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Integrating Insurance and Risk Management into Climate Change Governance: An SES Framework for Enhancing Resilience

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ABSTRACT

BACKGROUND AND OBJECTIVES: Climate change increasingly manifests through extreme weather events such as heatwaves, floods, storms, and wildfires. These events create complex challenges across social, economic, and biophysical systems. Insurance is exposed to multiple risks, including damage to property, infrastructure, and agriculture. It also faces pressures from evolving low-carbon development policies. Despite these challenges, insurance can enhance social resilience, mobilize finance, and influence risk-reducing behavior. Most studies on insurance and climate change focus on adaptation, mitigation, or disaster risk management (DRM) in isolation. They rarely examine how these aspects can integrate within insurance mechanisms and financing frameworks. To address this gap, this study adopted a conceptual approach based on Ostrom's Social-Ecological System (SES) principles. Insurance was situated within a holistic climate governance structure. This framework clarified how insurance could actively support both financial and governance systems to strengthen social resilience. The study drew on global best practices and examined insurance's role in cross-sectoral resilience, adaptation, and mitigation. Iran was considered as a specific context, with insights provided by experts. The study contributed to the SES literature by extending its applicability from natural resource systems to the governance of climate finance, reframing insurance from a purely corrective mechanism to a proactive actor within multi-level governance structures.

METHODS: The study used a three-level analytical approach to explore insurance integration into climate governance. The first level applied Ostrom's SES framework to create a conceptual model. This model included governance and six subsystems: economy-wide, public, finance, rural, urban, and social development. Insurance was positioned as a central bridge within the finance subsystem. It facilitates risk management, resource allocation, and adaptation. The model emphasized institutional linkages and feedback mechanisms between climate impacts, regulatory arrangements, and financial decision-making processes. Data were collected from global sources, including Climate Change Laws of the World (CCLW). This dataset included 931 policies in developed countries and 1,321 in developing countries, along with 499 and 429 relevant laws, and 1,520 and 1,015 targets, respectively. The second level involved international comparative studies. The conceptual model guided the analysis of case studies. Policies, laws, and targets related to insurance were assessed. Trends were identified for tailoring insurance to climate adaptation. Particular attention was given to regulatory design, compulsory

pooling structures, agricultural insurance schemes, disclosure requirements, and parametric solutions as emerging patterns within climate governance frameworks. The third level gathered expert feedback via a semi-structured questionnaire sent to 181 professionals. Experts prioritized governance subsystems and provided insights on climate change, insurance capabilities, and innovative interventions. Open-ended responses were analyzed inductively. Manual line-by-line coding was performed, and themes were grouped iteratively by author consensus. Quantitative rankings used variance and bootstrap 95% BCa confidence intervals. This methodology combined theoretical foundations, objective evidence, and expert input. It supported both localized and globalized conceptual model development.

FINDINGS: The conceptual framework positioned insurance as a key connector within the finance system. It enabled risk transfer and supports adaptation. International examples showed insurance as an active tool rather than a passive buffer. Norway's Natural Damage Insurance Act (1989) mandated post-disaster pooling and recovery measures. The UK's Flood Re program (2014) ensured affordable flood insurance through a holistic approach. France and Spain integrated risk management into agricultural, land-use, and forestry programs. Turkey and Kyrgyzstan used insurance platforms to operationalize national resilience targets. These cases illustrated how insurance instruments can simultaneously stabilize post-disaster recovery, incentivize preventive behavior through pricing mechanisms, and align financial protection with broader climate and development strategies. The study assessed the applicability of these instruments to Iran. Compatible approaches included public-private pooling and parametric solutions. Iran-specific constraints were noted, such as sanctions, limited reinsurance, and gaps in data infrastructure. Experts prioritized urban and rural zones for immediate attention. Finance received lower priority due to perceived urgency, though it remained strategically important. Key challenges included limited climate information, insufficient hazard data, and inadequate understanding of insurance assumptions. Additional issues were underdeveloped reinsurance markets, limited Enhanced Coverage Option (ECO) insurance options, and constrained financing avenues. Thematic analysis further revealed fragmented institutional coordination, limited climate-risk modeling capacity, and insufficient integration between environmental monitoring systems and insurance underwriting practices. Experts recommended expanding parametric insurance programs, enhancing data availability and mapping, and increasing access to innovative financing. Satellite-based parametric products for drought and subsidized rural coverage were suggested to improve equity. These findings highlighted insurance's role in linking finance and climate management across governance domains. They also indicated that strengthening data systems and regulatory transparency was essential for scaling insurance-based adaptation strategies.

