Evidence for Policy in Disaster Risk Management

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Scuola Superiore Sant'Anna
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Collection of Guidelines and Good Practices on the Science-Policy Interface

Union Civil Protection Knowledge Network

CIVITAS SOTERIA

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I. Introduction

One of the objectives of the Evidence for Policy in Disaster Risk Management Summer School is to provide participants with practice-oriented outputs that can be used in the discharge of their responsibilities as scientists and policymakers (or hybrid experts). In turn, participants are expected to share these outputs with their colleagues at the national level with a view to maximising the outputs' impact. To this end, the present document collects a set of guidelines and good practices

relating to some of the main theoretical and operational issues dealt with in the Masterclasses.

II. Scope of the Document

The aim of this document is, first of all, to collect guidelines and policy documents developed by national, regional and international bodies regarding the science-policy interface – either in general terms or in relation to specific sectors (e.g., health, urban development, marine environment). The document further collects practices developed at the national and/or international level that, according to existing literature and expert assessment, can be considered examples of virtuous and effective models of behaviour at the science-policy interface in disaster risk management. The good practices selected and presented here relate to three main areas of interest to scientists and policymakers, namely: legislative, regulatory and administrative matters; organisational and operational matters; and matters relating to communication at the science-policy interface.

The document is the result of a collaborative effort and pieces together, on the one hand, relevant good practices and guidelines selected by screening existing sources and literature identified, under the supervision of professor Andrea de GUTTRY, by three researchers of the Scuola Superiore Sant'Anna (Chiara Tea Antoniazzi, Luca Poltronieri Rossetti, Silvia Venier) and, on the other hand, good practices emerging from the critical discussion carried out during the Masterclasses and the closing session of the Summer School.

III. Collection of Guidelines

A) General Scope – International Sources

- ISN, UNDRR, IRDR, "A Framework for Global science in support of risk-informed sustainable development and planetary health", November 2021, https://www.irdrinternational.org/uploads/files/bhfPt7WZztTDhMkxiC5J2GCDEeitvb7ZEik2W2PD//DRR_GlobalScience-Framework-FINAL.pdf

  This research agenda was commissioned by the International Science Council (ISC) and United Nations Office for Disaster Risk Reduction (UNDRR) and its development has been led by the Integrated Research on Risk (IRDR) programme and based on a collaborative, co-design approach with wide, iterative consultation. Section 5 on "Research priorities" and section 6 on "Pathways to impact and transformative change" discuss some important areas where additional actionable knowledge would likely result in reduced risk and vulnerabilities and improved human well-being. The agenda is intended for those working in DRR and the related areas of global risk, climate change adaptation and development.

- OECD, "Scientific Advice for Policy Making: The Role and Responsibility of Expert Bodies and Individual Scientists", OECD Science, Technology and Industry Policy Papers – No. 21, 2015, https://doi.org/10.1787/5js33l1jcpwb-en

- UN CEPA Strategy Guidance Note on the Science-Policy Interface, March 2021, https://unpan.un.org/sites/unpan.un.org/files/Strategy%20note%20science%20policy%20interface%20March%202021.pdf

  The United Nations Committee of Experts on Public Administration (CEPA) has developed a set of principles of effective governance for sustainable development. The essential purpose of these voluntary principles is to provide interested countries with practical, expert guidance on a broad range of governance challenges associated with the implementation of the 2030 Agenda.

- UN-GGIM (United Nations Committee of Experts on Global Geospatial Information Management), "Draft Review of Frameworks, Rules, Legislation, and Policies on Geospatial Information and Services for Disasters", 2016, https://ggim.un.org/documents/B.P-2016-12-1%20TT-2%20Report%20on%20Review%20Framework%20WG-Disasters.pdf

  This report, which was compiled by the United Nations Committee of Experts on Global Geospatial Information Management UN-GGIM, delivers a review conducted on frameworks, laws, rules, and regulations already existing among Member States when it comes to the provision of geospatial information and services prior to, during and post disasters.

- UNISDR (now UNDRR), "Guidelines: National Platforms for Disaster Risk Reduction", 2007, https://www.unisdr.org/files/11543_STCReportlibrary.pdf

  This report provides guidance for establishing or enhancing National Platforms for Disaster Risk Reduction. A group of government officials from China, France, Germany, Iran, Italy, Japan, Madagascar, Nigeria, Norway, Panama, Peru, Senegal, South Africa, and Uganda contributed to this revised version. It emphasises that disaster risk reduction is a complex development issue that requires political and legal commitment, public understanding, scientific knowledge, careful development planning, responsible enforcement of policies and legislation, people-centric early warning systems, and effective disaster preparedness and response mechanisms.

- UNISDR, "Reducing Disaster Risks through Science: Issues and Actions", 2009, https://www.unisdr.org/files/11543_STCReportlibrary.pdf

This report, which was compiled by the ISDR Scientific and Technical Committee, provides recommendations for national risk assessment in disaster risk management. Its main objective is to bridge the divide between science and policy by providing guidance to national authorities.

- UNISDR, "A. Public Communication for Disaster Risk Reduction", Words into Action Guidelines: National Disaster Risk Assessment. Special Topics, 2017, https://www.undrr.org/publication/public-communication-disaster-risk-reduction

  This document provides guidance to government officials and other professionals on how to communicate risk information to the general public. Examples of government portals on disaster risk information and resources for further information are provided at the end of the document.

B) General Scope – EU Sources

- European Parliament, "Evidence for policy-making. Foresight-based scientific advice", 2021, https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690529/EPRS_BRI(2021)690529_EN.pdf

  This briefing first details the role of evidence in the policy ecosystem, with separate sections regarding science for policy and science- and technology-related policy. Subsequently, an evidence-based mechanism is suggested for rapid response during crises or emergencies.

- JRC, "Science Policy Interfaces in Disaster Risk Management in the EU", 2015, https://publications.jrc.ec.europa.eu/repository/bitstream/JRC97968/lbna27520enn.pdf

  This report, compiled by the Joint Research Centre and expert teams, aims to provide evidence-based scientific support to the European policy-making process.

