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From Sustainable Development to Sustainable Security: Reframing the Security–Sustainability Nexus

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Abstract

Sustainable development has traditionally been understood as a framework balancing environmental, economic and social objectives. However, accelerating climate change, geopolitical instability, technological disruption and growing systemic risks challenge the conditions under which these objectives can be achieved. Despite expanding research on sustainability, resilience and security, their interrelationships remain fragmented across disciplinary perspectives. This article examines how the relationship between sustainable development and security has evolved and analyzes how existing discussions on sustainable security can be brought together into a more coherent analytical framework. The study applies qualitative document analysis, comparative analysis, thematic analysis and analytical synthesis of the academic literature, international policy documents and institutional reports. The analysis indicates that progress towards sustainable development depends to a substantial extent on the resilience of environmental, economic, societal and institutional systems. Rather than representing a separate policy field, sustainable security provides an integrative perspective that explains how these dimensions interact under conditions of systemic uncertainty. Building on existing research in sustainability, security, resilience and governance, the article develops an Integrated Sustainable Security Framework that brings these dimensions into a single analytical structure suitable for examining their mutual relationships. Its main contribution lies in integrating existing perspectives into an analytically consistent framework that may support future empirical and interdisciplinary research on the sustainability–security nexus.

Keywords: sustainable development; sustainable security; security–sustainability nexus; resilience; systemic risk; integrated governance

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1. Introduction

Sustainable development has become one of the defining concepts shaping international governance, public policy and socio-economic development during the last decades. Since the publication of the Brundtland Report in 1987 and the adoption of the 2030 Agenda for Sustainable Development, sustainability has evolved from an environmental objective into a comprehensive framework integrating environmental protection, economic development and social well-being [1,2]. Governments, international organizations, businesses and civil society have progressively incorporated sustainability into strategic

planning, recognizing that long-term prosperity depends on balancing these interconnected dimensions [3].

The conditions under which sustainable development is pursued have nevertheless changed profoundly. Climate change, biodiversity loss, the COVID-19 pandemic, geopolitical instability, technological rivalry, cyber threats, energy insecurity and competition over critical raw materials have fundamentally altered the global risk environment [4]. These developments should not be understood as isolated crises. They represent interconnected systemic risks whose cumulative effects challenge many assumptions on which traditional approaches to sustainable development were built.

International assessments confirm this trend. According to the Sustainable Development Goals Report 2025, only about 17% of SDG targets are on track, while almost half show limited progress and more than one-third have stagnated or moved backwards [5]. These findings indicate that long-term sustainability is becoming dependent on the capacity of societies to cope with interconnected environmental, economic, technological and political pressures. Similar conclusions appear across the literature, although sustainability, resilience and security are still often examined separately [6].

This evolution has transformed the understanding of security. Security is no longer associated only with military capabilities or territorial defense. Climate change, pandemics, technological dependencies, disruptions of global production networks and resource scarcity directly influence the stability of societies [7]. Sustainability has undergone a similar transformation. It now depends not only on environmental policies but also on resilient institutions, secure access to energy and critical resources, effective public institutions and the capacity to anticipate, absorb and adapt to complex disruptions. Sustainability and security have become structurally interconnected rather than separate policy domains.

Despite rising scholarly interest, research on the sustainability–security nexus remains fragmented. Existing studies have examined this relationship from several perspectives, including environmental security, human security, resilience, sustainable development and governance. These approaches have substantially improved understanding of particular dimensions of the sustainability–security relationship and have demonstrated that sustainability and security are closely interconnected. At the same time, they usually concentrate on specific theoretical perspectives, policy sectors or individual dimensions of this relationship. Less attention has been devoted to developing an analytical framework that systematically explains how environmental sustainability, economic resilience, societal cohesion, governance capacity and security interact within one coherent conceptual structure.

This article addresses this gap by examining how the relationship between sustainable development and security has evolved and by developing an Integrated Sustainable Security Framework that brings together existing insights from sustainability studies, security studies, resilience research and governance. The article argues that changes in the global risk environment require a reconceptualization of sustainable development in which security functions as an enabling condition for sustainability, while sustainability reinforces the long-term foundations of security. The proposed framework should be understood as an analytical synthesis of existing theoretical perspectives rather than as a replacement for them.

The article addresses the following research question: How is the relationship between sustainable development and security being redefined, and how does the Integrated Sustainable Security Framework developed in this study contribute to a more coherent understanding of this transformation? To answer this question, the study applies qualitative document analysis combined with comparative analysis of the academic literature, international policy documents and institutional reports. The analysis synthesizes concepts

developed within sustainability studies, security studies and resilience research in order to identify common patterns, major shifts and institutional principles shaping the emergence of sustainable security.

The contribution of this article is twofold. First, it integrates existing debates on sustainability, security, resilience and governance into a coherent analytical framework explaining their evolving interdependence. Second, it offers a systematic conceptual synthesis that connects environmental sustainability, economic resilience, societal cohesion, governance capacity and security within one analytical structure. By clarifying the relationships among these dimensions, the proposed framework provides a basis for further conceptual refinement as well as future empirical and comparative research.

2. From Sustainable Development to Sustainable Security: Conceptual Evolution

2.1. Sustainable Development Beyond the Environmental Paradigm

Since its emergence in international policy debates, sustainable development has evolved from an environmental concept into a comprehensive governance framework integrating environmental protection, economic development and social well-being. The Brundtland Report established its normative foundations, while the 2030 Agenda and the Sustainable Development Goals expanded sustainability into a cross-sectoral principle influencing public policy, economic development, innovation, energy transition and institutional management [1].

The reviewed sources show that the understanding of sustainability has changed. Earlier approaches often addressed environmental degradation as a sectoral policy problem that could be mitigated through regulation or technological innovation [8]. Present research adopts a more systemic perspective, recognizing that environmental, economic, social and institutional processes interact through complex feedback mechanisms [3]. Climate change, biodiversity loss, demographic trends, technological transformation and geopolitical instability reinforce one another, producing cumulative risks that cannot be analyzed in isolation [9]. Sustainability now extends beyond environmental stewardship and reflects the capacity of societies to maintain their essential functions under conditions of long-term uncertainty [10,11].