CONCLUSION: Insurance offered significant opportunities as a strategic tool for adaptation, mitigation, and DRM under climate change. The adapted SES framework demonstrated a shift from reactive risk transfer to proactive, multi-sectoral coordination. This approach addressed a theoretical gap in climate finance governance. Effective integration required closing gaps in climate and risk information, developing sector- and location-specific insurance products, and leveraging financial instruments within governance systems. Expert insights and international analyses suggested parametric innovations and subsidized mechanisms tailored to Iran's challenges. Policymakers could achieve optimal outcomes by implementing short-term, localized interventions alongside long-term finance and insurance reforms. Embedding insurance more systematically within governance subsystems could enhance coherence between environmental objectives, financial stability, and social equity, thereby supporting resilient and climate-informed development pathways.

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Introduction

Climate change is increasingly driving extreme weather events such as heatwaves, floods, wildfires, and storms. The financial cost of these events is estimated at US$143 billion per year (Cologna et al., 2025; Seneviratne et al., 2021). These events are affecting our environments, communities, and economies. Insurance, which covers various climate-related hazards, is facing significant challenges. Transition-related risks also pose financial costs, impacting insurers and financial markets. However, insurance can support the transition to a low-carbon economy by alleviating climate-related costs for corporations (IAIS & SIF, 2018; Yang et al., 2025).

Three main strategies address climate change: adaptation, mitigation, and disaster risk management (DRM) (Cardenas, 2024; Farzaneh & Banimostafaarab, 2023; Patel et al., 2021). These strategies are distinct but interconnected. Adaptation involves adjusting to actual or expected climate impacts, aiming to reduce harm or exploit benefits. Mitigation refers to actions that reduce greenhouse gas emissions or enhance carbon sinks (IPCC, 2022). DRM focuses on risk reduction and managing residual risks to strengthen resilience (UNDRR, 2017). Insurance plays a vital role across all three, even if it is non-structural[1]:

[1] Non-structural measures are measures not involving physical construction which use knowledge, practice or agreement to reduce disaster risks and impacts, in particular through policies and laws, public awareness raising, training and education (UNDRR, 2017).

Adaptation: Insurance helps spread losses, provides liquidity, and supports risk reduction through underwriting, pricing, and product development. In developed countries, this includes storm or flood coverage, agricultural insurance, national disaster funds, preventive incentives, and green loans (Hamzeh et al., 2024-a). Developing countries often use microinsurance, index-based products, and weather derivatives, sometimes supported by international aid (Hamzeh et al., 2023-a). In Iran, rising awareness of climate impacts has led to increased demand for better products, such as risk-based pricing, parametric techniques, disaster funds, infrastructure improvements, and ecosystem restoration, though training gaps remain (Hamzeh et al., 2023-b, 2024-b; Mendoza & Dai, 2023; Scholer & Schuermans, 2022).

Mitigation: Insurance can encourage emission reductions by adjusting premiums and coverage limits. For example, in U.S. homeowners' insurance, increasing hurricane damage raised premiums and allowed for emission offsets proportional to exposure (Nabriski et al., 2025). Short-term insurance, compared to self-protection measures (e.g., irrigation), works well for high-severity, known risks but is less effective under uncertainty, highlighting the need for better forecasts (Traore, 2024).

Disaster Risk Management (DRM): DRM combines risk pooling to reduce impacts and enhance resilience. In the EU-28, high coverage is achieved through government-led compulsory or hybrid models, often with post-event coordination. Technologies like satellites, drones, AI, blockchain, and GIS improve transparency, facilitate parametric transfers, and offer ex-ante protections (Paleari, 2019; Sheehan et al., 2023).

Although previous studies offer valuable insights into insurance's roles in climate adaptation, mitigation, and DRM, they often focus on isolated aspects and lack a comprehensive conceptual model that positions insurance within Iran's finance governance framework, integrating it with economy-wide, public, rural, urban, and social subsystems using Ostrom's SES framework. This study addresses this gap by developing such a model based on international experiences and Iranian expert opinions.

