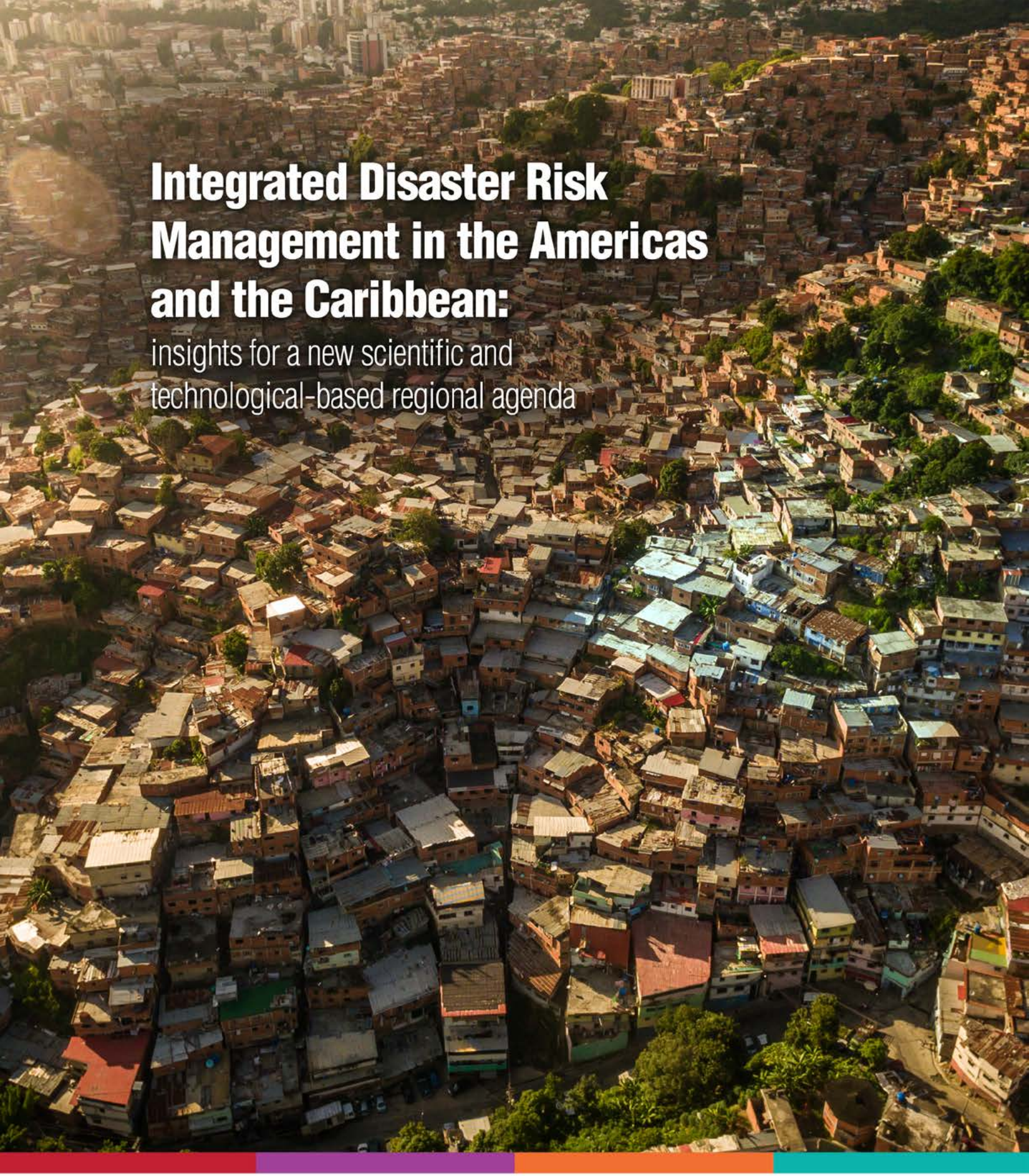

Integrated Disaster Risk Management in the Americas and the Caribbean:

insights for a new scientific and technological-based regional agenda

UNDRR
UN Office for Disaster Risk Reduction

R-STAG
Scientific and Technical Advisory Group (STAG) Americas & the Caribbean
SENDAI FRAMEWORK
FOR DISASTER RISK REDUCTION 2015-2030

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Utilizing what we know and identifying what we need to learn to share and further the integrated management of disaster risk

Diverse strategies and initiatives toward disaster risk reduction in the Americas and the Caribbean should be supported, consolidated, and extended. Accordingly, laying the foundations of a new scientific and technology-based regional agenda is much needed to adjust and strengthen policy formulation and practice and to promote alliances among all stakeholders involved in disaster risk reduction.

In this vein, one of the messages of the regional agenda is to establish multi-directional recognition of the need to guide the progress, access, and use of scientific evidence and the advancement of research infrastructure and technological developments to support the formulation and implementation of policies oriented toward Integrated Disaster Risk Management (IDRM).

Building on previous research initiatives and publications, the present proposal of a scientific and technology-based regional agenda articulates strategic challenges, critical areas of scientific research, and opportunities associated with the progress of the priorities of the Sendai Framework for Disaster Risk Reduction and the 2030 agenda for sustainable development, to observe regional priorities.

These key strategic challenges include: (1) Fostering science-based disaster risk research for IDRM; (2) Furthering interdisciplinary and transdisciplinary research and practice; (3) Moving from the availability and production of information to knowledge sharing and action; (4) Translating data, information, and knowledge to policymaking and practice through sound communication processes; (5) Enabling access to research infrastructure and technological developments; (6) Advancing the use of technology for capacity building, policy-making, and anticipatory action. The latter is understood as early action pre-impact and more fundamental efforts to avoid risk in the first place (prospective management) or reduce existing risk (corrective management); (7) Adopting a systemic risk perspective to understand and address space-based connectivity and interdependencies; and (8) Creating

synergies to map out intersectoral strategies, especially with the financial sector, to improve science-based frameworks for investment decisions and economic arrangements within the best practices in a systemic risk context. The national and international inclusion in this process of strong governance of disaster risk and sustainability is significant in achieving disaster risk reduction. Still, it is a fact that even though science and new technologies can support better management of disaster risk, such a task can only be undertaken with the participation of all relevant stakeholders based on an integrated and transdisciplinary approach.