- JRC, "Recommendations for National Risk Assessment for Disaster Risk Management in EU: Approaches for identifying, analysing and evaluating risks", 2019, https://www.preventionweb.net/files/65439_nrarecommendationsonline.pdf

  This report, prepared by the Joint Research Centre and expert teams, focuses on enhancing national risk assessment within the

Union Civil Protection Mechanism in the European Union. It emphasises the significance of risk assessment results for Disaster Risk Management planning and highlights the role of science in assisting civil protection authorities and relevant ministries.

- JRC/DRMKC, "Science for Disaster Risk Management 2020", 2020, https://drmkc.jrc.ec.europa.eu/knowledge/science-for-drm/science-for-disaster-risk-management-2020#content

  The report represents a collaborative effort of more than 300 experts on disaster risk, coming from different sectors and disciplines, that worked for more than 2 years together to present the consequences of disasters on various assets at risk. The various chapters and subchapters provide specific recommendations for the target audience, four groups of stakeholders that can actively contribute to reducing disaster risk: policymakers, practitioners (such as civil protection groups, critical infrastructure operators and organised civil groups directly engaged in disaster response), scientists and citizens.

- JRC, "Recommendations for National Risk Assessment for Disaster Risk Management in EU: Where Science and Policy Meet", 2021, https://policycommons.net/artifacts/2162371/recommendations-for-national-risk-assessment-for-disaster-risk-management-in-eu/2917890/fragments/

  This report, which was drafted by the Joint Research Centre and expert teams, provides recommendations for national risk assessment in disaster risk management within the European Union. Its main objective is to bridge the divide between science and policy by providing guidance to national authorities.

- MYRIAD-EU project, "Report on policies, policy-making processes, and governance for multi-hazard, multi-risk management", 2020, https://www.myriadproject.eu/wp-content/uploads/2023/04/D1.3_Review-of-policy-and-governance_v3.pdf

  This report was drafted as part of the project "MYRIAD-EU - Multi-hazard and systemic framework for enhancing Risk-Informed management and Decision-making in the E.U which was funded by the European Union's Horizon 2020 research and innovation programme called H2020-L". It seeks to provide a preliminary comprehension of the governance landscape for the management of multi-risks in Europe by highlighting general guidelines, good practice examples, emergent conceptual work, as well as barriers and potential opportunities.

- SPIRAL Project Handbook on "Effective interfaces between science, policy and society", 2013, http://spiral-project.eu/sites/default/files/The-SPIRAL-handbook-website.pdf

  This handbook provides a manual for projects and individuals interested in designing or improving interfaces between science, policy and society. It is structured around five main issues: a brief introduction to what SPIs are, and what they are not; why SPIs are needed; which are important attributes of SPIs, namely credibility, relevance, legitimacy and iterativity; some steps and recommendations for designing, maintaining and improving the SPIs of EU funded research projects; some factors facilitating successful SPIs before outlining some sources and resources that may be of interest to readers.

C) General Scope – Sources from Other Regions

- 2022 Asia Pacific Science and Technology Conference for Disaster Risk Reduction, https://resiliencecouncil.ph/event/apstcdrr-key-documents/

  Since 2016, Conferences have been organized to bring together practitioners and academics from the science and technology field on the one hand and policymakers on the other to reflect on key issues and opportunities in applying science to disaster-related policy making; share good practices from the region; and advance evidence-based policy making on disaster risk reduction. At the above link, key documents from the latest Conference as well as previous ones can be found.

- UNDRR, "Key Recommendations for a strengthened use of Science and Technology in Disaster Reduction in the Americas and the Caribbeans", 2020, https://www.undrr.org/media/77611/download

  This report, which was published by the United Nations Office for Disaster Risk Reduction UNDRR, provides key recommendations for a strengthened use of science and technology in disaster risk reduction in the Americas and the Caribbeans.

- UNDRR, "Integrated Disaster Risk Management in the Americas and the Caribbeans: insights for a new scientific and technological-based regional agenda", 2023, https://rp-americas.undrr.org/sites/default/files/2023-02/Integrated%20Disaster%20Risk%20Management%20-DRR%20ENGLISH.pdf

  Observing regional priorities, the present proposal for a science- and technology-based regional agenda, which was prepared by the United Nations Office for Disaster Risk Reduction UNDRR, identifies

strategic challenges, critical areas of scientific research, and opportunities associated with the advancement of the Sendai Framework for Disaster Risk Reduction and the 2030 Agenda for Sustainable Development, based on previous research initiatives and publications.

- UN Economic Commission for Africa, "Ninth session of the Committee on Sustainable Development and Africa Regional Forum on Sustainable Development", 2015 https://repository.uneca.org/bitstream/handle/10855/22768/b11538375.pdf?sequence=1&isAllowed=y

  The first section of this report deals with "New and emerging issues in science-policy interface" and highlights some of the key new and emerging priority issues affecting Africa's sustainable development (including climate change, energy, technology transfer, new digital technologies and focusing on young people, smart cities) and the challenges ahead, while also drawing some conclusions and policy recommendations.

- Zougmoré et al, Science-policy interfaces for sustainable climate-smart agriculture uptake: lessons learnt from national science-policy dialogue platforms in West Africa, 2019, http://oar.icrisat.org/11324/1/14735903.2019.pdf

  This study analyses the functioning and results of multi-stakeholder national science-policy dialogue platforms on climate-smart agriculture (CSA) established in Ghana, Mali and Senegal with a view to incorporating scientific evidence in agricultural development plans and to raising awareness about the impacts of climate change on agriculture more generally. The study further offers recommendations for effective and sustainable science-policy interaction on climate change and climate-smart agriculture.

D) General Scope – National Sources

- Australian government, Strengthening Evidence-based Policy in the Australian Federation", 2009, https://www.pc.gov.au/research/supporting/strengthening-evidence

  This document collects the proceedings of the roundtable organized in 2009 by the Australian government which discussed the principles of the evidence-based policy movement and reviewed how well Australian use of evidence conformed to best practice. It also considered how to improve the availability of quality

evidence and reviewed possible institutional developments to embed good use of evidence more firmly into policy-making.