Although previous studies have explored insurance's role in climate adaptation, mitigation, and DRM, they often focus on isolated aspects and lack a comprehensive model. This study fills this gap by integrating insurance into Iran’s finance governance framework using Ostrom’s SES model, covering economy-wide, public, rural, urban, and social subsystems. This research also addresses a theoretical gap in applying the SES framework to climate governance, particularly for financial instruments like insurance. While the SES framework has been used in natural resource systems, its application to finance and insurance within multi-sectoral governance has been underexplored. This study contributes to the development of the SES framework, reframing insurance from a reactive tool for risk transfer to a proactive force that manages and sustains governance processes within the finance subsystem. In Iran, a critical challenge exists in integrating insurance into climate governance, exacerbated by sanctions limiting reinsurance access, low insurance penetration, insufficient hazard data and modeling capabilities, and the lower perceived priority of the finance subsystem relative to urgent urban and rural issues such as drought and water scarcity. This study is guided by the following research questions:

Primary research question:

How can insurance be effectively integrated into Iran's climate governance to enhance resilience across sectors?

Secondary research questions:

1. How can Ostrom's SES framework be adapted to develop a conceptual model for insurance's role in multi-sectoral climate governance? (Level I)
2. What lessons can be drawn from international laws, policies, and targets regarding insurance's contribution to climate adaptation, mitigation, and DRM? (Level II)
3. What are the key priorities, challenges, and recommendations for insurance integration in Iran's climate governance subsystems, based on expert opinions? (Level III)"

To address these questions, the study uses a three-level analytical framework, described in the following section.

Materials and Methods

This study adopted a mixed-method approach that combined conceptual modeling, international comparison, and expert consultation to address the research gap.

Level I: Conceptual Model Development

The conceptual model positions insurance as a tool to strengthen financial mechanisms for climate adaptation and mitigation. It builds on Ostrom's SES framework, which integrates governance-policy interactions in socio-ecological systems (Palomo & Hernández-Flores, 2019). The framework includes first-tier components (social/ecological factors, external influences, interactions, outcomes) and second-tier variables (Nagel & Partelow, 2022). Core subsystems comprise resource units, resource systems, governance systems, and actors (Ostrom, 2009).

Adapted from international climate policies (Climate Change Laws of the World, 2025; Del Mar Delgado-Serrano & Ramos, 2015), the model focuses on the governance system. It examines mitigation decision-making across six subsystems: economy-wide, public sector, finance, rural, urban, and social development. Insurance serves as a bridge that links financial mechanisms to climate action.

Data came from the Climate Change Laws of the World (2025) database: 931 policies and 1,520 targets in developed countries; 1,321 policies and 1,015 targets in developing countries; plus 499 and 429 laws, respectively.

Level II: International Comparative Analysis

This level applied the conceptual model to international cases. It explored how insurance within the finance subsystem interacts with other subsystems to support adaptation, mitigation, and resilience. The analysis identified insurance-related laws, policies, and targets, along with recurring patterns, cross-sector synergies, and implementation gaps.

Level III: Expert Analysis of Iran's Context

This level examined Iran's situation through expert opinions, using the Level I conceptual model. A semi-structured questionnaire assessed priorities and challenges across the six subsystems. We received 183 responses from academia, government, and industry professionals; 181 were complete and suitable for analysis.

The questionnaire required ranking subsystems (Rank 1 = highest priority) and included open-ended questions on climate challenges and potential solutions. Quantitative analysis calculated mean rankings. Qualitative responses underwent inductive thematic analysis: repeated reading for familiarization, manual line-by-line coding, and iterative grouping into themes and sub-themes by author consensus.

This three-level approach yielded a robust conceptual framework and empirical insights.

Results and Discussion

Conceptual Model of Insurance in Climate Governance

In this study, we adapt Ostrom's social-ecological systems (SES) framework to explore climate change governance (Figure 1), with a focus on the governance system (GS). We break it down into six main subsystems of economy-wide, public sector, finance, rural, urban, and social development that shape how decisions are made and policies are implemented for climate mitigation and adaptation. Among these, the finance subsystem plays a central role, with the insurance sector acting as a bridge that transfers risk, builds resilience, and links resources across all other subsystems.