Thereupon, utilizing what we know and identifying what we need to learn to share and promote IDRM remains a complex defies that, on the shoulders of the Science & Technology community, seeks to contribute to regional applicability and social significance.

I. Background

Disaster risk and disasters in the Americas and the Caribbean: an overview

Disasters triggered by hazards of various origins have greatly affected the Americas and the Caribbean in recent decades. From the 1990s to 2020, the region had 3,788 major disaster events. While human losses have been recorded at 380,123, more than 328 million people have been affected (Table 1). These figures underestimate the true impact of disasters since small and medium-sized disasters are not included. Nevertheless, they indicate the need to redouble efforts to reduce disaster risk from an integrated and sustained management perspective.

Triggering Hazard	Number of events	Total deaths	Total affected people
Earthquake	147	228,962	16,185,636
Flood	911	47,411	61,298,041
Storm	985	39,550	154,155,923
Technological	1059	30,004	825,472
Epidemic	148	22,951	4,605,308
Extreme temperature	87	5093	5,698,357
Landslides	117	4954	686,224
Volcanic activity	64	553	3,974,778
Wildfire	147	535	11,670,001
Drought	120	110	69,822,688
Insect infestations	3	0	2000
Total	3788	380,123	328,924,428

Table 1. Number of distinct disasters in the Americas from 1990 to 2020 (Source: adapted from EM-DAT database n.d.).

2020 was a watershed moment in the contemporary history of the planet. In addition to the known hazards that trigger disasters, the appearance of the SARS-CoV-2 virus as a sociobiological hazard and the effects of the COVID-19 disease throughout the world confirmed the character of vulnerability and exposure as a permanent source of depletion of society on all scales and therefore, as the most influential generator of disaster risk. This global disaster explicitly reveals the need to transform the economic model that systematically favors short-term gains over long-term human and environmental security and address social inequalities to reduce disaster risk (Alcántara-Ayala et al., 2021).

More than 6.8 million people have died, and more than 671 million inhabitants have been infected since the COVID-19 pandemic began in 2020 (JHU, n.d.). Until the end of April 2022, the number of deaths in the Americas was 2,727,516, while Europe reached 1,815,332 and Asia 1,429,815. Africa and Oceania had fewer human losses, with records of 253,817 and 11,054 (o.17%), respectively (Figure 1).

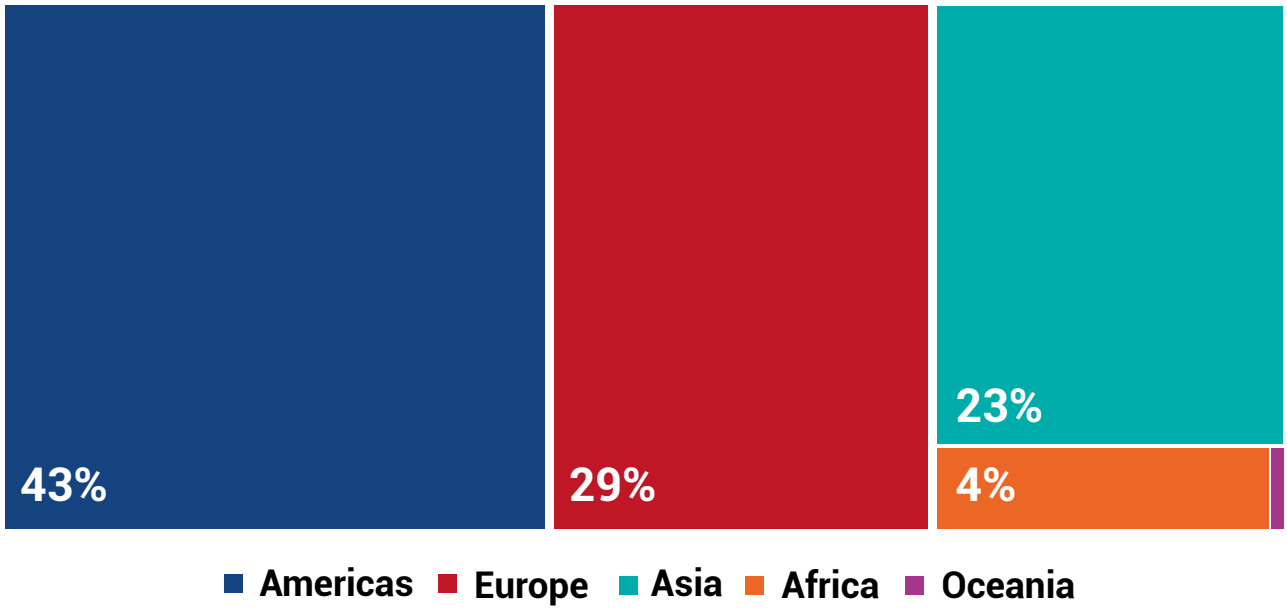

Figure 1. Regional percentage of global deaths associated with COVID-19 from the start of the pandemic to April 2022 (Source: adapted from JHU, n.d.).

Regarding confirmed cases of COVID-19 infections, Europe 191,617,999 is the region with the most significant number of occurrences, followed by the Americas, where 153,387,360 instances have been recorded. Numbers in Asia are as high as 149,373,610, whereas Africa and Oceania are the regions with the lowest records, with 12,097,346 and 7,251,992 infected people, correspondingly (Figure 2).