One consequence of this development has been the incorporation of resilience into sustainability policy [12]. Originally associated with ecological systems, resilience has become a widely recognized organizing principle describing the capacity to anticipate disruptions, absorb shocks and adapt to structural change [13]. Experiences related to the COVID-19 pandemic, energy disruptions and supply-chain vulnerabilities have accelerated this shift [14,15]. Comparative evidence supports this trend. The 2024 ND-GAIN Index demonstrates substantial differences in countries' preparedness and adaptive readiness, indicating that resilience has become an important determinant of long-term sustainable development [16], not merely a complementary policy objective [17].

This transformation has been shaped by changes in the international political and economic environment [18]. Economic interdependence, dependence on critical raw materials, digital infrastructure and advanced technologies have revealed that environmental, economic and geopolitical vulnerabilities frequently reinforce one another [19]. Sustainability can no longer be interpreted only through environmental performance or social development. Its implementation depends on institutional effectiveness, technological capacity, secure access to strategic resources and the ability of public institutions to respond to systemic disturbances [4].

These developments indicate that sustainable development is entering a new phase. Its normative objectives remain unchanged, but the conditions required to achieve them have

become substantially more complex. Sustainability is progressively linked with resilience, adaptive capacity and the stability of critical societal functions. This evolution explains why sustainability research is moving closer to security studies and provides the basis for understanding sustainable security through a more integrated analytical perspective.

2.2. Evolution of Security Thinking: From State Protection to Systemic Resilience

The concept of security has continuously evolved in response to changes in the international environment, technological development and societal expectations [20]. For much of the twentieth century, security studies were dominated by a state-centered perspective in which military power, territorial integrity and protection against external aggression represented the principal objectives of security policy [21]. The end of the Cold War broadened this understanding. Political instability, economic crises, organized crime, environmental degradation, pandemics and humanitarian emergencies demonstrated that the stability of societies could be undermined without conventional military conflict [22]. As a result, concepts such as human security, environmental security and comprehensive security expanded the scope of security studies beyond the traditional focus on state defense [23].

This shift transformed the understanding of security itself. The protection of individuals, critical infrastructures, institutions and essential societal functions became important alongside territorial defense. The Human Development Report (2025) reflected this change by emphasizing that long-term stability depends not only on secure states but also on secure and resilient societies [24]. Security became progressively associated with institutional quality, social cohesion and sustainable development.

Environmental change further accelerated this evolution. Climate change, biodiversity loss and resource scarcity came to be recognized not only as environmental challenges but also as factors capable of amplifying political, economic and social vulnerabilities [25,26]. This trend is reflected in the Global Risks Report 2025, which identifies environmental risks, extreme weather events, biodiversity loss and misinformation among the most significant long-term global risks [4]. Such assessments reinforce the view that environmental sustainability and security have become closely interconnected within a shared policy environment. In this regard, criteria derived from human security frameworks allow for a reliable discrimination between trivial unsustainable actions and those warranting serious collective concern, while highlighting how structural insecurities like poverty or conflict actively perpetuate unsustainable behaviors [27].

The first decades of the twenty-first century further reshaped security thinking [20]. The global financial crisis, the COVID-19 pandemic, disruptions of global supply chains (Setyadi et al., 2025) [15], cyberattacks, technological competition and the war in Ukraine demonstrated that many threats spread simultaneously across sectors and national borders [28,29]. Their cumulative effects cannot be fully understood through traditional military perspectives because they emerge from interactions among environmental, economic, technological and political systems. This development has strengthened the role of resilience as one of key principle of security policy [30]. Security is now understood not only as protection against threats but also as the capacity to anticipate, absorb, recover from and adapt to systemic disruptions.

These developments have substantially reduced the distance between security and sustainability. Both concepts address the capacity of complex systems to remain functional under conditions of uncertainty. Sustainability seeks to preserve the ecological, economic and social foundations of development, while security aims to preserve the stability and integrity of societies facing multiple forms of disruption [20]. As systemic risks become more interconnected, these objectives converge, creating demand for policy approaches capable of integrating environmental sustainability, resilience and security within

one common perspective. This integration is further enhanced by incorporating security into the traditional ESG parameters (forming an SESG framework), which has been shown to foster corporate and societal resilience in environments exposed to war, cyberattacks, and systemic shocks [31].

This evolution illustrates more than a gradual expansion of the security agenda. It represents a fundamental transformation in the way security itself is conceptualized. The main challenge is no longer limited to protecting states from identifiable external threats but concerns maintaining essential societal functions, institutional legitimacy and long-term development under conditions of systemic uncertainty. This transformation provides the foundation for examining sustainable security as an integrated governance framework.

2.3. Reframing the Security–Sustainability Nexus

The interaction between sustainability and security has generated a substantial body of interdisciplinary research [32]. Although existing studies differ in their theoretical perspectives, they converge on one important observation: environmental, economic, technological and societal transformations are reshaping both security challenges and the conditions required for sustainable development. Less attention has been devoted to explaining how these parallel developments should be interpreted conceptually. As a result, although several conceptual approaches have examined different aspects of the sustainability–security relationship, no broadly accepted analytical framework has yet systematically integrated its environmental, economic, societal, governance and security dimensions into a single conceptual structure.

One group of studies approaches security through the perspective of sustainability, arguing that environmental degradation, climate change and resource scarcity undermine economic development, political stability and human well-being [22]. Another body of research adopts the opposite perspective by analyzing sustainability through the lens of security, resilience, preparedness and institutional capacity [25]. While both approaches have significantly expanded the debate, they usually retain one concept as analytically primary and treat the other as a dependent variable.

More recent scholarship attempts to overcome this separation by presenting sustainability, resilience and security as mutually reinforcing dimensions of the same socio-political system [19,32]. These approaches have strengthened interdisciplinary dialogue and contributed to a more integrated understanding of public policy. Nevertheless, the literature remains conceptually fragmented. Different research traditions continue to employ distinct terminologies, analytical assumptions and reference objects, which limits their ability to explain the systemic interaction between environmental change, institutional quality, economic resilience and security.

The relationship between sustainability and security has already been conceptualized in several ways, although existing approaches differ in their analytical focus, level of analysis and intended purpose. Khagram et al. (2003) were among the first to argue that sustainable development and security should be understood as mutually reinforcing processes supported by effective governance and institutional capacity [33]. Abbott et al. (2006) further developed this debate by presenting sustainable security as a policy approach addressing the root causes of insecurity, including climate change, resource scarcity and global inequalities [34]. Rogers (2021) expanded this perspective by arguing that sustainable security requires a transition from threat-based responses towards preventing systemic risks in a highly interconnected world [20]. Keskinen et al. (2019) examined sustainable security through the interdependence of energy, food and water systems, emphasizing resilience and resource governance [35]. Espinosa García et al. (2021) proposed a comprehensive security framework that integrates sustainability into a multidimensional understanding

of security [19], while Kharlamova et al. (2025) incorporated security into ESG-oriented business resilience, extending the discussion to the corporate governance dimension [31].