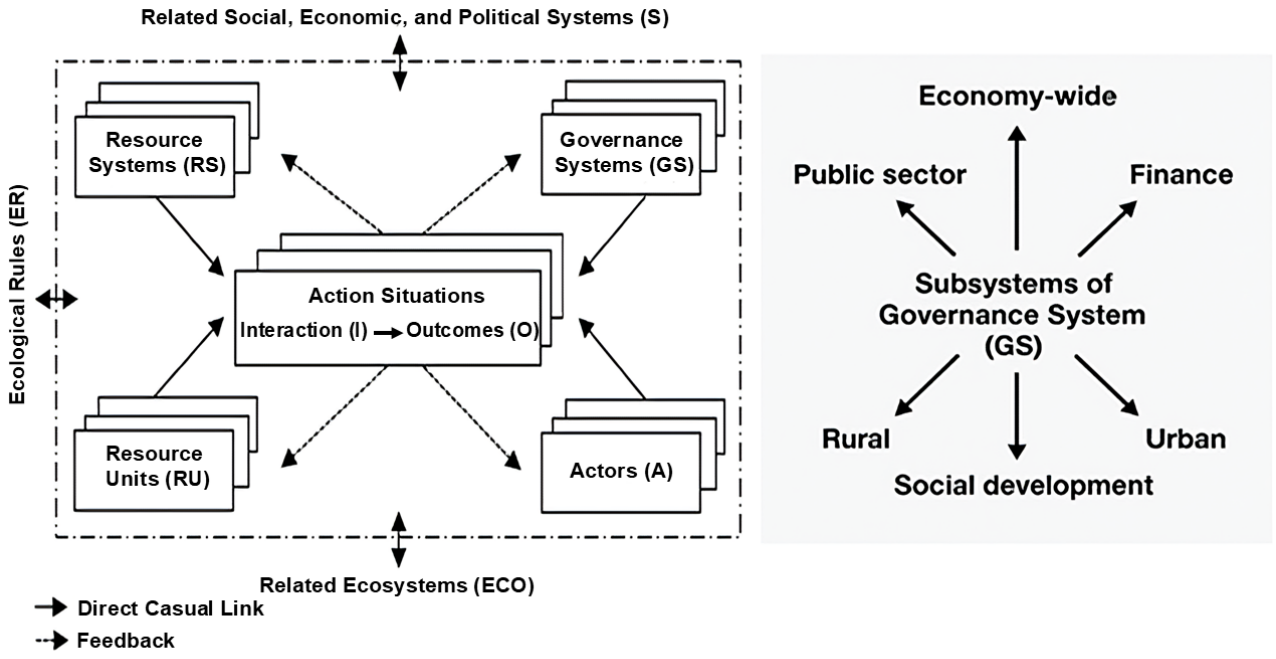

Fig.1. Ostrom SES framework (left) (Vogt et al., 2015) with author-developed governance subsystems (right).

This adapted framework serves as the foundation for examining real-world applications of insurance in climate governance, as explored in the following subsection.

Empirical Insights from Insurance-Related Instruments in Global Climate Governance

Using the conceptual model as a guide, we looked at real-world examples to see how insurance contributes to climate governance. We gathered insurance-related laws, policies, and targets from the Climate Change Laws of the World database, mapping them to the finance subsystem while noting connections to agriculture, Economy-wide, and building. The following table summarize these instruments, followed by focused analyses showing how insurance supports adaptation, mitigation, and resilience in practice.

Table 1. Selected insurance-related laws, policies, and targets in global climate governance*

Type	Country	Name/Description	Year	Related Subsystems
Law	Norway	Natural Damage Insurance Act	1989	Finance
Law	UK	Water Act 2014 (creation of Flood Re scheme)	2014	Finance, Building
Law	South Korea	Storm and Flood Insurance Act	2014	Finance
Policy	France	Law No. 2022-298 on crop insurance and climate risk management	2022	Finance, Agriculture
Policy	Spain	Royal Decree 425/2016 on subsidies for agrarian insurance	2016	Finance, Agriculture
Policy	Brazil	SUSEP Regulation 666/2022	2022	Finance
Target	Turkey	Increase compulsory earthquake insurance coverage; disaster reduction plans in all provinces	2023	Finance, Agriculture, Buildings, etc.
Target	Kyrgyzstan	Mitigate climate risks for agricultural producers via agricultural insurance system	2023	Finance, Agriculture, Economy-wide, etc.