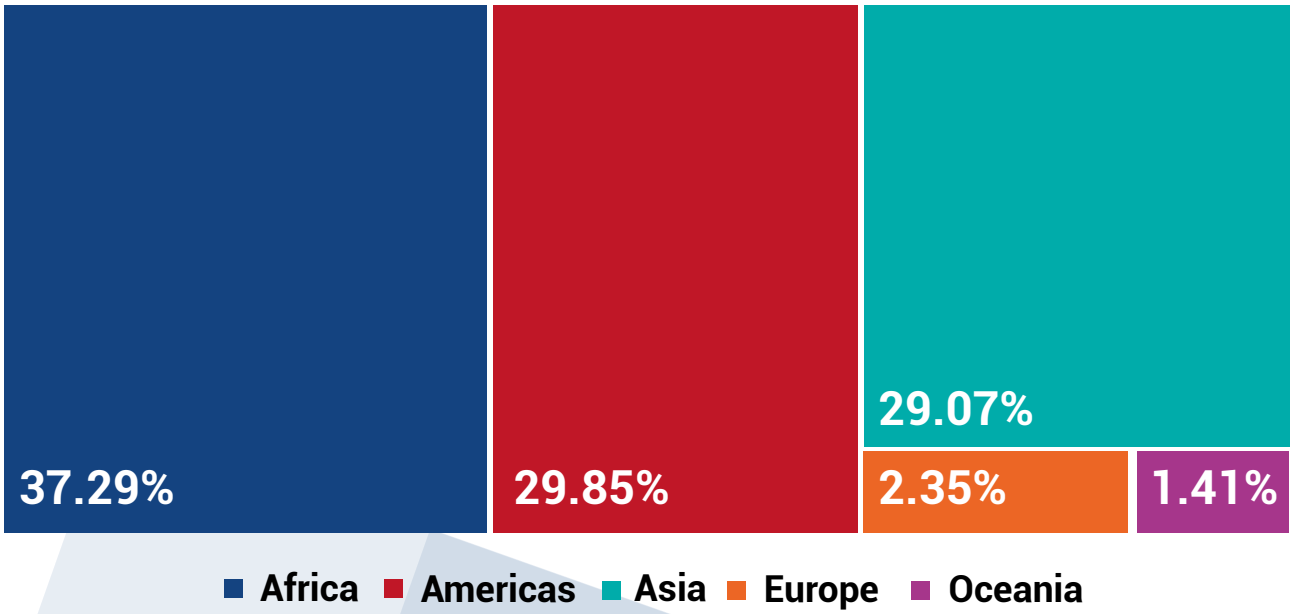

Figure 2. Regional percentage of global confirmed COVID-19 infections from the start of the pandemic to April 2022 (Source: adapted from JHU, n.d.).

The Americas has been the worst-hit region in the world by the global disaster triggered by the COVID-19 pandemic. At the regional level, during the acute phase, the US, Brazil, and Mexico had the highest number of victims associated with COVID-19. At the same time, the US, Brazil, and Argentina have the highest number of infected people (Table 2) (Figure 3).

Table 2. The twenty countries of the Americas with the highest number of deaths and infected people from COVID-19 from the start of the pandemic to April 2022 (Source: adapted from JHU, n.d.).

Impact of COVID-19 on the Americas			
Country	Number of Deaths	Country	Infected people
US	984,280	US	80,108,812
Brazil	662,447	Brazil	30,224,081
Mexico	322,915	Argentina	8,997,641
Peru	212,272	Colombia	6,064,226
Colombia	139,400	Mexico	5,671,735
Argentina	128,152	Canada	3,671,399
Chile	57,433	Peru	3,538,132
Canada	38,859	Chile	3,526,172
Ecuador	35,558	Cuba	1,099,688
Bolivia	21,846	Bolivia	900,659
Paraguay	18,705	Uruguay	882,861
Guatemala	17,522	Ecuador	860,235
Honduras	10,835	Costa Rica	842,434
Cuba	8,516	Guatemala	837,262
Costa Rica	8,369	Panama	765,126
Panama	8,136	Paraguay	642,533
Uruguay	7,159	Dominic Republic	576,358
Venezuela	5,705	Puerto Rico	536,947
Dominican Republic	4,372	Venezuela	522,008
Puerto Rico	4,188	Honduras	424,658

In addition to the profound meaning of these figures for the people directly affected, the importance of the social and economic consequences is not exclusive to a particular sector of society. Still, the worst impact is suffered by the most vulnerable, often the poorest and most marginalized people.

Moreover, in settings such as Latin America and the Caribbean, deep-rooted inequality, fractured health systems, balance-of-payments obligations, debt crises, high informality and poverty, gender-related violence, and high levels of biodiversity loss reveal pre-existing conditions that have aggravated the implications of the pandemic (UN, 2020) and will continue to undermine today's society, particularly the way disaster risk is addressed.

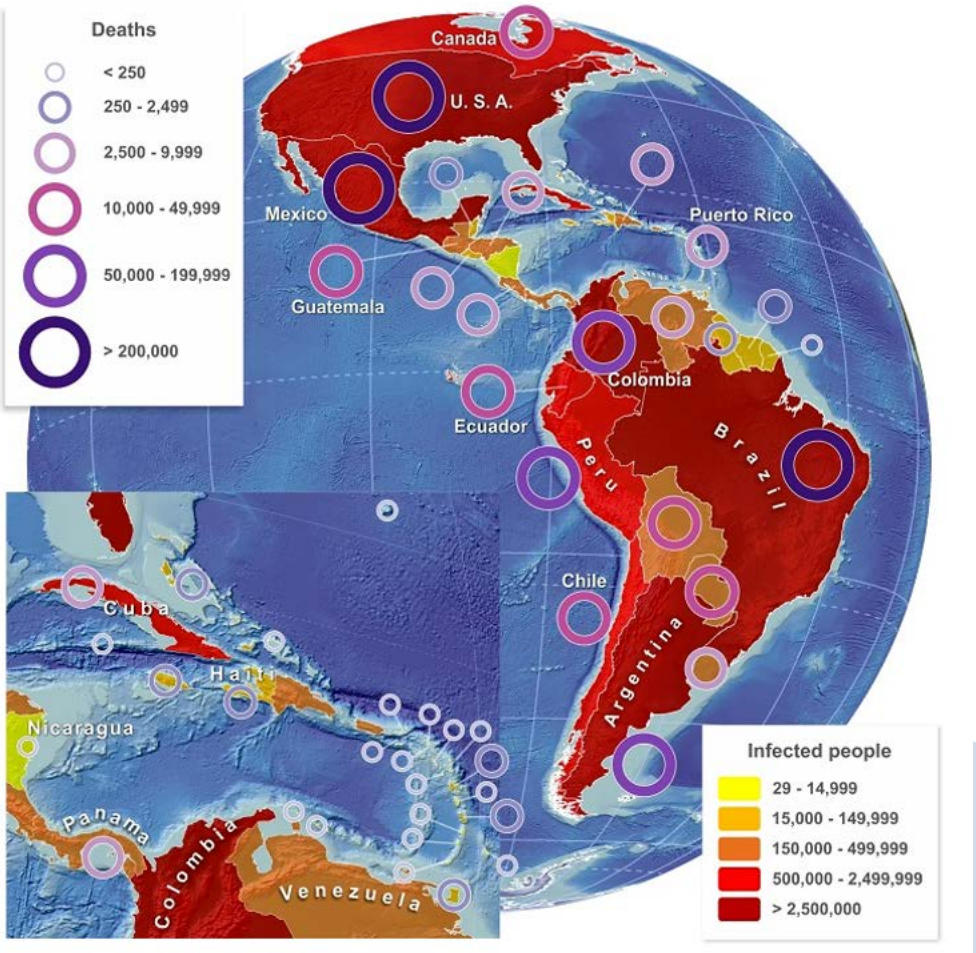

Figure 3. Impact of the global disaster triggered by the COVID-19 pandemic in the Americas and the Caribbean in terms of reported deaths and infections (January 2020 to August 2021) (Source: adapted from JHU n.d.).