These approaches have significantly advanced the debate by demonstrating that sustainability and security are closely interconnected. At the same time, they usually focus on particular policy sectors, governance levels or thematic dimensions (see Table 1 for a comparative overview). They do not offer a single analytical framework that systematically integrates environmental sustainability, economic resilience, societal cohesion, governance capacity and security into one conceptual structure suitable for policy analysis. The Integrated Sustainable Security Framework proposed in this article builds on these contributions but seeks to connect them within one coherent analytical perspective.

Table 1. Comparative analysis of selected approaches to the sustainability–security nexus.

Approach/Author	Main Analytical Focus	Key Contribution	Analytical Limitation
Khagram et al. (2003) [33]	Governance and sustainable development	Demonstrates the importance of governance and institutional capacity for sustainable development.	Limited integration of the security dimension.
Abbott et al. (2006) [34]	Sustainable security as preventive policy	Connects environmental change, conflict prevention and long-term security.	Primarily normative and policy-oriented; limited analytical integration.
Rogers (2021) [20]	Systemic security	Broadens security beyond military threats by emphasizing systemic risks and resilience.	Sustainability remains only partially integrated into the analytical framework.
Keskinen et al. (2019) [35]	Resilience and environmental governance	Demonstrates interdependence between resilience, governance and resource management.	Focuses mainly on environmental governance and resource systems.
Espinosa García et al. (2021) [19]	Comprehensive security governance	Integrates resilience into multidimensional governance and security debates.	Gives less attention to societal cohesion and governance capacity as distinct analytical dimensions.
Kharlamova et al. (2025) [31]	ESG and security	Extends sustainable security to corporate governance by incorporating security into ESG frameworks.	Primarily applicable to the corporate governance context.
This article	Integrated Sustainable Security Framework	Synthesizes existing perspectives by integrating environmental sustainability, economic resilience, societal cohesion, governance capacity and security into one coherent analytical framework suitable for analyzing the sustainability–security nexus.	Conceptual framework intended to support future comparative and empirical research.

Source: Authors' compilation based on Khagram et al. (2003), Rogers (2021), Abbott et al. (2006), Keskinen et al. (2019), Espinosa García et al. (2021), and Kharlamova et al. (2025) [19,20,31,33–35].

As the comparison presented above illustrates, existing conceptual approaches explain important parts of the sustainability–security relationship but usually address specific policy domains or analytical perspectives. This limitation becomes particularly evident under

conditions in which risks rarely occur in isolation [8]. Climate change interacts with food insecurity, technological dependence, cyber vulnerabilities, geopolitical rivalry and economic fragmentation, producing cascading effects that extend across policy sectors [9,36]. Such developments challenge analytical approaches based on disciplinary or sectoral boundaries because they cannot fully explain the cumulative character of present systemic risks. The distinction between sustainability policy and security policy becomes progressively less meaningful, as both seek to preserve the long-term functioning, adaptability and legitimacy of complex societal systems.

Building on the conceptual approaches discussed above, the present study argues that these developments reflect more than closer interaction between sustainability and security. They indicate a transformation in which sustainable development depends on factors traditionally associated with security, while security itself relies on environmental integrity, economic resilience, social cohesion and effective institutions. The Integrated Sustainable Security Framework proposed in this article seeks to bring these interdependent dimensions together within one coherent analytical structure, in which resilience functions as the integrating mechanism linking the framework's analytical dimensions rather than as a separate dimension itself.

Within the proposed framework, resilience is understood primarily as the integrating mechanism through which these dimensions interact. It is not treated as a separate analytical dimension or as an independent governance outcome, but as the adaptive capacity that enables environmental, economic, societal, governance and security capacities to function coherently under conditions of systemic disruption.

This perspective does not replace the original concept of sustainable development. It extends its analytical scope by recognizing that long-term environmental, social and economic objectives can only be achieved when societies possess sufficient capacities to anticipate, withstand, adapt to and recover from systemic disruptions. From this perspective, sustainable security represents a governance framework through which sustainability, resilience and security can be analyzed as mutually reinforcing components of long-term societal development [37].

This interpretation provides the theoretical foundation for the framework developed in the following sections. The evolution summarized in Table 2 illustrates how sustainability and security have converged into an integrated governance perspective capable of addressing the complexity of today's systemic risk environment. Ultimately, establishing this state of 'secure sustainability' or 'sustainable security' demands structured, systemic processes capable of bridging the policies and actors of these traditionally distant fields, using resilience as a boundary object that links short-term adaptive capacity with long-term ecological goals [33].

Table 2 illustrates that the relationship between sustainability and security has undergone a significant transformation during the last four decades. While early approaches largely treated these concepts as separate policy domains, successive theoretical developments have progressively reduced the distance between them. Sustainability expanded from environmental protection towards systemic management, while security evolved beyond military defense towards resilience, human well-being and adaptive capacity. The convergence of these trajectories provides the basis for understanding sustainable security as an emerging governance perspective capable of integrating environmental, societal, economic and institutional dimensions within a common analytical framework.

Table 2. Conceptual evolution from sustainable development to sustainable security.

Period	Dominant Sustainability Perspective	Dominant Security Perspective	Relationship Between Sustainability and Security
1980s–1990s	Environmental protection and sustainable development	National security	Two largely separate policy domains
1990s–2005	Sustainable development integrated with social and economic objectives	Human security and comprehensive security	Initial convergence through human-centered approaches
2005–2020	Climate governance, resilience, SDGs	Environmental and climate security	Security recognized as influenced by sustainability
Since 2020	Systemic sustainability and resilience	Sustainable security and systemic resilience	Sustainability and security become mutually reinforcing governance objectives

Source: Authors' compilation based on the analyzed literature.