Source: Climate change Laws of the World (2025)

* Selected insurance-related laws, policies, and targets are shown in Table 1; Full lists are available in appendix tables A1–A3.

The instruments in Table 1 (laws, policies, and targets) show insurance as a key element of climate governance. Instead of leaving flood, storm, or agricultural risks to individuals or governments alone, these tools spread risks across society.

Norway's Natural Damage Insurance Act (1989) requires natural hazard coverage for all fire-insured properties. This public-private pool speeds post-disaster recovery and provides data for planning.

The UK's Flood Re scheme (Water Act 2014) pools premiums to make flood insurance affordable in high-risk areas. It links finance with adaptation and building standards, protects property values, and promotes resilient construction. South Korea's Storm and Flood Insurance Act (2014) takes a wider approach, allowing government subsidies, mandatory coverage, and hazard mapping.

France's Law No. 2022-298 (2022) creates a universal agricultural risk-management system for 2023–2030 with substantial state funding. It shares responsibility among farmers, insurers, and government, turning insurance into a proactive resilience tool. Spain's Royal Decree 425/2016

similarly subsidizes agrarian insurance to boost uptake and reduce financial barriers. Brazil's SUSEP Regulation 666/2022 requires climate risk disclosure from insurers and pension funds, improving transparency and aligning finance with global standards.

Turkey's Eleventh National Development Plan (2019–2023) targets earthquake insurance for 12.1 million households, alongside disaster risk reduction and information technology rollout. Kyrgyzstan's Green Economy Program (2019–2023) uses agricultural insurance to help farmers manage climate risks, support food security, and encourage low-emission practices.

Overall, these examples reveal insurance as more than a safety net. It drives behavior change, supports evidence-based decisions, and bridges short- and long-term goals. The tools promote risk pooling, risk-reducing actions, and measurable progress while opening opportunities for mitigation links, such as premiums favoring low-carbon choices or parametric products.

The next section applies these global lessons to Iran's context.

Applicability of International Insurance Instruments to Iran's Climate Governance

The instruments listed in Table 1 provide useful lessons for Iran's climate governance. However, these tools must be adapted to address Iran's specific challenges.

The public-private risk pool approach, used successfully in Norway and the UK, fits Iran's needs due to its seismic activity and frequent floods. This model can help cover reconstruction costs. However, Iran's access to reinsurance markets is restricted by sanctions, making this approach more difficult to implement.

Agricultural subsidies from France, Spain, and Kyrgyzstan align with Iran's rural priorities. They can address drought, support farmers, and promote equity for low-income groups. However, Iran's underdeveloped financial infrastructure may limit the effectiveness of such subsidies.

Disclosure obligations (Brazil) and multisectoral targets (Turkey and Kyrgyzstan) help address Iran's data and modeling gaps for slow-onset risks like index-based insurance. To fill these gaps, Iran needs to invest in data collection systems.

Iran faces specific challenges, such as sanctions and underdeveloped financial infrastructure, which hinder the implementation of advanced insurance models. Iran could adopt a hybrid approach, combining compulsory disaster risk pooling, agricultural subsidies, and parametric insurance[1] for drought relief.

Iran should focus on insurance-driven climate policies that are effective within limited fiscal resources and promote international integration. Lessons from Norway, the UK, and Turkey underscore the importance of compulsory pooling for mitigating catastrophic disasters. France, Spain, and Kyrgyzstan demonstrate how agricultural subsidies can support climate-vulnerable farming

[1] Parametric insurance provides rapid payouts triggered by predefined, measurable parameters of Natural Catastrophe (NatCat) events, offering alternative or supplementary coverage for losses that are often excluded from traditional indemnity insurance due to excluded risks, limited (re)insurance capacity or situations of widespread damage (Ocampo, & Moreira,2024)

communities. Brazil's disclosure approach shows that regulatory tools can help reduce data and modeling gaps.