Economic advancement and investment in scientific research: a significant fissure

Strategies and schemes focused on DRR must be equipped with significant and sustained financial resources. However, historically many countries of the region have been characterized by scarce or null allocation of resources for science. This not only derives factors associated with national economic growth but by the interest in understanding and recognizing the value of science. This goes hand in hand with individual governments' perceptions and politicization of science. Moreover, if more was needed, information on the resources used to support S&T in the region must be more accurate in most countries.

Even though S&T can play a pivotal position in conceiving, structuring, and applying substantial and rational policies to reduce disaster risk, the benefits of informed policymaking and practice are increasingly challenged by a lack of understanding and or interest from governments, particularly in Latin America and the Caribbean (Figure 4).

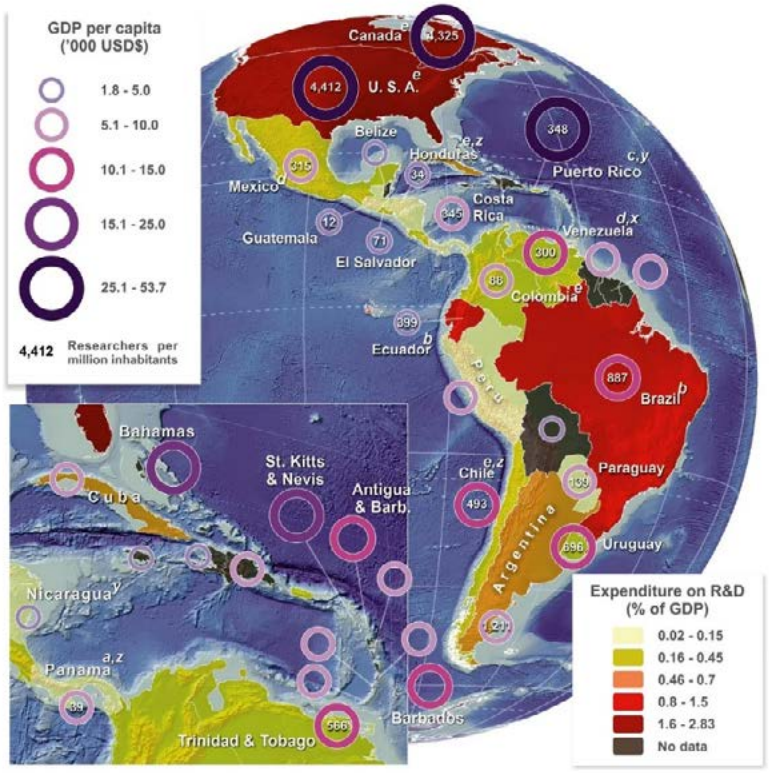

Figure 4. Expenditure on scientific research and development in the Americas and the Caribbean as percentage of GDP. Figures included for expenditure are diverse: most of them date back to 2018, whereas x, y, and z date back to 2014, 2015, and 2017 respectively. Number of researchers per million inhabitants along with GDP per capita in 2020 (except Venezuela, 2014) are shown in pie charts. Number of researchers were reported in 2013 (a), 2014 (b), 2015 (c), 2016 (d) and 2017 (e) (Sources: adapted from UNESCO Institute for Statistics and Trading Economics).

It must be recognized, nonetheless, that at a subnational level, most governments and organizations need more financial resources and depend significantly on national governments and external support. This implies insufficient human and financial resources to value and put science into practice for the benefit of societies. As a way of illustration, in 2018, the expenditure of Brazil and Ecuador on research and development was between 0.8 and 1.5% of their GDP. In contrast, Canada and the United States spent 1.56% and 2.83% correspondingly (see Figure 4). Even more challenging is to estimate from these figures the use of resources in terms of the types of research supported. This means that there need to be precise figures available on allocating resources to the diverse topics necessary to undertake integrated research on disaster risk. Although capacity-building can be of great value in counteracting the current lack of financial and human resources in some countries of the region, special efforts must be made to stimulate more significant investment in science and technology and, therefore, in informed policy formulation and practice.

The impact of disasters and the increasing vulnerability and exposure of societies, along with emerging hazards around the globe in recent years, demonstrate that reality has reached a turning point that requires all necessary human, scientific, technological, material, and financial resources to be made available promptly to reduce disaster risk before is too late.

Science and technology for whom

The advance in science and technology cannot be fully appreciated when policymaking and practice are backsliding rapidly or remaining static. In addition to scientific and technological advancements per se, it is necessary to ask what gaps we are facing and for whom the role of science and technological development needs to be improved.

The answer involves a myriad of perspectives. Nonetheless, decision-making involves complex processes that require data, information, and knowledge. However, as suggested in the Global Assessment Report 2022 (Kirsch-Wood et al., 2022), understanding the user's requirements involves a series of uncertainties and trust in the data-driven system, in which, generally, quality and accessibility are heterogeneous. What is more, the translation of information into knowledge and action is shaped by intricate modes of identifying and assessing vulnerability, exposure, and hazard dynamics within the context of the systemic nature of disaster risk.

All the same, a better understanding of the perspective of users can also shed

light on the direct applicability of disaster risk research in practice. The science and technology community and the decision-makers must work together toward consolidating the design, implementation, monitoring, and evaluation of DRR policies. They should also be involved, with all the other relevant stakeholders in integrated initiatives to enhance the co-production of knowledge and to ensure that notions, approaches, research findings, proposals, and guidelines on DRR are unambiguously communicated transversally to support mainstreaming best-informed practices to strengthen disaster risk reduction.