3. Materials and Methods

3.1. Research Design

This study adopts a qualitative research design to examine the evolving relationship between sustainable development and security through conceptual and policy-oriented analysis. The research addresses a phenomenon characterized by interdisciplinary overlap, continuous theoretical development and rapidly changing policy contexts. Under such conditions, a qualitative approach provides an appropriate framework for examining theoretical developments, identifying emerging patterns and interpreting relationships that cannot be adequately captured through quantitative indicators alone.

The study is conceived as a scientific and interpretative contribution, not an empirical case study testing causal relationships. Its objective is to explain how the relationship between sustainable development and security has evolved within academic debate and international policy discourse, and to assess the implications of this evolution for understanding sustainable security as an emerging policy perspective.

The analysis draws primarily on peer-reviewed academic publications, international policy documents and institutional reports published mainly between 2015 and 2025, complemented by seminal works that established the conceptual foundations of sustainable development, resilience and security. This combination makes it possible to capture both the historical evolution of these concepts and their present theoretical and policy development.

To examine this transformation, the study combines qualitative document analysis, comparative analysis, thematic analysis and analytical synthesis. These complementary methods support the identification of recurring concepts, major shifts and institutional principles across diverse sources. Their integration makes it possible to move beyond descriptive literature review towards a coherent analytical explanation of the transition from sustainable development to sustainable security.

The research follows an interpretative logic in which existing theories are treated as complementary perspectives instead of competing explanations. The purpose is not to formulate a universal definition of sustainable security but to explain the theoretical and policy developments that have facilitated its emergence as an integrated governance framework for addressing interconnected environmental, societal, economic and security challenges.

3.2. Data Collection and Source Selection

The analysis is based on a purposive selection of peer-reviewed academic publications, international policy documents, strategic reports and institutional publications addressing

sustainable development, security, resilience and public administration. As the objective of the study is to explain concepts and their evolution, sources were selected according to their theoretical relevance, scientific contribution and policy significance rather than statistical representativeness.

The document corpus combines the academic literature with policy-oriented sources in order to examine both the evolution of theoretical debates and their reflection in policy frameworks. Academic sources represent sustainability studies, security studies, resilience research and public administration scholarship, while policy documents and strategic reports provide insight into the practical development of these concepts within international policymaking.

Source selection followed three criteria. First, priority was given to publications that make an explicit theoretical contribution to sustainability, security or their interrelationship. Second, preference was given to studies addressing long-term structural developments instead of isolated events or narrowly defined sectoral issues. Third, the selected material represents different disciplinary perspectives, allowing the sustainability–security nexus to be examined from complementary perspectives.

The analysis intentionally incorporates concepts such as sustainable development, human security, environmental security, climate security, resilience, systemic risk and sustainable security. Examining these perspectives within a common analytical framework makes it possible to identify areas of convergence and divergence, trace their evolution and explain the emergence of sustainable security as an integrated governance perspective.

To ensure analytical consistency, all documents were examined using the same interpretative framework focused on conceptual definitions, institutional principles, reference objects of security, resilience mechanisms and the relationship between sustainability and security. Applying identical analytical criteria across all categories of sources strengthened the comparability of findings and supported the subsequent stages of thematic analysis and analytical synthesis.

3.3. Analytical Procedure

The analytical procedure followed a structured and iterative process combining qualitative document analysis, comparative analysis, thematic analysis and analytical synthesis. The objective was to explain how the relationship between sustainable development and security has evolved across the academic literature and policy documents and how this evolution has contributed to the emergence of sustainable security as an integrated governance perspective.

The first stage consisted of systematic reading and conceptual familiarization with the selected material. Academic publications and policy documents were examined comparatively in order to identify recurring concepts, theoretical assumptions and institutional principles related to sustainability, security and resilience.

The second stage involved thematic coding. The analysis focused on recurring conceptual categories, including sustainable development, human security, environmental security, climate security, resilience, governance, systemic risk and sustainable security. These categories were examined as interconnected themes reflecting the evolution of the sustainability–security nexus.

The third stage comprised comparative analysis. Individual approaches were compared with regard to their reference objects, underlying assumptions, institutional principles and interpretation of the relationship between sustainability and security. This comparison made it possible to identify theoretical convergence, remaining differences and the gradual integration of previously separate research traditions.

The final stage consisted of analytical synthesis. Findings obtained through document analysis, thematic coding and conceptual comparison were integrated into a coherent interpretative framework explaining the transition from sustainable development towards sustainable security. This process represents a critical integrative conceptual synthesis aimed at identifying conceptual convergence, theoretical development and governance implications across different disciplinary and institutional perspectives. The purpose was not to summarize the existing literature but to identify conceptual developments and policy implications emerging across different disciplinary perspectives.

Analytical credibility was strengthened through triangulation across academic publications, policy documents and strategic reports. These sources were treated as complementary forms of evidence, allowing conceptual interpretations to be compared across different disciplinary and institutional perspectives. In this study, triangulation served to strengthen interpretative consistency and conceptual robustness rather than statistical validation.

3.4. Research Scope and Limitations

This study is intentionally conceptual and analytical in scope. It does not evaluate the effectiveness of individual sustainability or security policies, nor does it seek to quantify the relationship between sustainability and security through statistical indicators. The analysis focuses on explaining the theoretical evolution of the sustainability–security nexus and the institutional principles supporting the emergence of sustainable security as an integrated analytical framework.

The interpretative character of the research defines its principal limitations. The findings are derived from critical analysis and synthesis of the existing academic literature, policy documents and strategic reports instead of primary empirical data. Although the use of multiple categories of sources and methodological triangulation strengthens analytical consistency, alternative interpretations of particular concepts remain possible. The proposed framework should be understood as a conceptual contribution derived from a critical integrative conceptual synthesis and intended to support further theoretical and empirical discussion. It is not presented as a universally applicable explanatory model.

These limitations indicate directions for future research. The analytical framework developed in this study may provide a basis for comparative empirical research examining how sustainable security is reflected in national policies, regional governance arrangements and international organizations. Future studies may operationalize the concept through measurable indicators and assess its implications for resilience, institutional quality and sustainable development across different institutional and geopolitical contexts.

4. Results

The findings presented in this section are derived from the qualitative research design described in the previous chapter. Given the conceptual and interpretative character of the study, they represent research findings generated through comparative analysis, thematic analysis and analytical synthesis, not statistical measurements. The findings explain the mechanisms that have driven the transition from sustainable development towards sustainable security and identify the principal governance implications of this conceptual evolution.