- Paraguay, Secretaría de Emergencia Nacional (SEN), "Guía para la elaboración de planes municipales gestión y reducción de riesgos", 2021, https://www.sen.gov.py/application/files/6216/1314/3165/PMGRR_PNUD.pdf

  The guide for the preparation of the municipal plans for disaster risk management and reduction is an instrument that seeks to promote territorial development of the municipalities in Paraguay and identify the hazards and risks of disasters that are generated within that space, especially through the involvement of the scientific and academic community, and calling for the enhancement of science-based decision-making and knowledge management and communication.

- Switzerland, Swiss Agency for Development and Cooperation (SDC), "SDC Guidelines on Disaster Risk Reduction", 2018, https://www.eda.admin.ch/content/dam/deza/en/documents/themen/katastrophenvorsorge/SDC-Guidelines-DRR_EN.pdf

  The SDC Guidelines on Disaster Risk Reduction provide orientation on how to manage systematically disaster risks and on how to integrate them into SDC's planning and operational processes relying on scientific data. The Guidelines are primarily intended for SDC staff and bodies that manage both development and humanitarian programmes and projects in partnership with governments, civil society, communities and the private sector as well as international organisations.

- UK, Intellectual Property Office, "Guide to Evidence for Policy", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/510985/Guide_to_evidence_for_policy.pdf

  The guide suggests that evidence used to inform public policy, or intended to inform government, should meet the following three criteria: be clear, verifiable and able to be peer-reviewed.

- USA, Commission on Evidence-based policy making, "The promise of evidence-based policy making", 2017, https://bipartisanpolicy.org/download/?file=/wp-content/uploads/2019/03/Full-Report-The-Promise-of-Evidence-Based-Policymaking-Report-of-the-Comission-on-Evidence-based-Policymaking.pdf

The Commission was established by the Evidence-Based Policymaking Commission Act in 2016, with the mandate to study and develop a strategy for strengthening government's evidence-building and policymaking efforts. This document collects the 22 recommendations approved by the Commission to improve data access, strengthen privacy protections, and enhance government's capacity for evidence building.

E) General Scope – Non-governmental Sources

- Centre for the Study of Existential Risk, "Building a Science-Policy Interface for tackling the Global Governance of Catastrophic and Existential Risks", 2023, https://www.cser.ac.uk/resources/report-building-science-policy-interface-tackling-global-governance-catastrophic-and-existential-risks/

  The publication focuses on the emergence of a Science-Policy Interface for Global Catastrophic Risks (GCRs); identifies persisting challenges; and argues for the strengthening of global coordination for the management of GCRs.

- ODI, "Political science? Strengthening science–policy dialogue in developing countries", 2008, https://cdn.odi.org/media/documents/474.pdf

  This study focuses on the SPI in developing countries. The findings confirm the need to tackle systemic barriers to institutionalising evidence-informed policy processes in the field of science, technology and innovation for development and shed light on ways in which the quality of policy dialogues on science and technology could be strengthened in order to enhance their value for pro-poor sustainable development policy and practice.

- Suhay et al, "Recommended practices for science communication with policymakers", American University/AAAS, 2019, https://www.american.edu/spa/scicomm/upload/recommended-practices-booklet_v17-digital.pdf

  Based on interviews with members and staff of the US Congress and on a survey of over 600 scientist members of the American Association for the Advancement of Science (AAAS), this document illustrates the most and least effective communication practices between scientists and policymakers and provides recommendations.

- URBAN Institute, "Principles of Evidence-Based Policymaking", 2016, https://www.urban.org/research/publication/principles-evidence-based-policymaking

  The URBAN Institute is an independent research organisation based in Washington DC, US. This brief describes four principles of evidence-based policymaking that policymakers, agency heads, and other public leaders can use to improve results in the public sector. These principles include: 1. Build and compile rigorous evidence about what works, including costs and benefits. 2. Monitor program delivery and use impact evaluation to measure program effectiveness. 3. Use rigorous evidence to improve programs, scale what works, and redirect funds away from consistently ineffective programs. 4. Encourage innovation and test new approaches.

F) Sectoral Scope

Health

- OECD, "Providing science advice to policy makers during Covid-19", 2020, https://www.oecd.org/coronavirus/policy-responses/providing-science-advice-to-policy-makers-during-covid-19-4eec08c5/

  The guidelines deal with communication aspects during emergency situations and include references on communicating openly scientific evidence that is incomplete or rapidly evolving.

- WHO, "WHO Guidance on Research Methods for Health Emergency and Disaster Risk Management", 2021, https://apps.who.int/iris/handle/10665/345591

  Evidence garnered from WHO's work with partners and countries informed the extensive process of developing this document, which was led by WHO country and regional offices and more than 100 global experts who contributed to the writing of the chapters and the peer-review process.

- WHO, "Evidence, policy, impact. WHO guide for evidence-informed decision-making", 2021, https://www.who.int/publications/i/item/9789240039872

  This guide and associated tool repository provide WHO staff, Member States and partner organisations with vetted methods and tools to better leverage diverse forms of evidence for more effective policy and practice in the clinical, public health and health system fields.

Marine environment

- STAGES project, "Proposal and Recommendations for a Science-Policy interface (SPI) to support MSFD implementation", https://archimer.ifremer.fr/doc/00259/36996/35487.pdf

  Scientific knowledge is at the heart of successful implementation of the Marine Strategy Framework Directive (MSFD), forming a key component of the wider knowledge-based underpinning decision making. The aim of this paper is to present a proposal for an effective MSFD SPI with recommendations for step-wise implementation of a SPI that is fit for purpose and that can support MSFD implementation in the long-term.

