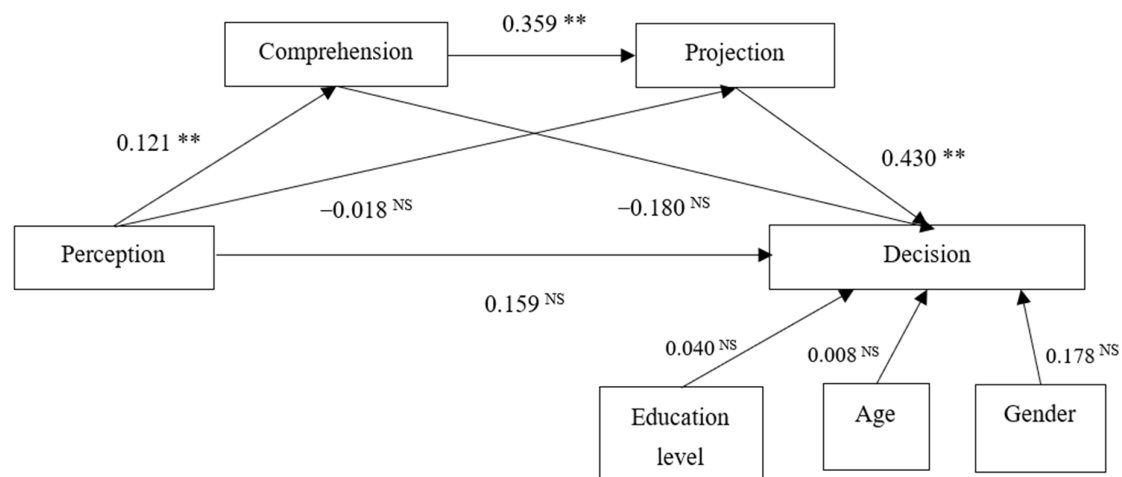


Figure 1. Regression coefficients in the serial multiple mediation analysis predicting decision with public-level projection. NS = Non-significant. ** $p < 0.01$.

2. Bootstrapping test of mediating effects

Table 4 summarizes the total, direct, and specific indirect effects derived from the bootstrap procedure (5000 samples) with bias-corrected 95% confidence intervals. To test the hypotheses, two separate situational awareness models were evaluated using Hayes's PROCESS macro. First, Hypothesis 1 evaluated the foundational cognitive sequence within the situation awareness framework. A mediation analysis (PROCESS Model 4) demonstrated that the indirect pathway from perception → comprehension → public-level projection was statistically significant ($\beta = 0.031$, 95% CI = [0.0013, 0.061]), providing support for H1.

Second, Hypothesis 2 examined the full behavioral translation of this process onto policy decisions (i.e., decision) using a serial mediation model (PROCESS Model 6). Within this full model, the total indirect effect was non-significant ($\beta = -0.011$, 95% CI = [−0.046, 0.028]). The two shorter pathways bypassing one mediator were both non-significant and negative in direction. However, the full theoretical pathway: perception → comprehension → public-level projection → decision, emerged as the only statistically significant indirect effect ($\beta = 0.019$, bias-corrected 95% CI [0.001, 0.048]). This shifting dynamic is consistent with a pattern of inconsistent mediation [39], providing support for H2. Although the lower bound of this confidence interval closely approaches zero, it strictly excludes it, satisfying

the conventional bootstrap criterion for establishing a significant indirect effect [38]. Given this proximity, the evidence should be interpreted with appropriate caution as preliminary rather than definitive, suggesting that while the full PSA pathway operates as hypothesized, its overall effect size is modest.

Table 4. Indirect effects of projection on decision through comprehension and projection as mediators.

Path	B	BootSE	BCI 95% CI
Total effect: perception → decision	0.148	0.084	−0.018, 0.313
Direct effect: perception → decision	0.159	0.084	−0.006, 0.323
Total indirect effect: perception → decision	−0.011	0.018	−0.046, 0.028
Perception → comprehension → decision	−0.022	0.015	−0.058, 0.000
Perception → projection → decision	−0.008	0.014	−0.036, 0.022
Perception → comprehension → projection	0.031	0.015	0.0013, 0.061
Perception → comprehension → projection → decision	0.019	0.012	0.001, 0.048

Models were adjusted for age, gender, and education level. The empirical 95% confidence interval does not include zero. Unstandardized regression coefficients (B) are presented; BootSE refers to the standard error calculated using bootstrapping. Bold lines represent hypothesize examinations which were found to be significant.