For clarity, the results are organized into three complementary parts. The first identifies the structural drivers of the sustainability–security transition. The second examines the principal dimensions of sustainable security emerging from the analyzed literature and policy documents. The third integrates these findings into a coherent analytical framework explaining sustainable security as an evolving governance perspective capable of addressing interconnected environmental, economic, societal and security challenges.

4.1. Structural Drivers of the Sustainability–Security Transition

The analysis indicates that the transition from sustainable development towards sustainable security has resulted from the cumulative interaction of several structural transformations. No single policy initiative or external shock can explain this transition [38]. These developments originate in different policy domains but reinforce one another, making sustainability and security two closely interconnected dimensions of the same governance challenge.

The first structural driver is the changing character of environmental risks. International assessments consistently identify environmental threats among the most significant long-term global risks. The Global Risks Report 2025 identifies extreme weather events, biodiversity loss and ecosystem collapse among the highest-ranked long-term risks, reinforcing the argument that environmental sustainability has become inseparable from long-term societal resilience [4]. Climate change, biodiversity loss, land degradation and resource depletion no longer affect only ecological systems. They influence food security, public health, migration, economic stability and institutional capacity, demonstrating that environmental sustainability has become an essential precondition for long-term security and societal resilience [5].

The second driver is the changing geopolitical environment. Geopolitical competition, the war in Ukraine, energy insecurity and disruptions of international trade have demonstrated that sustainable development depends on stable access to strategic resources, functioning supply chains and a predictable international environment [39,40]. Environmental objectives, industrial policy, energy transition and security policy have become closely interconnected.

The third driver is the deepening interdependence of economic and technological systems. Digital infrastructure, critical raw materials, semiconductor production, artificial intelligence and advanced technologies support both economic development and national resilience while simultaneously creating new vulnerabilities. In the cyber domain, sustainable security entails not only preventing unauthorized access but maintaining continuous, usable services; rigid and onerous authentication procedures place too much burden on users, wasting human energy and leading to systemic cyber sustainability issues [41,42]. Sustainable development depends not only on environmental performance but also on the robustness and adaptability of economic and technological systems [10,43]. This driver is shaped by the emergence of tightly coupled resource-infrastructure economies, where energy transition, critical raw materials (such as lithium), and marine governance are entangled, exposing significant synergies and geoeconomic trade-offs at the security–sustainability nexus [44].

Another important driver is the transformation of public administration. Governments are required to manage multiple interconnected crises that extend across institutional and sectoral boundaries. Climate adaptation, cyber resilience, disaster preparedness, public health and energy security demand coordinated public action capable of integrating policies that were traditionally developed separately [18,45]. A critical component of this governance is ensuring the security of modern energy and transportation infrastructure, such as ultra-high voltage (UHV) transmission lines and high-speed railway systems, which are vulnerable to severe icing and environmental hazards under extreme weather events [46]. Within this context, resilience functions as the principal integrating mechanism connecting environmental sustainability, economic resilience, societal cohesion, governance capacity and security. It strengthens the capacity of societies and institutions to absorb shocks, adapt to change and maintain essential functions without compromising long-term development [47,48].

The final driver is societal resilience. The analysis indicates that adaptive capacity depends not only on infrastructure, technology or institutional performance but also on social trust, institutional legitimacy and civic participation [48,49]. Societies characterized by stronger social cohesion are generally better equipped to respond to environmental, economic and security disruptions [24]. Sustainable security encompasses not only physical protection but also the preservation of social conditions supporting long-term stability and collective adaptation.

Although each driver follows its own dynamics, their significance lies primarily in their interaction. Environmental pressures reinforce economic vulnerabilities, geopolitical tensions reshape technological development, weak governance reduces adaptive capacity and declining social cohesion limits resilience. Sustainable security emerges from this cumulative interaction. It cannot be explained by any single source of risk. This interdependence represents the principal finding of the analysis and explains why sustainable security provides a more comprehensive interpretative perspective than sustainable development alone.

4.2. Dimensions of Sustainable Security

The comparative analysis indicates that sustainable security should not be understood as another sectoral policy or merely as an extension of environmental security. The analyzed literature and policy documents consistently point to a more comprehensive interpretation in which security emerges from the interaction of several mutually dependent dimensions [50]. Within the proposed framework, resilience is treated as the integrating mechanism that enables interaction and adaptation across all dimensions. It should thus be distinguished from the analytical dimensions themselves, which represent the principal capacities supporting sustainable security.

Across these dimensions, resilience operates as the common integrating mechanism that enables their interaction and adaptive functioning. It, thus, links the dimensions conceptually but is not presented as an additional dimension of the framework itself. None of these dimensions is sufficient on its own. Sustainable security develops through their combined contribution to long-term societal stability and adaptive capacity.

Within the proposed framework, the principal referent of security is the capacity of society and its public institutions to maintain essential functions, protect critical systems and sustain long-term development under conditions of systemic disruption. State security, human security and the resilience of critical infrastructure are understood as complementary expressions of this societal capacity rather than as competing security perspectives. State security, human security and the resilience of critical infrastructure are understood as complementary expressions of this societal capacity rather than as competing security perspectives.

The first dimension is environmental sustainability. Healthy ecosystems, climate stability and responsible resource management remain essential conditions for social and economic development. Environmental degradation weakens these foundations and generates pressures that extend into food security, public health, migration and economic stability [26]. Environmental sustainability remains a core component of sustainable security, although no longer its only pillar.

The second dimension is economic resilience. Stable public finances, diversified supply chains, secure access to energy and critical raw materials, technological innovation and the capacity to absorb external shocks all influence the ability of societies to sustain development under changing conditions. Economic resilience contributes directly to long-term security by reducing structural vulnerabilities and strengthening adaptive capacity.

The third dimension is societal cohesion. The analysis demonstrates that resilience depends not only on material resources or institutional performance but also on social trust, solidarity, inclusive governance and public confidence. Societies characterized by stronger social cohesion generally respond more effectively to environmental, economic and security disruptions. Sustainable security equally depends as much on social relationships as on physical infrastructure or financial resources.