Recommended actions include:

- Analyzing satellite-based parametric insurance for drought relief and improving monitoring.
- Reviewing crop subsidies within existing budgets for the rural economy.
- Requiring insurance company disclosures to enhance regulatory transparency.

A combination of compulsory disaster pooling, rural subsidies, and parametric innovations aligns well with Iran's SES framework.

Iranian expert insights complement these global lessons. They highlight subsystem priorities and reveal challenges and opportunities for insurance integration.

Prioritizing Governance Subsystems and Thematic Insights from Expert Opinions on Iran's Climate Adaptation

The expert questionnaire highlights key governance weaknesses in Iran, based on feedback from practitioners and scholars. The rankings reveal the most urgent areas, while the open-ended responses explain their relevance and connections to finance and insurance.

Table 2. Ranked priorities of governance subsystems

Subsystem	Mean Rank (Friedman test)	Variance	95% BCa Confidence Interval for Mean
Urban	2.16	1.735	1.98 – 2.35
Rural	2.45	1.416	2.29 – 2.62
Economy-Wide	3.03	2.210	2.83 – 3.25
Public Sector	3.93	1.278	3.78 – 4.09
Finance	4.68	1.808	4.48 – 4.87
Social Development	4.75	2.888	4.51 – 4.99

Source: Authors' analysis of expert questionnaire responses (n = 181).

The Friedman test (p-value =0.000) shows significant differences in how experts prioritize governance subsystems. As shown in Table 2, urban and rural subsystems rank highest, while finance ranks lowest. However, open-ended responses indicate that finance is still considered crucial. Experts identified several constraints: lack of data, inadequate risk modeling, reinsurance gaps, outdated regulations, and absence of climate-smart insurance (ECO- insurance[1]) products. While these issues may seem less urgent than urban/rural challenges like water scarcity, heat stress, or infrastructure problems, the variance (1.808) and bootstrap 95% confidence interval (4.48-4.87, BCa interval, 2000

[1] The Enhanced Coverage Option (ECO) is an endorsement to select crop insurance policies that provides additional area-based coverage for a portion of the underlying policy deductible, offering trigger levels of 90% or 95% (USDA RMA, 2025).

resamples) reflect strong expert consensus on finance's lower priority regarding insurance barriers. The low ranking in finance highlights a readiness gap, not a lack of importance. Many experts believe that, as data systems and infrastructure improve, finance will positively influence climate adaptation. Thus, the approach should focus on on-the-ground adaptation while strengthening financial resilience.

Table 3. Dominant thematic issues within each governance subsystems

Subsystem	**Top recurring items / dominant phrases (ordered roughly by frequency)**
Urban	Air pollution; Waste management; Transportation; Urban water crisis; Aging infrastructure
Rural	dDrought; Water scarcity; Agricultural losses; Migration; Rangeland degradation
Economy- Wide	Impact on labor markets; Reduced investment; Rising operational costs; Fragile businesses
Public Sector	Lack of coordination; Fragmented mandates; Insufficient climate budget; Weak laws
Social Development	Education/Awareness gaps; Inequality; Mental health effects; Gendered vulnerability
Finance	Insurance gaps (Low penetration); Reconstruction costs; Limited risk-transfer instruments; Lack of green financial instruments; Insufficient data for pricing

Source: Authors' analysis of expert questionnaire responses (n = 181).

Table 3 shows recurring problems across each governance subsystem and how funding arrangements could impact climate adaptation.

In the urban and rural subsystems, issues like air pollution, waste management, transport, water scarcity, drought, and agricultural losses were emphasized. One expert noted: "reduced agricultural production and increased food prices due to pest proliferation." Another suggested solutions like: "preventing water waste in agriculture through advanced irrigation and low-water crops." These concrete challenges underscore the role of insurance and finance in addressing immediate climate risks.

Though less frequently discussed, finance-related issues also identified important gaps. These included inadequate insurance, high reconstruction costs, limited risk transfer instruments, lack of green finance, and insufficient information to set premiums. Experts highlighted barriers such as: "increased financial risk in the insurance sector due to rising natural damages," and "lack of data for systemic risk management." These gaps hinder insurance's potential to support adaptation but do not diminish its role in stabilizing income, prevention, and resilience.