II. Context and Scope

Although the effort of science and technology (S&T) to improve societies for the better has long been acknowledged in the region, recent approaches seek to further the role of science in setting priorities, making informed decisions, and progressing disaster risk governance. Today more than ever, there is an evident necessity to strengthen alliances among all stakeholders relevant to disaster risk reduction (DRR). The strategic partnerships between science and technology and policy formulation and practice are vital.

The role of S&T is recognized as of high relevance in the First priority of the Sendai Framework for Disaster Risk Reduction (SF). Nonetheless, the potential contributions of S&T may well align with all priorities (Table 3), which comprise understanding disaster risk, strengthening disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience and enhancing disaster preparedness for effective response, and "Build Back Better" in recovery, rehabilitation, and reconstruction (UNISDR, 2015).

Table 3. References to the needed contributions of the S&TC towards implementing the SFDRR (Alcántara-Ayala and Sassa (2021), based on UNDRR, 2015).

Sendai Framework for Disaster Risk Reduction 2015-2030: synergies with the S&TC (UNISDR, 2015)

III. Guiding principles

(g) "Disaster risk reduction requires a multi-hazard approach and inclusive risk-informed decision-making based on the open exchange and dissemination of disaggregated data, including by sex, age and disability, as well as on easily accessible, up-to-date, comprehensible, science-based, non-sensitive risk information, complemented by traditional knowledge;" (p. 13)

Priority 1: Understanding disaster risk

National and local levels

(h) "To promote and improve dialogue and cooperation among scientific and technological communities, other relevant stakeholders and policymakers in order to facilitate a science policy interface for effective decision-making in disaster risk management;" (p. 15)

Global and regional levels

(a) "To enhance the development and dissemination of science-based methodologies and tools to record and share disaster losses and relevant disaggregated data and statistics, as well as to strengthen disaster risk modelling, assessment, mapping, monitoring and multi-hazard early warning systems;" (p. 16)

(g) "To enhance the scientific and technical work on disaster risk reduction and its mobilization through the coordination of existing networks and scientific research institutions at all levels and in all regions, with the support of the United Nations Office for Disaster Risk Reduction Scientific and Technical Advisory Group, in order to strengthen the evidence base in support of the implementation of the present Framework; promote scientific research on disaster risk patterns, causes and effects; disseminate risk information with the best use of geospatial information technology; provide guidance on methodologies and standards for risk assessments, disaster risk modelling and the use of data; identify research and technology gaps and set recommendations for research priority areas in disaster risk reduction; promote and support the availability and application of science and technology to decision-making; contribute to the update of the publication entitled "2009 UNISDR Terminology on Disaster Risk Reduction"; use post-disaster reviews as opportunities to enhance learning and public policy; and disseminate studies;" (p. 16)

V. Role of stakeholders

(b) "Academia, scientific and research entities and networks to focus on the disaster risk factors and scenarios, including emerging disaster risks, in the medium and long term; increase research for regional, national and local application; support action by local communities and authorities; and support the interface between policy and science for decision-making;" (p. 23)

VI. International cooperation and global partnership

Means of implementation

(b) "To enhance access of States, in particular developing countries, to finance, environmentally sound technology, science and inclusive innovation, as well as knowledge and information sharing through existing mechanisms, namely bilateral, regional and multilateral collaborative arrangements, including the United Nations and other relevant bodies;" (p. 25)

Support from international organizations

(c) "The United Nations Office for Disaster Risk Reduction, in particular, to support the implementation, follow-up and review of the present Framework by: preparing periodic reviews on progress, in particular for the Global Platform for Disaster Risk Reduction, and, as appropriate, in a timely manner, along with the follow-up process at the United Nations, supporting the development of coherent global and regional follow-up and indicators, and in coordination, as appropriate, with other relevant mechanisms for sustainable development and climate change, and updating the existing web-based Hyogo Framework for Action Monitor accordingly; participating actively in the work of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators; generating evidence-based and practical guidance for implementation in close collaboration with States and through the mobilization of experts; reinforcing a culture of prevention among relevant stakeholders through supporting development of standards by experts and technical organizations, advocacy initiatives and dissemination of disaster risk information, policies and practices, as well as by providing education and training on disaster risk reduction through affiliated organizations; supporting countries, including through national platforms or their equivalent, in their development of national plans and monitoring trends and patterns in disaster risk, loss and impacts; convening the Global Platform for Disaster Risk Reduction and supporting the organization of regional platforms for disaster risk reduction in cooperation with regional organizations; leading the revision of the United Nations Plan of Action on Disaster Risk Reduction for Resilience; facilitating the enhancement of, and continuing to service, the United Nations Office for Disaster Risk Reduction Scientific and Technical Advisory Group in mobilizing science and technical work on disaster risk reduction; leading, in close coordination with States, the update of the publication entitled "2009 UNISDR Terminology on Disaster Risk Reduction", in line with the terminology agreed upon by States; and maintaining the stakeholders' commitment registry;" (p. 26)

The scientific and technological-based regional agenda to facilitate integrated disaster risk management in the Americas and the Caribbean builds on diverse insights and documents. This process ensures the inclusion of wider scientific perspective policymaking driven by considering the SF, the Regional Assessment Report on Disaster Risk in Latin America, and the Caribbean, RAR 2021 (UNDRR, 2021), the Key Recommendations for a Strengthened use of Science and Technology in Disaster Risk Reduction in the Americas and the Caribbean (UNDRR-ROAMC, 2021), and the Global Assessment Report 2022 (GAR, 2022) (Kirsch-Wood et al., 2022).

Similarly, it articulates key strategic challenges, critical areas of scientific research, and opportunities associated with the priorities of the SF and the 2030 agenda for sustainable development, along with other foresight identified through the collaboration with disaster risk reduction (DRR) regional partners in the last couple of years.

The overarching goal of this regional agenda is to guide the progress and use of scientific evidence and the advancement of research infrastructure and technological developments to support the formulation and implementation of policies oriented toward Integrated Disaster Risk Management (IDRM). IDRM involves a series of complex perspectives, depending on local contexts, but should also consistently be tailored by considering holistic, equitable, inclusive, and humanistic dimensions.

The agenda is also intended to be an enabler to identify gaps in knowledge and practice and proposes broad lines of research strategies critical to advancing and influencing integrated disaster risk management into planning and development.

This document intends to provide a generic framework for the direction and types of science and technology strategies that must be undertaken to address disaster risk management through an overarching perspective.