The fourth dimension is governance capacity. Effective public administration, transparent decision making, cross-sectoral coordination and the ability to anticipate emerging risks determine whether governments can respond successfully to interconnected crises. Public institutions function as the mechanism through which environmental, economic and societal objectives are translated into practical resilience. This interpretation is further supported by the OECD Infrastructure Governance Indicator, whose average score across 23 OECD countries reached only 0.59 (on a scale from 0 to 1), indicating that substantial governance gaps remain in strengthening governance capacities supporting the resilience of critical infrastructure despite visible progress in cross-sectoral coordination [43]. Weak institutions often amplify existing vulnerabilities even where sufficient economic or technological resources are available [45]. To mitigate these gaps, safety governance must shift from a reactive, one-dimensional accident prevention approach toward a polycentric collaborative governance mode that integrates physical, institutional, and socio-economic systems to foster ecological resilience [51].

The fifth dimension is security itself. Within the analyzed literature, security extends beyond defense policy or crisis response. It includes the protection of critical infrastructure, cyber resilience, energy security, preparedness for natural hazards, public health protection and the capacity to maintain essential public functions during prolonged periods of uncertainty. Security is understood primarily as preserving the continuity and stability of societal systems.

These dimensions should not be interpreted as separate policy areas. Their significance lies in their interaction. Strong environmental policies cannot compensate for weak governance, economic resilience cannot replace social cohesion, and advanced technologies alone cannot ensure security without effective institutions. Sustainable security emerges from the balance among these dimensions. No single component is capable of producing it independently.

An important finding of the analysis is that resilience links all five dimensions. It operates as the functional mechanism through which environmental sustainability, economic resilience, societal cohesion, public capacity and security reinforce one another. This explains why resilience appears across different research traditions despite considerable differences in terminology. It provides the operational foundation for an integrated governance framework capable of addressing systemic risks over the long term.

Furthermore, international standards such as ISO 22300:2025 provide the foundational vocabulary and guidelines for societal security and resilience [52]. Their successful implementation relies heavily on understanding local risk awareness and participatory approaches to empower diverse cultural and economic contexts [53,54].

The identified dimensions indicate that sustainable security should not be interpreted as a replacement for sustainable development. A more appropriate understanding is that it broadens the analytical perspective of sustainable development by incorporating governance capacities that have become indispensable under conditions of systemic uncertainty. Sustainable development continues to define long-term objectives, while sustainable security explains the conditions under which these objectives remain achievable.

These dimensions are synthesized in Figure 1, which illustrates their mutually reinforcing character within the concept of sustainable security. The figure should be interpreted as an analytical representation of the functional interdependence among these dimensions rather than as a hierarchical or sequential model, emphasizing that each dimension contributes to sustainable security through continuous interaction with the others.

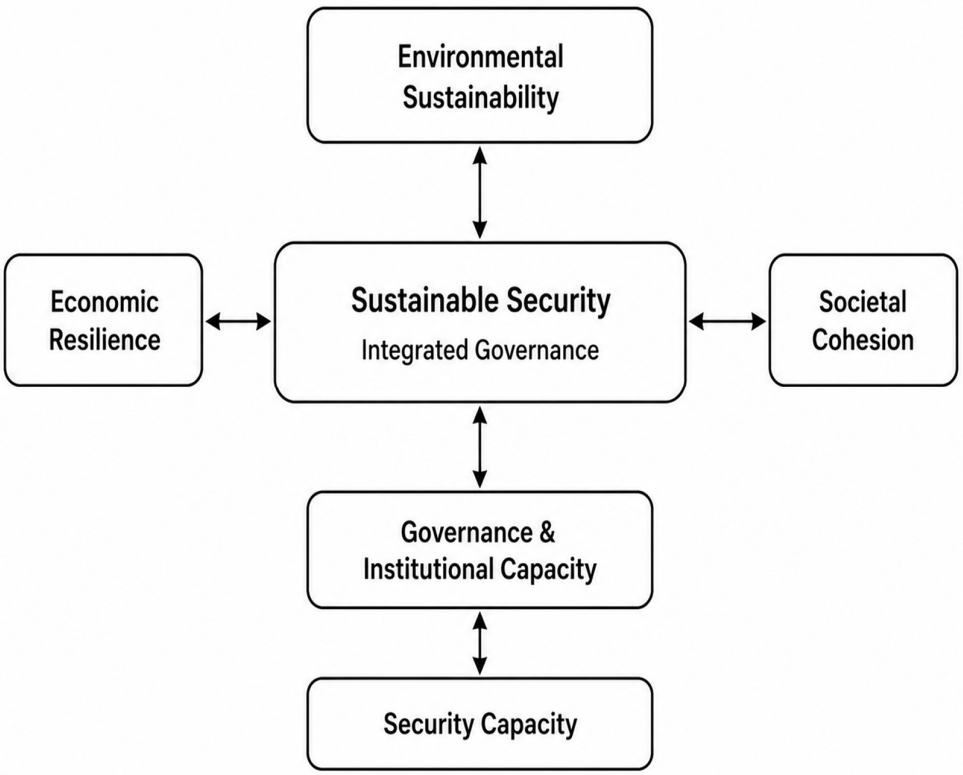


Figure 1. Analytical dimensions of sustainable security. Source: Authors' compilation based on the analytical findings.

4.3. An Integrated Framework of Sustainable Security

The findings presented in the previous sections indicate that sustainable security should not be interpreted as a separate policy field or merely as another variant of environmental or human security. It emerges from the interaction of environmental, economic, societal, governance and security dimensions that collectively determine the capacity of societies to respond to long-term systemic challenges. Their significance lies less in their individual functions than in the way they reinforce one another.

This interaction forms the basis of the Integrated Sustainable Security Framework proposed in this study. The framework is intended as a conceptual perspective. It does not propose a new theory of sustainable development or security. It organizes the principal findings into a coherent integrative perspective explaining how resilience connects different dimensions of sustainability and security within one coherent structure.

In this framework, resilience is used at two complementary analytical levels: as the overarching integrating mechanism linking all dimensions of sustainable security and, in specific contexts such as economic resilience, as a characteristic of the adaptive capacity within an individual dimension. Sustainable security extends the scope of sustainable development by emphasizing the public capacities required to achieve long-term environmental, economic and social objectives under conditions of persistent uncertainty.

The framework assumes that present societies operate in an environment characterized by interconnected risks. Environmental degradation, geopolitical instability, technological disruption, economic dependencies and social vulnerabilities rarely develop independently. They interact through feedback mechanisms that amplify their cumulative effects, limiting the effectiveness of policies designed within isolated sectoral frameworks.