3. Testing alternative models

To further validate the PSA model and test H3, we examined whether the same serial mediation structure would hold when projection was operationalized at the individual rather than the public level, that is, whether the pathway: perception → comprehension → individual-level projection → decision would replicate the significant serial effect found in the primary model (Figure 2). The results indicate that the alternative model was not supported. None of the indirect paths in this alternative model reached significance and the full serial chain through individual-level projection yielded $\beta = 0.009$ (95% CI = [−0.001, 0.027]) (Table 5).

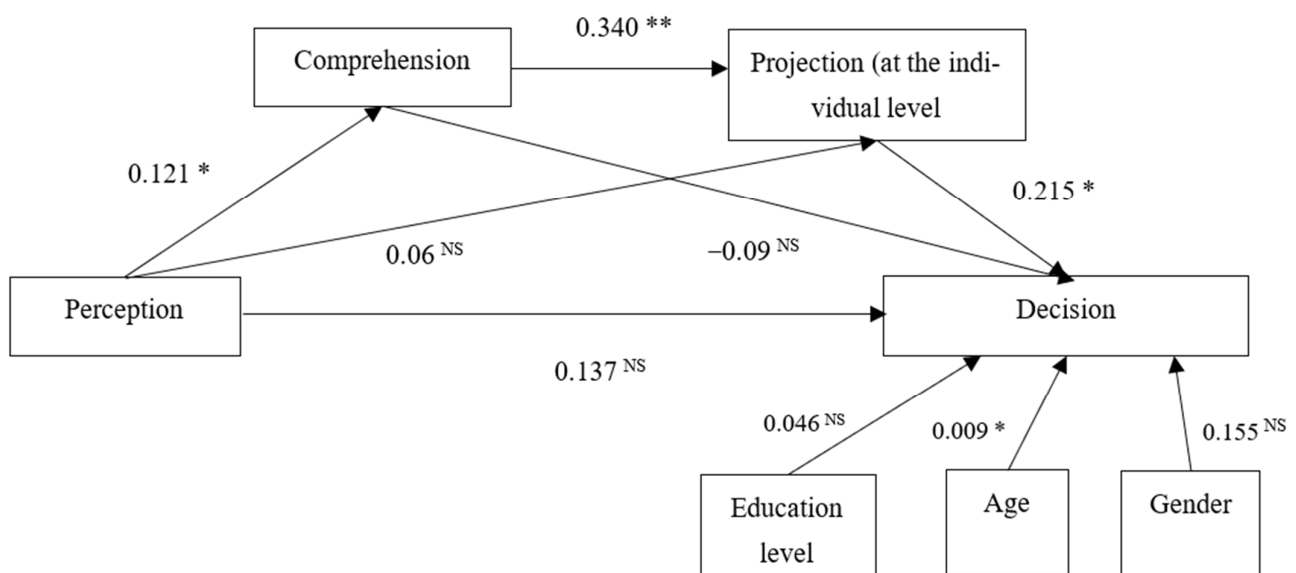


Figure 2. Regression coefficients in the serial multiple mediation analysis predicting decision with individual-level projection. NS = Non-significant. * $p < 0.05$. ** $p < 0.01$.

Table 5. Indirect effect of alternative model: projection measured at the individual level.

Path	B	BootSE	BCI 95% CI
Direct effect: perception → decision	0.137	0.085	−0.029, 0.304
Total indirect effect: perception → decision	0.011	0.018	−0.020, 0.053
Perception → comprehension → decision	−0.012	0.012	−0.04, 0.007
Perception → individual level projection → decision	0.014	0.013	−0.004, 0.046
Perception → comprehension → individual level projection → Decision	0.009	0.007	−0.001, 0.026