- UNEP, MAP, PlanBleu, "Strengthen, structure and sustain a Science Policy Interface (SPI) for IMAP implementation in the Mediterranean", https://planbleu.org/wp-content/uploads/2019/11/SPI_report_Final.pdf

  UNEP/MAP and the Barcelona Convention provide a unique framework for institutional cooperation among all Mediterranean countries and the EU to improve environmental protection, sustainable management of coastal and marine resources and the resilience of coastal areas to climate change. The Ecosystem Approach (EcAp) represents the overarching guiding principle to policy developments and implementation under the auspices of the Barcelona Convention, with the ultimate objective of achieving Good Environmental Status (GES) of the Mediterranean Sea and coast. GES has been defined through eleven Ecological Objectives (EO) (often grouped in three clusters: (i) pollution, contaminants and eutrophication; (ii) marine biodiversity and fisheries; (iii) coast and hydrography) and twenty-eight corresponding operational objectives. The IMAP (Integrated Monitoring and Assessment Programme) provides a mechanism to evaluate status and progress towards the achievement of GES by means of a set of common and candidate indicators. The present document discusses the role of a SPI in general and then in the IMAP implementation and propose a set of recommendations to this end.

- South African Institute of International Affairs, "Strengthening the Science–to–Policy Interface in the Western Indian Ocean Region", 2021, https://www.africaportal.org/publications/strengthening-science-policy-interface-western-indian-ocean-region/

  SAIIA is an independent, non-government think tank whose key strategic objectives are to make effective input into public policy, and to encourage wider and more informed debate on international affairs, with particular emphasis on African issues and concerns. This policy brief focuses on evidence-based policy making in the field of

governance of aquatic resources and proposes a set of trust-building strategies to support the science-policy interface.

Urban development

- UNECE, "Guidelines on evidence-based policies and decision-making for sustainable housing and urban development", 2020, https://unece.org/DAM/hlm/documents/Publications/2020_Guidelines_on_evidence-based_policies.pdf

  This Guidelines document is the result of a joint effort of the United Nations Economic Commission for Europe (UNECE) and the United Nations Human Settlements Programme (UN-Habitat). The Guidelines aim to support the efforts of governments in the UNECE region to improve evidence-based policymaking on sustainable urban development and housing.

Chemical and waste management

- UNEP, "Assessment of options for strengthening the science-policy interface at the international level for the sound management of chemicals and waste", 2020, https://wedocs.unep.org/bitstream/handle/20.500.11822/33808/OSSP.pdf

  This document aims at discussing existing science-policy interfaces and outlining options for strengthening the science-policy interface in this sector, including the establishment of an independent platform, the institutionalisation of the global chemicals outlook (GCO) and global waste management outlook (GWMO) processes, and the establishment of thematic subsidiary panels with specialised task forces.

IV. Collection of Good Practices

1) General Sources of Good Practices

- UNDRR, "The Report of the Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030. Good Practices in Disaster Risk Reduction", extracted from formal submissions to the Midterm Review of the Sendai Framework, 2023, https://sendaiframework-mtr.undrr.org/media/86860/download?startDownload=true

  This document seeks to distil good practices from the findings and recommendations identified in The Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030 (MTR SF)3, emerging from over seventy Voluntary National Reports (VNRs) submitted by Member States following national consultations and reviews, as well as formal

submissions of non-State stakeholders, meetings, interviews with experts and practitioners, policy documents, strategic and guidance documents, and thematic studies. Bringing this global expertise to scale will be critical to accelerate progress towards accelerating implementation of the Sendai Framework and thus risk-informed sustainable development.

- ROADMAP (euROpean observAtory on Disaster risk and crisis MAnagement best Practices), https://solutionsexplorer-roadmap.ci3r.it/

  The Solutions Explorer is an open-source web platform with easy access to data and experiences in the field of Disaster Risk Management. The Solutions Explorer hosts good practices in Disaster Risk Management available at different governance levels (local, regional, national and international) supporting the activities of ROADMAP project. Its database is interoperable with the DRMKC resources (e.g., Gaps Explorer) and can be easily linked with other relevant databases available.

- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf

  Using the findings of previous research and insights gained from comprehensive stakeholder consultations, the International Federation of Red Cross and Red Crescent Societies and the United Nations Development Programme developed a new practical guidance tool relating to law and DRR, the *Checklist on Law and Disaster Risk Reduction* (the Checklist). The Checklist provides a prioritised list of 10 questions that lawmakers, officials, practitioners need to consider in order to ensure that their laws provide the best support for DRR. The Handbook has been developed to provide guidance on how to use the Checklist and conduct related legislative reviews and reform processes. While the methodology for using the Checklist needs to be tailored to each country's context and respective needs, the Handbook is intended to provide general guidance on key steps to consider.

2) Good Practices relating to Legislative, Regulatory and Administrative Aspects

Adopting a legislative framework that is tailored to the country's hazard risk profile, institutional structure and operational capacity

The relevant practice shows that there is no "one-size-fits-all" solution when adopting DRM and DRR legislation. Different models exist, ranging from broad and overarching laws, to a set of coordinated specific laws (with a variable degree of detail), to a mix of the two approaches. Going beyond purely formal and

terminological aspects, in the development or revision/reform of DRM/DRR laws it is of fundamental importance to give appropriate consideration to the country's concrete risk profile, its existing risk governance capacity and national development context. Moreover, pertinent legislation should:
a) Set out principles and priorities that guide the country's approach to risk reduction;
b) Determine the level of prioritisation of the DRR component within the relevant (general or sectoral) legislative instruments.

National practice
The Philippines' Disaster Risk Reduction and Management Act of 2010 commences with a statement that it is the policy of the state to "adopt a disaster risk reduction management approach that is holistic, comprehensive, integrated and proactive […]."; the DRR focus and prioritisation is evident in the laws of countries such as Algeria, Mexico, Namibia, New Zealand; DRR priority laws (sometimes with a low level of detail) are typical of countries with high governance capacity (ex. Japan, New Zealand).

Sources
- Sendai Framework, 27(a), (b)
- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf
- IFRC and UNDP (2014) Effective law and regulation for disaster risk reduction: a multi-country report, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/DRR%20Report%20%28full%20version%29%20final_page_LR.pdf
- PARLAMERICAS (2019) Parliamentary protocol for disaster risk reduction and climate change adaptation, https://parlamericas.org/uploads/documents/ENG_Protocolo_DRR_Online_Version.pdf

Aligning with international standards and commitments
Ensuring DRM and DRR legislation is consistent with international standards, frameworks, and commitments, such as those outlined in the Sendai Framework for Disaster Risk Reduction. This promotes uniformity, facilitates international cooperation, and strengthens the nation's capacity to address transboundary hazards.