Challenges like slow-onset risks (e.g., drought) are hard to cover with traditional insurance due to measurement and timing difficulties. Experts advocated for parametric or index-based insurance using satellite-derived data like rainfall and vegetation indices. One expert suggested: "development of early warning systems for floods and storms." Improved databases for building losses, hazard mapping, and weather monitoring are essential for better underwriting.

Experts also recommended innovative financing mechanisms, such as public-private disaster bonds, crop and city risk pools, and subsidized green insurance. One respondent noted: "banking and insurance facilities from international aid mechanisms." These options could increase coverage

access, enhance equity, and link adaptation to financial protection. Social programs could also provide affordable insurance to at-risk groups.

Other subsystems, such as economy-wide, public sector, and social development, provide context for financial interventions. Poor coordination, unclear mandates, and budget constraints complicate scaling insurance solutions. Experts frequently mentioned “rising costs, such as increased healthcare and insurance expenses.” These social issues highlight how risk transfer can help mitigate broader challenges.

The thematic analysis shows that insurance and finance products can do more than provide a safety net. They can serve as adaptation strategies, facilitating targeted responses, encouraging behavioral prevention, and supporting long-term adaptation, provided they are supported by relevant data and policies.

Conclusion and Suggestions

This study shows that insurance extends beyond post-event financial compensation. When properly integrated into governance systems, it enables climate security.

We applied Ostrom’s SES framework to identify relationships between insurance and climate-related subsystems in Iran. This application addresses a theoretical gap by extending the SES framework to financial instruments and multi-sectoral climate finance governance. It positions insurance as a proactive bridge across subsystems.

International laws, policies, and targets provide practical lessons for Iran. Experts highlight how insurance can support adaptation, mitigation, and disaster risk reduction. A comparative analysis of selected international instruments shows their relevance to Iran. We recommend adaptations such as satellite-based parametric insurance for drought and public-private risk pools, despite challenges like sanctions and data gaps.

Although lower in urgency, the financial system sector can catalyze progress. Parametric insurance, including index-based products and innovative disaster instruments, could drive advancement. Expert insights from inductive thematic analysis, direct quotes, and statistical measures reveal barriers (e.g., inadequate modeling and reinsurance) but confirm long-term potential. Early policy actions should integrate insurance with local-scale adaptation while strengthening supporting institutions.

By embedding insurance in SES-based governance, it can reduce environmental vulnerabilities and promote pro-nature behavior. Based on the conceptual model, international comparative analysis, and expert opinions, the following key recommendations are proposed to enhance insurance integration in Iran's climate governance:

- **Improving data infrastructure and risk modeling**
  Climate and risk data infrastructure will require more sustained investment in advanced systems, including satellite-based technologies, to close the gaps identified in the insurance sector. In the coming years, better data availability will play a key role in improving risk pricing, particularly for slow-onset events such as drought, where information is still insufficient. As these data systems evolve, they are likely to make the design and expansion

of parametric insurance more feasible, in line with the concerns raised by experts in the finance sector and the rural subsystem.

- **Development of sector-specific parametric insurance products**
  In future practice, satellite-based parametric insurance for drought relief is expected to expand, along with index-based products designed for both urban and rural areas and triggered by indicators such as rainfall levels or vegetation indices.
- **Offering subsidized coverage**
  In the future, it appears to be crucial to make insurance more accessible for farmers in rural areas and for people in cities who are at risk. Even small forms of government subsidization could have a significant impact. In some cases, this could include options such as eco-friendly options or green loans to try to level the playing field slightly.
- **Improving transparency and coordination between regulations**
  In the future, the rules could work more effectively if insurance companies are more open about the risks they are dealing with regarding the climate. Additionally, the insurance could be more closely tied to the planning and budgets to try to reduce the mix-ups between different agencies.

Contribution of Each Author

First Author: Conceptualization, Acquisition of data, Analysis and interpretation of data, Drafting of the manuscript, Supervision.

Second Author: Conceptualization, Statistical analysis, Critical revision of the manuscript for important intellectual content, Review and refinement of methodology, Synthesis and interpretation of results

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of the registered research. Furthermore, ethical considerations including plagiarism, informed consent, misconduct, fabrication and/or falsification of data, duplicate publication, and/or misconduct have been fully observed by the authors."

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