While strategic challenges have been outlined as the basis to build an S&T-policy interface, the proposal of specific research lines seeks to guide the efforts of researchers and other relevant DRR stakeholders toward regional priorities aligned to opportunities and challenges identified in recent years in the context of the Sendai Framework implementation.

III. Research Agenda

Strategic challenges require more significant DRR stakeholders' involvement, inclusion, diversity, intersectionality, and innovation. The Americas and the Caribbean need to be better equipped to move forward and answer the world's strategic challenges today.

The planet shares significant problems, crises, and challenges. Although the defies are often the same in most countries, some pressing challenges urgently require improving implementation mechanisms to support the formulation and practice of disaster risk policies in the Americas. These key strategic challenges include:

1) Fostering science-based disaster risk research for IDRM,
2) Furthering interdisciplinary and transdisciplinary research and practice,
3) Moving from the availability and production of information to knowledge sharing and action,
4) Translating data, information, and knowledge to policymaking and practice through sound communication processes,
5) Enabling access to research infrastructure and technological developments,
6) Advancing the use of technology for capacity building, policy-making, and anticipatory action. The latter is understood as early action pre-impact and more fundamental efforts to avoid risk in the first place (prospective management) or reduce existing risk (corrective management)[1],
7) Adopting a systemic risk perspective to understand and address space-based connectivity and interdependencies, and
8) Creating synergies to map out intersectoral strategies, especially with the financial sector, to improve science-based frameworks for investment decisions and economic arrangements within the best practices in a systemic risk context.

The S&T agenda is organized around a framework of eight key pillars and their corresponding outcomes and objectives, upon which the strategy to support the SF within the bounds of the 2030 Agenda for Sustainable Development will be based in the region. Owing to the links and interdependencies between the process of development and reduction and construction of disaster risk and disasters, these pillars are essential for the progress of the critical twosome disaster risk management and sustainable development.

1 Anticipatory action refers to the notion provided in the Glossary of Early Action Terms – a tool to help bridge sectors and support conversations around Early Warning and Early Action (2022). The Glossary was developed by Paul Knox Clarke of the ADAPT Initiative in conjunction with the Risk-informed Early Action Partnership. Risk-informed Early Action Partnership (REAP).

IV. Rationale

Despite the enormous efforts made up till now by the S&T community and practitioners in the region, misunderstanding of the components creating disaster risk prevails. Whether due to ignorance or specific interests, disasters continue to be considered natural; therefore, many of the policies still have the sole or dominant cut of civil protection with a focus on response and attention to emergencies. Consequently, it must be recognized that the importance of understanding disaster risk and disasters as social constructions go beyond disciplinary language preferences.

On the one hand, this notion unmasks the belief that disasters are synonymous with the occurrence of extreme natural phenomena. This involves the exogenous vision of its causality, which denies risk construction as an endogenous process strongly linked to the social and territorial dynamics that favor the generation of conditions of vulnerability and exposure. On the other hand, understanding risk as a social construct lies in the possibility of identifying the drivers of disaster risk that transcend administrative borders to have the potential to articulate and coordinate policies across governmental units and sectors.

Not only the lack of understanding about the meaning of the various dimensions of vulnerability and exposure, and thus of disaster risk, occurs in the world of practice. It is also essential to redouble efforts so that all members of the S&T community have a clear understanding of the complexity of the processes involved in risk construction, regardless of their specific disciplinary endeavor.

Considering the above, it is of utmost importance to assess the understanding and framing of disaster risk in collaboration with all the relevant stakeholders in DRR. This will allow for a shared understanding of the processes involved in the construction of disaster risk to better identify the interventions, actions, and strategies required for its integrated management under specific contexts.

Quite clearly, conditions of vulnerability and exposure are highly associated with the character and historical development of territories. Accordingly, the cornerstone for developing the research agenda recognizes the need to promote, advance, and specify an approach to equitable, sustainable, and informed territorial development, where there is a permanent link between science and public policy and practice. Territorial development is considered a process of the social construction of a particular area, driven by the interaction between geodynamic characteristics, individual and collective initiatives, and economic, technological, socio-political, cultural, and

environmental forces within the territory (ECLAC).

Integrated Disaster Risk Management (IDRM) is vital to successful and sustained DRR practices. IDRM involves a series of complex processes in which understanding the social construction of disaster risk due to the dynamic interlinkages and interdependencies between choices, decisions, and practices embedded in historical and contemporary development is required. This includes identifying and recognizing root causes, disaster risk drivers, and science-based interventions (Oliver-Smith et al., 2016; 2017).

IDRM should be of transversal and integrated nature, in which the three levels of government, as well as all sectors of society, are compelled to act as critical actors to outline and execute policies and strategies for DRR aiming at preventing new disaster risks, reducing existing disaster risks, managing residual risks, and permanently control disaster risk factors in society. In attaining these goals, the bond between development and its management is imperative, along with the active participation and ownership of communities at risk. Therefore, it is necessary to build and consolidate permanent and sustainable institutional structures grounded on integration and coordination across territorial levels (Narvaez et al., 2009).

Depending on local contexts, IDRM comprises myriad perspectives but should consistently be tailored considering holistic, equitable, inclusive, and humanistic dimensions. A holistic approach underlines the functional relation between parts and the whole. Fairness to all parties, as shaped by reason and conscience, leads to equitable consideration for what is unbiased or impartial. By the same token, IDRM also should be supported and mainstreamed, affirming the stance of participation of all community members who feel appreciated and considered in the whole process. Furthermore, the humanistic dimension encompasses the betterment of human living conditions and capacity for fulfillment with the support of science. It embraces values and commitment to human welfare, including dialogue, tolerance, and respect for diversity.

Against the above background, many of the processes involved in integrated disaster risk management are undertaken under the agency of disaster risk governance (UNDP, 2010), which has been defined concisely by Aysan and Lavell (2014) as “the way in which the public authorities, civil servants, media, private sector, and civil society coordinate at community, national, and regional levels to manage and reduce disaster and climate-related risks."
The synergy between the potential contributions of the S&TC to disaster risk governance is multidimensional, with education being one of the main ones.