National practice
The Sendai Framework has influenced the ongoing legal review process in Indonesia, prompting the relevant agencies and stakeholders to consider accountability issues, the use of technology, and previously excluded sectors (such as tourism). It has also fostered greater participation of vulnerable groups and the private sector, among others.

Sources

- IFRC and UNDP (2015) The Handbook on Law and Disaster Risk Reduction, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/Handbook%20on%20law%20and%20DRR%20LR.pdf

Ensuring appropriate integration between DRM/DRR framework legislation, subsidiary and sectoral legislation, regulations, guidelines, policies and plans

To guarantee a coherent legal framework as the basis for effective action, states need to ensure the proper integration and coordination between DRR/DRM laws and connected sectoral legislation (e.g., on matters such as development, environmental management and protection, forestry, infrastructure, water management, construction and building, climate change adaptation and mitigation, etc.), as well as with relevant secondary legal and operational instrument (regulations, guidelines, policies, plans). Introducing provisions that address DRR into sectoral laws might be a particularly effective way to ensure this result. In addition, the proper alignment between these sources helps to remove or avert any duplications, discrepancies, contradictions or bottlenecks that may hamper their implementation.

National practice

Bolivia's *Mother Earth Law* requires the consideration of the prevention of and response to disasters in a system of integral planning; in Armenia, the law on 'Environmental Impact Assessment and Expertise' requires that the results of the EIA process should include an assessment of the level, size and potential impact of possible emergencies (including natural disasters), as well as means to reduce or remove the impact; in New Zealand the Building Act is one of four primary pieces of legislation addressing disaster risk reduction; integrated legal frameworks addressing both DRR and climate change exist for example in Algeria, the Dominican Republic, Mexico and Uruguay.

Sources

- Sendai Framework, 30 (a) (c), (f), (h), (n)
- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf
- IFRC and UNDP (2014) Effective law and regulation for disaster risk reduction: a multi-country report, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/DRR%20Report%20%28full%20version%29%20final_page_LR.pdf

Ensuring the engagement of all relevant stakeholders, including civil society, the private sector, scientific institutions and communities in the design of DRM/DRR legislation, the ensuing implementation, actions and decisions

Effective DRM/DRR needs the involvement of many stakeholder groups. It is necessary to build the institutional and procedural avenues to allow DRM/DRR efforts to be more inclusive of civil society and private sector actors, and to seek better representation of communities, women, minorities, children, people with disabilities and other vulnerable groups. Legislation needs to guarantee this

engagement by assigning clear roles and responsibilities. To foster these goals, the following aspects should be considered in the relevant legislation, taking into account the institutional, social, economic context of the relevant country: a) Ensuring community involvement and representation of civil society in decision-making; b) Ensuring meaningful engagement and representation of women, minorities, children, people with disabilities and older persons; c) Including private sector actors in both decision-making bodies as well as DRM/DRR activities; d) Ensuring that the best available scientific resources and analysis inform development and DRM/DRR decisions.

National practice
The Dominican Republic, Nigeria, Italy, Iraq, Namibia, Nicaragua and the Philippines all have in their relevant legislation provisions that mandate the participation of civil society and National Red Cross/Red Crescent Societies in DRM committees both at the national and decentralised level; Japan's Basic Disaster Management Plan calls for the need to expand women's participation in the DRM policy/decision-making process; Japan's Act on Special Measures Concerning Countermeasures for Large-Scale Earthquakes mandates to analyze research from universities and other research bodies, contributing to the development of policies as well as to the dissemination of information to the public; in Tanzania, when preparing an emergency preparedness plan, the competent Minister is to consult not only the Disaster Management Department and government ministries, but also private institutions and relevant organisations as well as individual persons.

Sources
- Sendai Framework, 7, 19 (d), (g), 27 (f), 36 (a)-(d)
- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf
- IFRC and UNDP (2014) Effective law and regulation for disaster risk reduction: a multi-country report, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/DRR%20Report%20%28full%20version%29%20final_page_LR.pdf

Ensuring mechanisms for implementation, monitoring and enforcement
It is essential to establish robust mechanisms that reconcile the divide between science and policy to effectively implement DRM and DRR legislation. This requires the development of comprehensive implementation frameworks, the allocation of sufficient resources, and the improvement of enforcement mechanisms. Robust monitoring and evaluation systems assure decision-making based on evidence, while stakeholder engagement promotes openness and transparency. Countries can improve disaster risk management practises and overall resiliency by integrating scientific knowledge and involving hybrid experts.

National practice
The Disaster Administration Act, 200528, No. 53 of 2005, is a law that provides for the effective administration of disasters and related or incidental matters. Section

3 of the Act establishes the National Disaster Management Authority for the purpose of formulating disaster management policies, authorising the National Plan, and coordinating the enforcement and implementation of disaster management policies and plans for India.

Sources
- UN-GGIM (2016) Draft Review of Frameworks, Rules, Legislation, and Policies on Geospatial Information and Services for Disasters, https://ggim.un.org/documents/B.P-2016-12-1%20TT-2%20Report%20on%20Review%20Framework%20WG-Disasters.pdf

Establishing mechanisms for regular review and revision of DRM and DRR legislation

Conducting systematic evaluations of DRM and DRR legislation to determine its compatibility with shifting risk profiles, emergent challenges, and advancing scientific knowledge. This procedure involves evaluating the efficacy and efficiency of existing laws, identifying any voids or inconsistencies, and proposing any amendments or revisions that may be necessary. The revision process is enhanced by the incorporation of lessons learned from previous catastrophes, post-event assessments, and scientific research.

National practice

The 2015 Disaster Risk Management Act of Jamaica emphasises the need for geospatial information to support the various elements of the framework for disaster risk management. New provisions in Section 51 of the Act mandate that the Office conduct post-disaster evaluations.