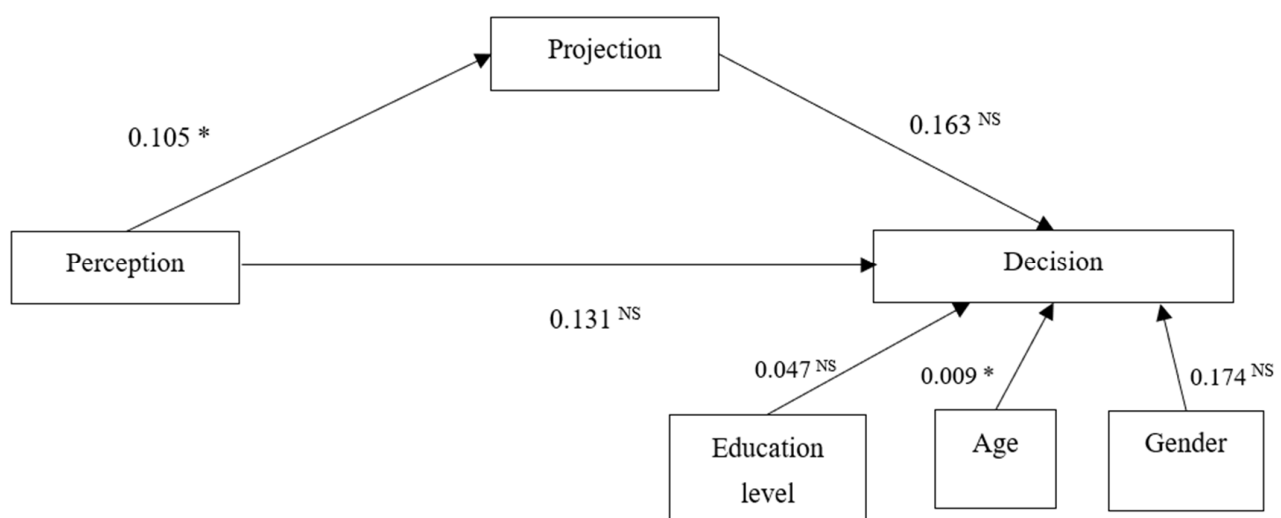
Models were adjusted for age, gender, and education level. The empirical 95% confidence interval does not include zero. Unstandardized regression coefficients (B) are presented; BootSE refers to the standard error calculated using bootstrapping.

We additionally tested a simpler model in which individual-level projection alone served as the mediator between perception and decision, without comprehension in the chain. This model was likewise non-significant (indirect effect: $\beta = 0.017$, 95% CI = [−0.006, 0.057]; Table 6, Figure 3). This finding is theoretically noteworthy in relation to the Protective Action Decision Model [PADM, 12], which posits that individuals interpret environmental cues and project their personal consequences as the basis for adopting protective actions. Consistent with PADM, perception significantly predicted individual-level projection in our data, yet individual-level projection did not translate into support for continuity-preserving prioritization policy.

Table 6. Indirect effect of alternative model: projection at the individual level mediated the relationship between perception and decision.

Path	B	BootSE	BCI 95% CI
Total effect: perception → decision	0.148	0.084	−0.018 0.313
Direct effect: perception → decision	0.131	0.085	−0.036 0.297
indirect effect Perception → individual level projection → decision	0.017	0.016	−0.006 0.056

Models were adjusted for age, gender, and education level. The empirical 95% confidence interval does not include zero. Unstandardized regression coefficients (B) are presented; BootSE refers to the standard error calculated using bootstrapping.

**Figure 3.** Regression coefficients in the serial multiple mediation analysis with projection at the individual level predicting decision. NS = non-significant. * $p < 0.05$.

These findings are generally consistent with H3: public-level projection appeared more strongly associated with policy support than individual-level projection. Although a formal comparison of the two indirect effects was not conducted, the point estimates are in the predicted direction in the full serial mediation model (public: $\beta = 0.019$; individual: $\beta = 0.009$), and the public-level pathway reached significance while the individual-level pathway did not. This distinction aligns with the theoretical premise of PSA that under system-facing threats, it is the anticipation of consequences for shared infrastructure, not for oneself personally, that motivates support for collective continuity measures.

Having established that the PSA pathway is specific to public-level processing, we next examined whether the model generalizes across different threat types or is bounded by the characteristics of the present context. To address this question, we drew on comparative data from the early COVID-19 pandemic, as described in Section 2.4.

4. The case of COVID-19

To further examine the PSA framework beyond the blackout scenario, we analyzed an additional cross-national dataset collected during the COVID-19 pandemic in the United States, the United Kingdom, and Israel. The surveys were administered simultaneously between 30 April and 7 May 2020, using online survey platforms: Amazon Mechanical Turk (Mturk) in the United States, Prolific in the United Kingdom, and Midgam in Israel. Respondents represented adult populations above the age of 18 in each country. Participants were randomly assigned to one of two experimental conditions emphasizing different societal consequences of the pandemic: a lethal condition focusing on projected mortality and healthcare collapse, and an economic condition focusing on financial damage and unemployment. This design aligns with prior research examining the influence of external crises, particularly fatal terror attacks, on public support for escalation and restrictive policy responses [40,41].