Professional development in terms of a variety of specialized training, formal education, and teaching, or advanced professional learning intended to help functionaries, policymakers, academicians, teachers, students, and other relevant DRR actors improve their professional knowledge, competence, skill, and effectiveness in understanding and managing disaster risk and disasters. Over and above, working through alliances as part of transdisciplinary efforts to produce and co-production knowledge is strategic and unreplaceable.

In many countries of the region, sectoral institutions associated with DRR have specific roles and responsibilities. However, mechanisms for intersectoral collaboration still need to be recognized, prioritized or implemented. Hence, the full benefit of developing transdisciplinary initiatives will help to seek ways to strengthen the existing and new institutions and structures. Likewise, it is essential to underscore the efforts that need to be made regarding cross-cutting information, knowledge, communication, and action.

Despite that availability of information remains plentiful but heterogeneous and very difficult to access by many stakeholders, it needs well-established processes and initiatives to transform into the central node of DRR knowledge, communication, and action. Under these conditions, the S&TC is committed to leading initiatives to continue supporting and enhancing existing and new information to produce useful, usable knowledge for sustainable development and DRR-driven action (Aitsi-Selmi et al., 2016). These efforts are indeed directed at reducing existing risk and avoiding the construction of new disaster risk, but also strengthening preparedness, response, rehabilitation, recovery, and reconstruction from an integrated perspective.

It must be evident, however, that this approach suggested by the S&TC must maintain a high level of integration and multi-directional communication and interest from all relevant DRR stakeholders to be successful. All these recommendations regarding the infinite dimensions of policy, legal and institutional frameworks on DRR are essential but not sufficient if there is a lack of opportunity for implementation at the governmental levels and sectors concerned. Therefore, science-based IDRM should also encompass monitoring and assessing strategies and initiatives during and after their enforcement phases.

In a similar vein, it should be borne in mind that, within the spectrum policy, in many countries, efforts involving the pooling of resources for DRR face the more pressing challenges of the reality of the economic and political world derived from the exacerbation of regional and global crises. Ideally, the DRR governance policy agenda

should target the persistent imbalances concerning social policy and environmental protection and seek coherence between economic policies and social reality.

Moving from the quotidian notion of spending to investment is one of the main themes of disaster risk reduction during the last decades, especially after the global impact of the disaster triggered by COVID-19. Preoccupation with creating models to assess the economic impact of disasters gives way to an emerging sense of responsibility for reducing disaster risk. Nonetheless, the truth is that governments at all levels cannot provide or be provided with objective evidence metrics, cost-benefit analysis, projections, and estimates that help take financial measures, investment decisions, policies, and strategies for financial protection that strengthen the risk reduction agenda.

Preference for the more politically profitable course of post-disaster expenditure often drives away the long-term benefit of investment. Likewise, in many countries of the region, resources are not commonly allocated for DRR, and the primary financial source is a disarticulated investment in public services. Financing efforts also focus on mechanisms to support rehabilitation after a disaster; in other words, there is a domain of efforts directed at investment in disaster management but not yet on disaster risk reduction.

Thereupon, utilizing what we know and identifying what we need to learn to share and promote IDRM remains a complex defies that, on the shoulders of the S&T community, seeks to contribute to regional applicability and social significance.

V. Pillars, key outcomes, and objectives

Pillar I. Comprehension and co-learning of disaster risk as a process of social construction

Outcome: Sound governance and renewed trust

Objective 1. Develop and optimize methods of co-learning to comprehend disaster risk.

Objective 2. Provide the evidence to understand that language matters. Thus, the definition of disasters as natural may have repercussions on the responsibilities and accountability arising from decision-making in specific administrative units.

Objective 3. Help to internalize the root causes and drivers of disaster risk and disasters to be addressed by an evidence-based process of governance. It is more than ever essential that the Forensic Investigation of Disasters (FORIN) approach is considered for this type of stock-taking and assessment.

Objective 4. Advance scientific evidence to support efficient governance arrangements and structures to build strong institutions.

Objective 5. Provide examples and scenarios to foster an understanding of the social construction of systemic risk to outline and implement integrated disaster risk management.

Objective 6. Encourage disaster risk reduction undertakings as a strong signal of sound economic governance and renewed confidence in policymakers.

Objective 7: Establish performance metrics and indicators to track the progress and effectiveness of disaster risk management efforts and governance structures. Use this information to improve and adapt strategies as needed continuously.

Pillar II. Sustained policies and practices for DRR based on scientific evidence and in harmony with equitable, sustainable, and informed territorial development

Outcome: Formulation of policies based on environmentally sound territorial development

Objective 1. Produce evidence to intrust and mandate environmentally sound territorial development as a baseline for the IDRM.

Objective 2. Guide the construction of IDRM policies grounded in territorial development.

Objective 3. Demonstrate science-based IDRM as an essential component and prerequisite of sustainable development.

Pillar III. Education, production, and co-production of knowledge

Outcome: Confidence in the usefulness and usability of knowledge co-production

Objective 1. Induce frameworks of professional development for DRR stakeholders oriented to IDRM.

Objective 2. Provide evidence to explain the processes involved in transdisciplinary perspectives.

Objective 3. Facilitate processes of transdisciplinary interaction to co-produce DRR knowledge.

Objective 4. Stimulate the analysis of the advantages of co-producing knowledge.

Objective 5. Advise policymakers on the usefulness and usability of knowledge co-production for DRR.

Objective 6. Foster the engagement in collaborative transdisciplinary and novel research and practice on DRR at local, subnational, and regional scales.

Objective 7. Facilitate workshops and fora for researchers, practitioners, and policymakers to share experiences related to co-producing knowledge on disaster risk reduction.

Objective 8. Provide training workshops and demonstration cases to facilitate the procedures to undertake and understand the potential insights derived from Forensic Investigations of Disasters.

Objective 9. Establish partnerships and collaborations between academia, government, and civil society organizations to co-produce knowledge and inform policies and practices related to disaster risk management.

Pillar IV. Cross-cutting information, knowledge, communication, and action

Outcome: Communication and action interface for the DRR multi-stakeholder community

Objective 1. Use scientific and technological knowledge and tools (Earth observations, instrumentation, monitoring, modeling, etc.) to improve understanding of the dynamics of single, multiple, and cascading hazards.

Objective 2. Develop new, or modify existing methods of measuring vulnerability and exposure to different hazards.

Objective 3. Motivate periodic disaster risk scientific assessments from transdisciplinary integrated perspectives.