Sources
- IFRC and UNDP (2014) Effective law and regulation for disaster risk reduction: a multi-country report, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2021-02/Law%20and%20DRR%20Summary%20Report.pdf

Ensuring appropriate water management in a multi-level governance setting

Water crises have long been considered among the gravest global threats. According to a report published by UNESCO on behalf of UN-Water (2023), 2 billion people do not have access to safe drinking water, while 3.6 billion lack access to safely managed sanitation – figures that are bound to worsen in the coming decades. Therefore, it is of the utmost importance to establish appropriate water management systems, which can adapt to evolving conditions, fit in multi-level governance settings and engage a plurality of stakeholders.

National practice

The Netherlands' water governance system has been recognised by the OECD as "a global reference for water management". In the country, water boards are locally-elected authorities, which act independently from other branches of

government and are able to autonomously levy taxes and issue administrative fines. This system ensures direct participation of the population in the ruling and administration of the water household control in the Netherlands, maintaining, innovating, improving and building the necessary infrastructure related to water management, such as water barriers, pumping systems and polders. The system is credited with improved efficiency compared to other countries' systems and to the rest of the Dutch government's structure; and with enhancing popular understanding and awareness of water management and water risks.

Source
- Dutch Water Authorities (2017) Water Governance: The Dutch Water Authority, https://dutchwaterauthorities.com/wp-content/uploads/2021/05/The-Dutch-water-authority-model.pdf

Creating a culture of prevention and preparedness through education, including by mandatory training in school curricula

The most effective way of improving people's responsiveness to disasters and, more generally, of changing individual behaviours, is by reforming the education system. It is important to provide, at all stages of the education system, scientifically-validated and up-to-date information about practices to be adopted in case of emergency. Furthermore, the education system should contribute to making citizens more aware, already since an early age, about the risks posed by a number of phenomena ranging from climate change related disasters, earthquakes, and pandemics. The safety of children can be significantly improved if they have participated in disaster preparedness drills. Relevant laws and codes on education may include a requirement to address DRR and preparedness as part of the school curricula.

National practice

Mexico's legal framework mandates two types of formal DRR education initiatives: (1) the inclusion of civil protection and DRR in the school curriculum; and (2) the establishment of a civil protection professionalisation system to strengthen the public sector, especially the National Civil Protection School for training, accreditation and a certification system. The school offers both academic education and job level certification. This is then complemented by the General Law on Education of 1993, which requires each municipality and public primary school to operate a community council for public awareness and school emergency planning, including drills and simulations.

Source
- Sendai Framework, 24(g), (l)-(m), 27(a)
- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf

3) Good Practices relating to Organisational and Operational Aspects

Establishing clear roles and responsibilities related to risk reduction for all involved national and local institutions

To be effective, DRM/DRR legislation must establish a clear organisational framework that clearly assigns roles and responsibilities to specific institutions and levels of government for the implementation of the relevant obligations. Legal instruments need to establish precise attributions and an effective division of labour across the relevant ministries, departments, agencies, committees and other institutions, identifying their specific tasks in relation to the risk reduction cycle. This must properly take into account the institutional specificities of the country under consideration (ex. unitary or federal structure) and the relations between central and decentralised authorities. The involved institutions and bodies should: a) be vested with sufficient authority and have sufficient resources to discharge their duties; b) be given the necessary tools to cooperate and interact effectively and timely. These goals can be achieved though overarching DRM laws setting out the main distribution of such roles and responsibilities, with the necessary integration from other sources. Likewise, policies and other administrative acts rather than laws are sometimes relied on for this function, depending on the institutional structure and culture of each state.

National practice

In Italy, the DRM institutional framework comprises several authorities. The National Platform for Disaster Risk Reduction, established in 2008, is the main instrument for the cross-sectoral coordination of DRR policies and programmes. The Platform is a multi-stakeholder mechanism composed of representatives of national ministries, territorial authorities and volunteer organisations operating in the area of civil protection. Overall coordination is guaranteed by the National Italian Department of Civil Protection, which acts as a link to the whole Italian Civil Protection System. Namibia's DRM law requires the appointment of 'national focal persons' from every governmental institution, association or organisation to serve as a liaison with its national DRM agency (the Directorate: Disaster Risk Management) and take part in the 'national focal persons forum. Under New Zealand's DRM law, local governments hold primary responsibility for DRR along with other governance responsibilities, but they are coordinated under a national legal framework and coordination mechanism.

Sources

- Sendai Framework, 19 (b), (e), (f)
- IFRC (2015) The Handbook on Law and Disaster Risk Reduction, https://www.ifrc.org/sites/default/files/2021-07/IFRC_Handbook_Law_DRR.pdf
- IFRC and UNDP (2014) Effective law and regulation for disaster risk reduction: a multi-country report, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/DRR%20Report%20%28full%20version%29%20final_page_LR.pdf

Establishing robust knowledge management systems

Building comprehensive knowledge management systems within DRM and DRR organisations to capture, document, and disseminate best practices, lessons learned, and innovative approaches. This promotes continuous learning and ensures that all levels and functions share valuable knowledge.

National practice

Experts and legislators from Indonesia and Bangladesh were invited to share their experiences with the Vietnamese National Assembly, thereby enhancing Vietnam's awareness and capacity to conduct a DRM legal review.

Sources

- IFRC and UNDP (2015) The Handbook on Law and Disaster Risk Reduction, https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-09/Handbook%20on%20law%20and%20DRR%20LR.pdf

Investing in capacity building and training initiatives to enhance the skills and knowledge of personnel involved in DRM and DRR activities (especially hybrid experts)

Promoting interprofessional training programmes that bring together scientists, policymakers, practitioners, and community representatives is essential to strengthening the integration of scientific insights into practical solutions. Capacity-building programmes should prioritise training initiatives targeting hybrid experts.

National and international practice

The Local Level Risk Management (LLRM) module was piloted in the Ararat region of Armenia as part of the UNDP project Strengthening National Disaster Preparedness and Risk Reduction Capacity. The initiative assessed risk, vulnerability, and capacity, educated communities and local authorities on disaster preparedness and risk reduction, and supported small-scale mitigation projects.