Participants in each condition were exposed to written vignette-based news reports attributed to widely recognized national news sources: NBC News in the United States, Sky News in the United Kingdom, and Channel 12 in Israel. The use of vignette-based experimental designs across these three countries is consistent with prior comparative studies employing similar methodologies [42,43]. In both conditions, the reports referenced a Harvard University study tracking COVID-19 spread patterns. The lethal condition emphasized projected fatalities, overwhelmed healthcare systems, and rapid viral transmission, whereas the economic condition emphasized severe economic losses and rising unemployment. Mortality and economic estimates were proportionally adapted to each country's population and economic scale in order to preserve realism and comparability across contexts.

Participants across all countries (U.S.: $n = 139$; U.K.: $n = 168$; Israel: $n = 154$) were distributed across the two experimental conditions (lethal: $n = 232$; economic: $n = 229$). The PSA framework was tested using PROCESS Model 92, with age, gender, and education included as covariates in all analyses. For each model, perception served as the independent variable (X), support for restrictive policies served as the outcome (Y), comprehension (M1) and projection (M2) functioned as the serial mediators, and country was introduced as the moderator (W) of the entire indirect pathway. Results indicated no significant serial mediation effects across any of the countries or conditions. Specifically, no significant indirect effects were found for the sequential pathway linking perception, comprehension, projection, and support for restrictive policies in either the lethal condition (Table 7) or the economic condition (Table 8). The absence of significant PSA pathways in the COVID-19 context may reflect the fact that, by the time of data collection, the pandemic was no longer an unfamiliar or weakly understood threat. Descriptive analyses indicated consistently high levels of factual knowledge across the three participating countries

and across both experimental conditions (lethal and economic), with correct responses ranging from approximately 88% to 100% across the perception items and 4 of 6 items exceeding 90%. In contrast, respondents in the power outage scenario demonstrated greater variability in threat-related knowledge ($M = 2.87$ out of 4, $SD = 0.91$), and with 24.5% answered all four perception items correctly. These descriptive differences are consistent with the interpretation that the COVID-19 pandemic represented a more familiar threat than the blackout scenario, which may have reduced the contribution of the perception stage within the PSA process. Accordingly, the COVID-19 comparison should be interpreted as suggesting potential boundary conditions for PSA rather than demonstrating that the framework is specific to infrastructure threats.

Table 7. The indirect effect of the serial mediation for each country for the Lethal condition.

	B	BootSE	BCI 95% CI
US	−0.0029	0.028	−0.057, 0.06
U.K.	0.0080	0.015	−0.016, 0.04
Israel	0.0091	0.015	−0.015, 0.05

Table 8. The indirect effect of the serial mediation for each country for the Economic condition.

	B	BootSE	BCI 95% CI
US	0.0265	0.036	−0.047, 0.10
U.K.	0.0352	0.022	−0.003, 0.08
Israel	0.0274	0.024	−0.020, 0.07

4. Discussion

The present study examined how the public interprets unfamiliar systemic threats under conditions of uncertainty and how such interpretations shape support for continuity-preserving policies. Building on Situation Awareness (SA) theory and extending it from the domain of individual to the societal level, we introduced the concept of Public Situation Awareness (PSA) as a cognitive process through which individuals collectively interpret systemic vulnerability, anticipate cascading societal consequences, and support policies aimed at preserving essential societal functions. Using the case of a threatened nationwide power outage in Israel, the findings were generally consistent with the proposed sequential pathway linking perception of threat-relevant information, public-level comprehension, public-level projection, and support for continuity-preserving prioritization policies. Importantly, the public-level projection pathway was statistically significant whereas the corresponding individual-level pathway was not, suggesting that support for continuity-oriented governance responses may depend more strongly on societal-level interpretation of systemic consequences than on anticipated personal impact alone. Notably, only the full serial pathway produced a significant indirect effect, whereas shorter pathways yielded non-significant effects, suggesting that PSA operates most coherently when public comprehension and public-level projection are jointly involved rather than functioning as isolated cognitive stages. Although the findings support the proposed serial pathway linking perception, public comprehension, public projection, and policy support, they should be interpreted with appropriate caution, as this analysis is an initial empirical examination of the PSA framework and should be viewed as a basis for further theory development and empirical validation across different contexts, threat scenarios, and populations.