Objective 4. Facilitate interface specifications defining sound and informed communication processes among all DRR relevant stakeholders.

Objective 5. Assist in optimizing and appropriating communication processes across a range of DRR stakeholders.

Objective 6. Project the impact of DRR scenario building based on integrated knowledge for policymaking. Providing insights to ensure that metrics for evaluating scenarios are co-identified through an inclusive engagement process that reflects the interests of different stakeholders

Objective 7. Provide insights for formulating proposals to undertake interventions oriented to DRR from integrated perspectives.

Pillar V. Identification, recognition, and control of drivers of disaster risk

Outcome: Reliance on the critical endeavor of recognizing and addressing disaster risk drivers to effectively reduce disaster risk

Objective 1. Raise awareness of the need to identify local drivers of disaster risk.

Objective 2. Recommend the approaches to analyze local disaster risk drivers in the regional and global context.

Objective 3. Share examples of initiatives and interventions to address disaster risk drivers at local and regional scales.

Objective 4. Provide insights on articulating efforts across sectors to address disaster risk drivers at the national level.

Objective 5. Favor discussions to strengthen the DRR governance policy agenda steering coherence between economic policies and social reality.

Objective 6. Contribute to the progress of moving to informed ex-ante public investment in DRR.

Objective 7. Develop quantitative and qualitative simulations and assessments, objective evidence metrics, cost-benefit analysis, projections, and estimates that help take financial measures, investment decisions, policies, and strategies.

Pillar VI. Prevention of new risks, reduction of existing risks, and residual risk management

Outcome: IDRM policymaking and practice

Objective 1. Help to identify priorities of S&T collaborative action directed to preventing new risk, reducing existing risk, and managing residual risk at the local, subnational, national, and regional scale.

Objective 2. Organize collaborative efforts to co-guide the establishment of a high-level, trans-disciplinary group of experts for assessing the effectiveness of existing policies and practices on DRR, as well as the directions to further future policy formulation based on context and with the engagement of the various related sectors and civil society.

Objective 3. Facilitate exchange among DRR stakeholders to learn from good practices in IDRM.

Objective 4. Provide interaction spaces to share insights concerning obstacles for IDRM among DRR stakeholders.

Objective 5. Speed up opportunities of regional collaboration oriented to IDRM.

Objective 6. Enhance synergies to map out intersectoral strategies to improve science-based frameworks for investment decisions and economic arrangements within the best practices in a systemic risk context.

Objective 7. Help to seek avenues and processes to strengthen the existing and new institutions and structures connected to DRR.

Objective 8. Substantiate IDRM as a holistic, equitable, inclusive, and humanistic duty.

Pillar VII. Integrated Preparedness, Response, Rehabilitation, Recovery and Reconstruction (IPR4)

Outcome: Policies oriented to build resilient societies

Objective 1. Strengthen the configuration of policies targeting Preparedness, Response, Rehabilitation, Recovery, and Reconstruction from an integrated S&T perspective.

Objective 2. Support training and capacity-building of individuals, communities, institutions, businesses, and systems to confront, survive, adapt, and overcome stresses and shocks derived from disaster risk conditions and the occurrence of disasters.

Objective 3. Provide S&T insights to build Early Warning and Warning Integrated Systems for hazards of diverse origins.
Objective 4. Assist the development of capacities of the relevant DRR stakeholders involved in Preparedness, Response, Rehabilitation, Recovery, and Reconstruction.

Objective 5. Enable creating and sustaining implementation strategies and initiatives for monitoring, assessing, and validating procedures involved in Preparedness, Response, Rehabilitation, Recovery, and Reconstruction.

Pillar VIII. Policy, legal and institutional frameworks on disaster risk reduction

Outcome: Development and implementation of strategic DRR frameworks

Objective 1. Contribute to understanding the complexity and challenges of systemic risk's ripple effects on disaster risk reduction and governance.

Objective 2. Promote the creation of evidence-based policy and legal and institutional frameworks on disaster risk reduction.

Objective 3. Enhance professional development of in-service functionaries and other constituents of the DRR partnership.

Objective 4. Organize the region's collaborative use of available capacity-building resources to develop IDRM policy frameworks grounded in S&T.

Objective 5. Assist in the long-term mobilization, creation, and function of regional partnerships for IDRM.

Objective 6. Identify and draw the multiple dimensions of the need for investment in policy frameworks and institutional capacity building based on S&T for IDRM.

Objective 7. Help the continuous improvement of decision-making and practice, ongoing learning process, self-reflection, adaptation, and growth.
Objective 8. Advance in the strengthening and understanding of the complexity of the regulatory, legal, institutional, and normative frameworks that govern DRR.

VI. Execution of the Research Agenda

The current barometer demonstrates a trend toward more significant public concern about implementing science-based decision-making and practice to manage disaster risk.

In reliance on an integrated perspective of disaster risk management, the new scientific and technological-based regional agenda aims to provide the basis to work together to ensure that science effectively meets policymaking and practice in the Americas and the Caribbean.

IDRM can hardly be developed and spread effectively in societies lacking a solid component of science and technology in policy formulation, capacity building, and practice.

Activities, coherence, and synergies among all DRR stakeholders concerning responsibilities and commitments to be undertaken in the region will demonstrate the beneficial impact of S&T. In this vein, the positive outcomes of IDRM shall be expressed in the daily lives of people, economic performance, social and territorial development, and a strengthened disaster risk governance.

In a manner accessible to a non-specialist public, addressing the strategic challenges of the research agenda will facilitate greater involvement of DRR stakeholders in policymaking and practice. Thus, science-informed policy formulation will allow the course of this effort to have inclusion, diversity, intersectionality, and innovation as a frame of reference.

Likewise, the proposed specific research lines seek to guide the efforts of researchers and other relevant DRR stakeholders toward regional priorities aligned with capacity-building founded in S&T for counteracting the current lack of financial and human resources in some countries of the region.

Achieving the overarching goal of the scientific and technological-based regional agenda is a task of many groups of experts. Instead, the participation of the entire family of organizations and stakeholders is required for its successful placement in the world of DRR formulation and practice.

Similarly, detailed elaboration and accomplishment of the key strategic challenges will draw on the direct participation of existing networks, working groups, initiatives, institutions, and programs, which have valuable experience in the day-to-day situation on the ground. In contrast, others own vast expertise in the governance arena.

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