Sources

- Capacity for Disaster Reduction Initiative (CADRI), Basics of Capacity Development for Disaster Risk Reduction, 2006. https://www.preventionweb.net/files/globalplatform/entry_bg_paper~basicofcapacitydevelopmentfordisasterriskreduction.pdf

Ensuring that adequate resources are allocated to all phases of the disaster management cycle

In many countries, including EU Member States, there is a tendency of attributing most financial and human resources to disaster response, with the result that prevention and preparedness activities are overall neglected. Such imbalance can have negative impacts on the response itself as, by focusing on treating the

symptoms rather than addressing the underlying causes, emergencies are bound to reoccur and exacerbate, thus draining resources for disaster management (a problem known as "firefighting trap").

National practice

After the devastating forest fires that affected Portugal in 2017, the Agency for Integrated Rural Fire Management ("Agência para a Gestão Integrada de Fogos Rurais", AGIF) was created with a view to coordinating public policies on fire management and assessing fire prevention and suppression activities. One of the most significant achievements of AGIF has been to considerably increase the share of resources allocated to prevention activities: while, in 2017, 20% of expenditure on the Integrated Rural Fire Management System was devoted to prevention activities, that percentage increased to 50% in 2019 and amounted to 46% in 2021.

Sources

- Agência para a Gestão Integrada de Fogos Rurais (AGIF) Investment in the SGIFR, https://www.agif.pt/en/investment-in-the-sgifr
- Collins et al (2013) Forest fire management to avoid unintended consequences: A case study of Portugal using system dynamics, *Journal of Environmental Management* 130:1-9, https://doi.org/10.1016/j.jenvman.2013.08.033

Building well-structured, integrated and multi-hazard Early Warning Systems (EWS), with the inclusion of community-based instruments

Effective EWS not only require good background legislation, but most importantly technical capacity, streamlined organisation and adequate planning. Nevertheless, effective EWS cannot be independent stand-alone instruments, and should be integrated within the wider DRM/DRR management cycle**.** Relevant authorities should stive to promote the progressive integration between global, regional, sub-regional, national and community EWS. A multi-hazard approach should be adopted, while ensuring focus on and prioritisation of EWS in relation to the specific risks and hazards in each context. Research and practice show that community involvement in the management of EWS can be crucial to their effectiveness. This can be achieved, for example, by consulting with community members in the design and development of EWS, integrating community-based EWS with formal/national EWS and assigning community representatives with maintenance or oversight responsibilities.

National and international practice

Some countries that include specific mandates on risk mapping and EWS in their DRM laws include Algeria, Dominican Republic, Guatemala, Italy, Mexico, Nicaragua, South Africa and Viet Nam. In four countries of the Asia-Pacific zone (Indonesia, Philippines, Sri Lanka and Viet Nam) the American Red Cross and Asia Disaster Preparedness Center (ADPC) organised a project entitled "Facilitating the integration of tsunami warning by strengthening multi-hazard warning systems." The project aimed to establish and/or strengthen early warning national forums,

build the capacity of National Societies to translate hazard information into response options and to communicate these options to at-risk communities. The 2004 tsunami provided a catalyst to create an organisation known as the Regional Integrated Multi-Hazard Early Warning System. This appears to be a top-down high-tech collective effort focusing on the national level EWS of 26 Indian Ocean countries.

Sources

- Sendai Framework, 33(b)
- United Nations Office for Disaster Risk Reduction and World Meteorological Organization (2022) Global status of multi-hazard early warning systems – Target G, https://www.undrr.org/media/84088/download
- UN ECOSOC, Economic and Social Commission for Asia and the Pacific (2015) Strengthening regional multi-hazard early warning systems, https://www.unescap.org/sites/default/d8files/event-documents/E_CDR4_2E.pdf
- IFRC (2012) Community Early Warnings systems: Guiding Principles, https://www.ifrc.org/sites/default/files/CEWS-Guiding-Principles-EN.pdf

Applying foresight in disaster risk management

Foresight is a systemic participatory process aimed at intercepting the medium- to long-term future and building plausible and unbiased rationales of possible future developments. Foresight uses qualitative logic, combined with quantitative methods and an interdisciplinary and multi-level approach (from a global perspective to the specific). Several foresight approaches exist, such as horizon scanning, scenario planning, megatrends analysis, and backcasting. Related to foresight methods are the novel concepts of Global Catastrophic Risks (GCRs), namely the risk of an event, of either natural or human origin, characterised by low probability, high impact, high uncertainty and capable of leading to the loss of more than 10% of the population, and Existential Risk (X-risks), i.e., the risk of an event occurring that is capable of depleting human population to a point of no return. The adoption of foresight methods and the use of these emerging concepts can enrich strategic understanding before action is taken, benefiting decision-makers who will be better equipped to take reasoned and sound decisions for the long term.

International practice

Foresight, GCRs and X-risks are emerging from academic circles and gaining ground within international institutions. The outbreak of the Covid-19 pandemic has also accelerated the use of anticipatory thinking and foresight. Examples of the application of or reference to these emerging concepts in international documents include the Sendai Framework for Disaster Risk Reduction, as well as WHO, G20, World Economic Forum and UN Secretary-General reports (see below).

Sources

- World Health Organization (2022) Emerging trends and technologies: a horizon scan for global public health, https://www.who.int/publications/i/item/9789240044173
- World Economic Forum, Centre for the New Economy and Society (2021) Building Back Broader: Policy Pathways for an Economic Transformation, Community Paper, https://www.weforum.org/whitepapers/building-back-broader-policy-pathways-for-an-economic-transformation/
- S20 Saudi Arabia (2020) Foresight: Science for Navigating Critical Transitions, G20 Science 20 Engagement Group 2020 Synthesis Report, https://www.cser.ac.uk/news/science-20-report-foresight-science-navigating-cri/

Applying Artificial Intelligence to weather forecasting and disaster risk management

The use of Artificial Intelligence (AI) is rapidly expanding to several contexts of research, policy and practice, including weather forecasting and disaster risk management. Machine learning models are increasingly applied to forecast tornadoes, storms, strong winds, hail and other weather events; as well as to predict the impacts of such events, by incorporating information on the events' past effects on properties, infrastructure, nature etc.

National practice

The SILVA project, coordinated by the Finnish Meteorological Institute and the National Emergency Supply Agency, collected data on the negative impacts caused by weather and climate conditions dating back to 20 years, with a view to developing more accurate impact forecasts through the use of machine learning. In this way, critical sectors and rescue services can better prepare for hazardous weather and climate situations (e.g. leading to wildfires).