PSA contributes theoretically by extending situation awareness beyond its traditional operational setting and repositioning awareness as a collective societal process. Endsley's

model [11] conceptualized SA as a sequence of perception, comprehension, and projection within individual operators navigating dynamic environments. The present findings suggest that under conditions of societal uncertainty, similar cognitive stages operate at the public level: citizens first become aware of threat-relevant information, then interpret its implications for collective functioning, and subsequently project broader societal consequences across interconnected systems. By doing so, PSA reframes awareness as a collective interpretive process shaped through communication flows, institutional narratives, and collective meaning-making. Consequently, support for continuity-preserving policies emerges not solely from direct perceptions of personal danger, but from a recognition of shared societal vulnerability and systemic interdependence. This marks a key theoretical distinction between public-level and individual-level projection: infrastructure crises are experienced not merely as personal disruptions, but as threats to the shared systems upon which populations collectively depend. When individuals perceive themselves as embedded within an interdependent societal system rather than as isolated decision-makers evaluating purely personal costs and benefits [33,35], support for prioritizing essential collective functions might become more likely. PSA thus shifts attention from perceiving individual risk to understanding systemic vulnerability, providing a cognitive mechanism through which public awareness translates into coordinated collective action under conditions of uncertainty. Unlike existing frameworks that primarily explain how individuals or organizations perceive and interpret unfolding situations, PSA conceptualizes the emergence of collective public understanding as a distinct societal mechanism. This distinction addresses an explanatory gap that individual-level frameworks cannot fully account for: it explains why citizens may support continuity-preserving policies even when such policies impose personal costs. Consistent with this, the present findings showed that public-level projection, but not individual-level projection, significantly predicted policy support, suggesting that the societal-level interpretive process captured by PSA cannot be reduced to individual judgments but instead represents a distinct mechanism operating at the collective level.

From this perspective, PSA may be understood as a public-level mechanism that creates the societal conditions for effective resilience governance. PSA explains how citizens develop support for policies intended to preserve essential societal functions during periods of disruption. Such support may strengthen the legitimacy and public acceptability of resilience-oriented interventions, thereby contributing indirectly to the long-term sustainability of critical infrastructure and social systems. This role becomes particularly important in contemporary critical infrastructure systems, which are increasingly characterized by interdependencies and vulnerability to cascading failures across sectors [18]. Accordingly, resilience depends not only on engineering and organizational capacities but also on public understanding of systemic risks and acceptance of prioritization decisions. Such public cooperation is also based on governance capacities that foster adaptive governance, social learning, and coordinated action among institutions, stakeholders, and the public [44–46]. From the perspective of PSA, these governance capacities are further strengthened when citizens understand systemic risks and accept the rationale underlying prioritization decisions. Also, the Sendai Framework identifies understanding disaster risk and strengthening disaster risk governance as foundational priorities for societal resilience [19,47]. The present findings extend these perspectives by suggesting that PSA may represent one social-cognitive mechanism through which such governance becomes socially supported. Specifically, perceiving threat-relevant information was associated with support for continuity-preserving policies primarily when accompanied by collective comprehension and public-level projection. This finding also resonates with research on mega-crises, which identifies collective sensemaking and the development of shared

understandings as central challenges of governance under conditions of uncertainty and systemic disruption [48]. Social sustainability, understood as the capacity of communities to preserve essential functions and social cohesion under stress [15], has become an important dimension of infrastructure governance [21]. In this sense, PSA's core capacity, i.e. recognizing systemic interdependence and supporting actions that preserve essential societal functions, may represent a foundational social-cognitive component of both infrastructure resilience and social sustainability. As such, PSA may provide one mechanism through which adaptive governance and sustainability transitions can be socially supported. This perspective is also consistent with the objectives of SDG 9 (resilient infrastructure) and SDG 11 (resilient communities), highlighting that investments in infrastructure resilience require not only physical systems and institutional capacity, but also communication processes that enable citizens to understand systemic interdependencies and the rationale underlying prioritization decisions. Although illustrated here in the context of critical infrastructure resilience, PSA may also represent a broader social-cognitive capacity relevant to sustainability governance more generally, particularly in contexts where effective implementation depends on collective understanding, public legitimacy, and support for policies that protect long-term societal functions, including climate adaptation, energy transitions, water conservation, and public health preparedness.