From this perspective, sustainable security depends on public institutions capable of coordinating responses across policy sectors and institutional levels [55,56]. Environmental policies influence economic resilience, economic resilience shapes technological capacity, institutional quality determines crisis management, and social cohesion affects the ability of communities to adapt to change. Security is not produced exclusively by defense institutions but by the interaction of institutional capacities distributed across society [57].

A key finding of the analysis is that resilience functions as the principal integrating mechanism connecting all dimensions of sustainable security. It is not an additional policy objective but the operational capacity through which environmental sustainability, economic resilience, governance quality, social cohesion and security reinforce one another. Without adaptive capacity these dimensions remain fragmented, while stronger resilience enables them to operate as an integrated governance system capable of addressing systemic risks while preserving long-term development.

The proposed framework suggests a more comprehensive understanding of public governance. Managing systemic risks requires a shift from predominantly reactive crisis management towards more anticipatory and adaptive governance based on preparedness, institutional learning, policy coordination and long-term planning. This does not reduce the importance of traditional security policies. Defense, civil protection, law enforcement and emergency management remain essential, but their effectiveness depends on environmental governance, economic resilience, institutional quality and public trust.

The Integrated Sustainable Security Framework should be understood as a conceptual tool. It is not intended to serve as a prescriptive governance model. Its principal contribution lies in explaining the structural relationships linking sustainability, resilience and security within a single conceptual perspective. This interpretation provides an understanding of how societies can strengthen long-term resilience under conditions shaped by interconnected environmental, economic, technological and geopolitical challenges.

Figure 2 synthesizes these findings by illustrating the relationships, reciprocal interactions and long-term governance implications linking structural drivers with the principal dimensions of sustainable security. It complements the findings and provides a visual representation of the article's principal conceptual contribution.

The framework should be interpreted as a dynamic system of mutually reinforcing interactions rather than as a linear sequence of causal relationships. Structural drivers influence each analytical dimension simultaneously, while the dimensions themselves interact through reciprocal feedback processes. Improvements or disruptions within one dimension may in turn strengthen or weaken the performance of the others. Resilience provides the integrating mechanism through which these interactions support adaptation, institutional learning and the long-term capacity of the system to respond to interconnected risks.

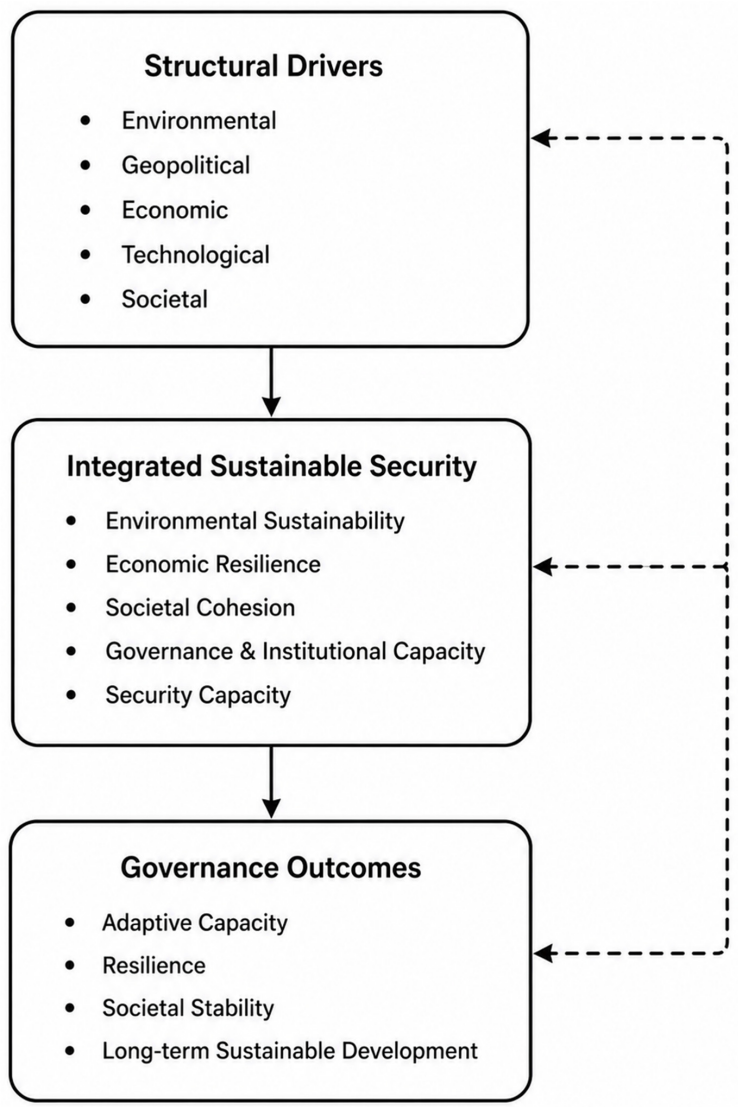


Figure 2. Integrated Sustainable Security Framework. Source: Authors' compilation based on the analytical findings.

5. Discussion

The findings suggest that the relationship between sustainable development and security has entered a new stage of conceptual development. While these fields originally evolved along separate academic and policy trajectories, present environmental, geopolitical, technological and economic changes have substantially reduced the distinction between them. Sustainability can no longer be examined independently of adaptive capacity and security, while security itself depends on environmental integrity, economic resilience and social stability [50]. The analysis supports an integrated perspective in which sustainability and security reinforce one another within the same institutional system.

This shift reflects a fundamental transformation in the character of public risks. Climate change, technological disruption, geopolitical competition, energy insecurity and economic interdependence rarely occur as isolated phenomena. Their interaction generates cumulative effects that exceed the explanatory capacity of sector-specific approaches. Policies focusing exclusively on environmental protection or crisis response address only part of a systemic problem [38]. This fragmentation is empirically validated by analyses of security actors, which reveal a stark divergence between high-level environmental security declarations and practical on-the-ground execution, illustrating that implementation often

remains dependent on fragmented, individual practitioner-led initiatives rather than cohesive institutional mechanisms [58]. The findings indicate that sustainable development depends on institutional capacities able to anticipate, absorb and adapt to interconnected disruptions instead of responding to individual crises separately.

One important implication concerns the understanding of security itself. Security is no longer limited to territorial defense or protection against immediate threats. It has become closely associated with maintaining essential public functions, institutional continuity and societal resilience under conditions of long-term uncertainty. This interpretation does not reduce the importance of defense, civil protection or emergency management. Their effectiveness, however, depends on environmental sustainability, economic resilience, institutional quality and public trust.