Source

- Finnish Meteorological Institute (2022) Unique weather and climate database to help prepare for dangerous weather phenomena, https://en.ilmatieteenlaitos.fi/news/16KktknSrgrqpC157pT3Hn

4) Good Practices relating to Communication at the Science-Policy Interface

Creating formal and informal networks and platforms that bring together scientists, policymakers, practitioners, and other stakeholders

These platforms function as spaces for dialogue, information exchange, and collaboration, enabling the incorporation of scientific knowledge into policy decisions and the dissemination of policy priorities and implementation challenges to the scientific community.

National practice (with international support)

India's 2006 Human Resource Development initiative aimed to improve the capacity and quality of available human resources within key government departments for effective disaster management and included the establishment of dependable communication networks which were essential to fulfil the cited objective.

Source
- Capacity for Disaster Reduction Initiative (2011) Basics of Capacity Development for Disaster Risk Reduction, https://www.undrr.org/publication/basics-capacity-development-disaster-risk-reduction

Developing strategies and tools to effectively translate complex scientific information into accessible and actionable formats for policymakers and non-technical stakeholders

It is essential to summarise research findings, provide precise recommendations, and effectively communicate key messages through visualisations or infographics. With their unique combination of scientific knowledge and policy comprehension, hybrid experts play a crucial role in this process.

National practice (with international support)

Since 2009, The Water Management Centre (WMCN) has provided water consumers in the Netherlands with daily updates on water levels, inundation risk, and water quality. In this network facility, both national and regional departments of the Rijkswaterstaat collaborate. The water monitoring data is provided to the Water Management Centre, which interprets it in conjunction with weather forecasts from the KNMI, Deltares models, and regional reports. In this manner, the Centre writes reports for users and authorities.

Source
- JRC-EC (2015) Science Policy Interfaces in Disaster Risk Management in the EU. https://publications.jrc.ec.europa.eu/repository/bitstream/JRC97968/lbna27520enn.pdf

Strengthening the use of crowdsourced information for disaster management

Official datasets used for disaster management can be usefully integrated with crowdsourced information. This allows for filling information gaps as well as involving citizens in all phases of the disaster management cycle. Technological developments are key and social media are playing an increasing role in this area. This practice is not without limitations, which primarily concern the reliability of crowdsourced information and need to be addressed.

National practice

With a view to strengthening preparedness to floods, the disaster management agency of the city of Jakarta conducted a series of projects with several partners (including UNOCHA, university partners, Twitter and others) to integrate official maps with crowdsourced information, primarily through social media. Today, the

PetaBencana.id platform combines reports from citizens with data from the city authorities and build real-time flood maps that both citizens and the authorities can use to make informed decisions.

Sources
- Tagliacozzo, Rizzoli, Morsut and Di Bucci (2022) Good practices in risk and crisis communication, ROADMAP – Thematic Paper 02 (and sources therein)
- OECD (2017) Embracing Innovation in Government Global Trends, pp. 23-26

Sources of similar practices
- LINKS – "Strengthening links between technologies and society for European disaster resilience" (H2020 Project), https://links-project.eu/
- Tavra, Racetin and Peroš (2021) The role of crowdsourcing and social media in crisis mapping: a case study of a wildfire reaching Croatian City of Split, *Geoenvironmental Disasters* 8: 10, https://doi.org/10.1186/s40677-021-00181-3

Mainstreaming cognitive and behavioural sciences in disaster management

Among the many barriers to effective disaster management are psychological and social factors that inform the ways of thinking and behaviours of individuals affected by a disaster. These factors – which include how alerts are communicated and by whom, how affected people balance risks and gains, the impact of past experiences – are often neglected but should play a more prominent role in disaster preparedness and response. Nudge theory can provide relevant insights in this area.

National practice (with international support)

In light of Haiti's susceptibility to natural disasters, various projects have been carried out with a view to strengthening disaster preparedness and response capacity in the country. A data collection and analysis work was undertaken by the World Bank, with the support of the EU and the Global Facility for Disaster Reduction and Recovery, focusing on the behavioural obstacles that affect evacuation decisions in Haiti. Behavioural recommendations have been put forward to promote people's timely and effective evacuation.

Source
- World Bank (2020) Using Behavioral Insights to Improve Disaster Preparedness, Early Warning and Response Mechanisms in Haiti, https://blogs.worldbank.org/latinamerica/nudging-save-lives-applying-behavioral-science-disaster-risk-management-haiti

Sources of similar practices
- UNEP, The Little Book of Green Nudges: 40 Nudges to Spark Sustainable Behaviour on Campus, https://wedocs.unep.org/handle/20.500.11822/33578 (on behavioural science applied to environmental management)

Promoting the use of maps and other appropriate visual aids

It is crucial that scientific information related to disaster is delivered to policymakers and the affected communities in an accessible way. Visual approaches, including the use of maps, can be a very effective means of communication, provided that they are easily intelligible and adapted to their target audience. Affected communities and local governments can also be involved in the creation of maps, with a view to increasing their awareness and collecting up-to-date information on the local situation and needs that would not be available otherwise.

National practice (with international support)
In some areas of the Philippines that are particularly prone to flooding, training was carried out with a view to enabling local government staff to employ community mapping
methods, specifically through OpenStreetMap. OpenStreetMap provides access to open maps online, whose full data can be downloaded. Local stakeholders can importantly contribute to enriching the portal by feeding up-to-date and localised information, which can be crucial in emergency preparedness and response.

Source
- International Bank for Reconstruction and Development / The World Bank (2014) Community Mapping for Disaster Risk Reduction and Management: Harnessing Local Knowledge to Build Resilience, https://www.gfdrr.org/sites/default/files/publication/Community-Mapping-for-Disaster-Risk-Reduction-and-Management_0.pdf

Sources of similar practices
- Mahardhika Machmud (2020) City-Wide Mapping for Disaster Management, Urbanet, https://www.urbanet.info/city-wide-mapping-for-disaster-management/
- Missing Maps project: https://www.missingmaps.org/

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