The findings additionally suggest that PSA may be relevant to how publics evaluate fairness and legitimacy during crises. Infrastructure disruptions frequently require prioritization decisions concerning which services, sectors, or populations receive preferential restoration or support. Public acceptance of such measures may depend not only on the decisions themselves, but also on whether citizens understand the systemic rationale underlying them. In this sense, PSA may contribute to the perception of disruptions and prioritization measures as collectively shared societal challenges rather than as arbitrary or politically motivated inequalities, a dimension of particular importance during prolonged disruptions requiring sustained public cooperation. The comparison with the COVID-19 dataset further sharpens this interpretation. Unlike the blackout scenario, the pandemic context did not produce significant PSA pathways. This difference should be interpreted cautiously, as the two contexts differed in important respects. One possible explanation is that, by the time the COVID-19 data were collected, the pandemic had become a familiar and institutionally scripted threat. Under such conditions, citizens may have relied less on constructing a shared understanding of the unfolding situation and more on established knowledge, routines, and guidance. Future comparative research is needed to determine whether novelty, uncertainty, and limited institutional scripting constitute important conditions for the emergence of PSA.

Several practical implications emerge from the study. First, crisis communication strategies concerning infrastructure threats may benefit from moving beyond narrowly individualized preparedness messaging and instead emphasizing systemic interdependencies and the societal rationale underlying prioritization decisions. Explaining why hospitals, water systems, telecommunications, or emergency services receive preferential restoration may strengthen public legitimacy for continuity-preserving governance during crises. Second, uncertainty reduction in systemic crises should be recognized as a collective interpretive process shaped through media narratives, institutional transparency, and social networks, not solely an individual cognitive task. Finally, policymakers and infrastructure managers may benefit from treating public cooperation not as an external social variable, but as an integral component of infrastructure resilience itself.

The study also has several limitations. First, the study employed a cross-sectional design, which limits the ability to draw causal conclusions regarding the relationships among the PSA components. Although the proposed model is theoretically grounded,

longitudinal research is needed to examine how public situation awareness develops and changes over time as crises evolve. Second, respondents who selected “don’t know” on one or more policy-support items were excluded from the mediation analysis, as the outcome variable required explicit support or opposition to capture resource-prioritization policies. However, these individuals may represent a distinct and theoretically meaningful subgroup. Rather than reflecting a lack of awareness, “don’t know” responses may indicate decision uncertainty, ambivalence, or difficulty evaluating trade-offs between personal interests and collective societal needs under conditions of uncertainty. Future research should examine this subgroup separately to explore how public situation awareness translates into either a clear policy orientation or unresolved decision uncertainty, which could offer valuable insights for crisis communication and public engagement strategies. Third, although the decision items involved explicit personal costs rather than abstract endorsement of essential services, responses may nevertheless have been influenced to some extent by social desirability (for example, as hospitals are a significant public asset). Future research could further examine policy support using behavioral or experimental paradigms that reduce this potential bias. Finally, the study was conducted within the specific security and geopolitical context of Israel, characterized by frequent exposure to national security threats and heightened public awareness of risk. As a result, caution is warranted when generalizing the findings to other countries, infrastructure systems, or crisis contexts. Comparative studies across different societies and hazard types are needed to identify the boundary conditions and broader applicability of the PSA framework. Future studies may also extend PSA beyond infrastructure disruptions to additional forms of systemic risk, including climate-related crises, cyberattacks, AI-related disruptions, financial instability, and large-scale technological failures. Comparative research across societies and governance systems may further clarify how institutional trust, media environments, and political polarization shape the emergence and stability of PSA.

5. Conclusions

PSA shifts attention from individual risk appraisal to collective interpretation, proposing that the sustainability of essential services is supported not only by technical robustness, but also by citizens’ capacity to recognize interdependence and endorse policies that protect the system as a whole. While the present findings require replication across additional hazards, populations, and cultural contexts, the framework offers a novel theoretical lens for understanding how publics respond to unfamiliar systemic threats. Future resilience research should therefore consider public situation awareness as a foundational component of infrastructure resilience itself.

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