The analysis suggests that sustainable security should be interpreted as a conceptual extension of sustainable development. It does not replace the original concept. Sustainable development continues to define long-term environmental, economic and social objectives. Sustainable security complements this perspective by explaining the public capacities required to achieve these objectives under conditions characterized by interconnected systemic risks. This interpretation helps explain why sustainable security has received rising scholarly attention during the last decade. The shift reflects not only theoretical debate, but also practical experience gained from climate-related disasters, the COVID-19 pandemic, supply-chain disruptions and geopolitical instability [47].

Another important finding concerns resilience. Although resilience is interpreted differently across individual disciplines, the analysis indicates that its principal value lies in its integrative function. Resilience connects environmental sustainability, economic performance, institutional capacity, societal cohesion and security within one common perspective. It should be understood primarily as a coordinating capacity supporting anticipation, adaptation and institutional learning. Recovery after crises represents only one element of this adaptive capacity. This interpretation explains why resilience has become a common element across sustainability studies, security research, public administration and disaster risk reduction despite their different theoretical traditions.

The Integrated Sustainable Security Framework proposed in this article should be understood within this context. Its purpose is not to replace existing theories or provide a universal explanatory model. It offers a coherent structure that reduces conceptual fragmentation by integrating relationships that are often examined separately. In this respect, the framework contributes to interdisciplinary dialogue while preserving the distinct contribution of sustainability studies, security studies and resilience research. Its empirical application may prove challenging because several of its core dimensions continue to be interpreted differently across academic disciplines and policy contexts.

The findings have practical implications for public policy. Public institutions face situations in which environmental, economic, technological and security risks emerge simultaneously [59,60]. Such conditions require stronger policy coordination, institutional learning and adaptive governance [18,55]. Fragmented governance may remain effective when addressing isolated challenges, but its limitations become evident once several systemic disturbances develop at the same time [43]. These observations are equally relevant for implementing the United Nations Sustainable Development Goals [2].

The framework recognizes that integrated governance requires managing trade-offs between legitimate public objectives. Measures adopted to strengthen one dimension may generate unintended consequences for another. For example, efforts to improve energy security through accelerated diversification of energy supplies may temporarily increase economic costs, while rapid expansion of domestic extraction of critical raw materials needed for the green transition may create tensions with environmental protection

objectives. Sustainable security therefore requires governance arrangements capable not only of integrating complementary policies but also of balancing competing priorities through transparent, evidence-based decision making [61,62].

Progress towards the SDGs depends not only on sector-specific policies but also on institutional arrangements capable of strengthening resilience and managing interconnected risks over the long term [5]. Sustainable security provides an analytical perspective that complements the SDG framework by highlighting the institutional and adaptive capacities necessary for achieving sustainable development under conditions of systemic uncertainty. To operationalize this integrated approach, policy planners should utilize multidimensional assessment metrics, such as the Sustainable Energy Security (SES) index—evaluating availability, acceptability, affordability, and efficiency—to balance immediate geopolitical goals with long-term ecological and societal preservation [63,64].

The proposed framework should nevertheless be interpreted with appropriate methodological caution. It represents an interpretation derived from qualitative analysis. It has not been empirically validated as an explanatory model. Future research may examine its applicability within different governance systems, policy sectors and geographical contexts, as well as operationalize sustainable security through measurable indicators suitable for comparative empirical analysis.

The findings indicate that sustainable security does not emerge from a simple expansion of the traditional security agenda or from a reformulation of sustainable development alone. It develops through the integration of environmental sustainability, economic resilience, societal cohesion, governance capacity and security within one analytical perspective. Such an integrated understanding offers a more convincing basis for explaining long-term systemic challenges than approaches that continue to examine these dimensions separately.

6. Conclusions

This study examined the evolving relationship between sustainable development and security in order to explain why these concepts have become interconnected within present public policy practice. The analysis indicates that this development reflects a fundamental transformation in the character of public risks. It cannot be explained simply as an expansion of sustainability or security as separate policy domains. Sustainable security emerges from the interaction of environmental sustainability, economic resilience, societal cohesion, governance capacity and security, creating an integrated perspective for understanding long-term societal resilience.

The findings suggest that sustainable security should not be interpreted as a substitute for sustainable development. Sustainable development continues to define the normative objectives of balanced societal development, while sustainable security explains the public capacities required to achieve these objectives under conditions characterized by interconnected environmental, economic, technological and geopolitical challenges. In this respect, sustainable security broadens the analytical perspective of sustainable development without altering its basic principles.

The main scientific contribution of this article lies in integrating perspectives from sustainability studies, security studies, resilience research and governance into a coherent framework. The proposed Integrated Sustainable Security Framework, supported by the two models developed in this study, provides a structured explanation of how these dimensions interact and reinforces the view that resilience functions as the principal mechanism linking them within a common integrative perspective.

The findings have practical implications. Public institutions operate in an environment where environmental degradation, technological disruption, economic dependencies and

security challenges develop simultaneously and reinforce one another. Effective responses depend less on isolated sectoral policies and more on institutional coordination, adaptive capacity and long-term resilience. This interpretation is consistent with evidence presented in the Sustainable Development Goals Report, the ND-GAIN Index and the Global Risks Report, which all indicate that progress towards sustainable development is becoming progressively more dependent on the capacity to manage interconnected systemic risks.

The study should be considered in light of its methodological scope. The proposed framework is derived from qualitative analysis and analytical synthesis rather than empirical testing of causal relationships. Future research may examine its applicability through comparative case studies, quantitative approaches or mixed-methods research across different governance systems, geographical regions and public policy sectors.

The analysis presented in this article indicates that sustainable security offers a useful analytical perspective for explaining the interaction between sustainability and security under conditions of systemic uncertainty. While this study is bounded by its qualitative and conceptual design—as outlined in Section 3.4—it provides a structural foundation for future empirical validation across diverse institutional and geopolitical contexts. Future research should focus on operationalizing the Integrated Sustainable Security Framework (ISSF) through quantitative metrics, cross-country comparative analyses, and sector-specific case studies (e.g., critical infrastructure and energy governance), building upon recent scholarship indexed in Web of Science and Scopus on adaptive governance, socio-ecological resilience, and systemic risk management.

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