Paper:

Role Played by Science and Technology in Disaster Risk Reduction: From Framework Planning to Implementation

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The Hyogo Framework for Action, which was adopted in 2005, promotes the creation and strengthening of national platforms designated as national integrated disaster risk reduction (DRR) mechanisms. The Sendai Framework for Disaster Risk Reduction 2015–2030 (the Sendai Framework) emphasizes the role played by science and technology in DRR decision-making and the importance of the support provided by the international scientific and technological community in DRR. The Global Forum on Science and Technology for Disaster Resilience 2017 (Tokyo Forum 2017) agreed to formulate guidelines supporting national platforms for DRR by efficiently utilizing scientific and technological tools and producing a synthesis report on disaster science and technology. Since each country is attributed the primary responsibility for implementing the aforementioned agreement according to its national needs and conditions, it should develop a mechanism that allows all stakeholders to share information on science and technology for DRR in their own language. Each national platform should review the status and issues of ongoing DRR efforts based on scientific and technological knowledge, enhance multi-sectoral discussion among various stakeholders about how DRR should be implemented in the country, and achieve consensus on the practical measures to be designed and implemented from a macro perspective. This paper defines a series of actions to be performed by the national platform of each country as the "Nation's Synthesis" and proposes the relevant functions and international cooperation frameworks to be established.

Keywords: disaster risk reduction, national platform, science and technology, scientific evidence synthesis

1. Introduction

Disasters such as earthquakes, tsunamis, volcanic eruptions, and hydro-meteorological hazards exacerbated by climate change are posing serious risks to people's lives, livelihoods, and health. The effects of such disasters are particularly severe on women, the elderly, children, and people living in vulnerable conditions. Currently, the damage created by disasters is increasing in both developed and developing countries alike. Due to the increase in global socioeconomic interdependency, the impact of a disaster in one country immediately crosses borders, resulting in cascading effects in other countries and further expanding its negative consequences worldwide.

The economic damage and loss caused by disasters have been increasing in both developed and developing countries, which suggests that the reduction of disaster risks is not limited to being a humanitarian issue but is indispensable for economic growth, as well as sustainable development. In the fields of natural and social sciences,

much attention is focused on disasters; however, current research has a major shortfall in terms of how science and technology is used to influence social and political decision-making in the context of hazards and disasters. Why can we not completely exploit advanced science and technology to solve such problems and why are losses are continuing to increase? To date, science and technology has not found an answer to this question.

To reduce disaster risks, the Hyogo Framework for Action (HFA) [1] requested states to support the creation and strengthening of national integrated disaster risk reduction (DRR) mechanisms, such as multi-sectoral national platforms, which was originally defined in the Economic and Social Council resolution 1999/63 and General Assembly resolutions 56/195, 58/214, and 58/215 [2]. Further, the Sendai Framework for Disaster Risk Reduction 2015–2030 (Sendai Framework) [3] requests each state to promote and improve dialogue and cooperation among scientific and technological communities and other relevant stakeholders to facilitate a science-policy interface for effective disaster risk management decision-making. How can national platforms develop and implement evidence-based policies for DRR by obtaining support from the scientific and technological community? Both the scientific and technological community and other relevant stakeholders have not found a way to execute this mission yet.

We must overcome many challenges before realizing the implementation of practical DRR measures by incorporating scientific and technological knowledge in policy development and public behavior. We should promote and strengthen the development of a system through which scientists and practitioners of each country can assist their national platforms for DRR in their own language, and international support should be provided through enhanced inter- and transdisciplinary cooperation. Further, we should coordinate ongoing scientific and technological research activities at national, regional, and global levels to establish a support system for DRR through comprehensive, effective, and sustainable transdisciplinary cooperation. Over the past ten years, several scientific challenges have been overcome in the field of DRR. One of the most typical solutions to such challenges is "disaster reduction hyperbase (DRH)." DRH is a Web-based database that disseminates appropriate DRR technology and knowledge, or the so-called "implementation technology," comprising implementation-oriented technology, process technology, and transferable indigenous knowledge [4]. Moreover, the Disaster Risk Management Knowledge Centre published a report in 2017 on the practical use of scientific knowledge in disaster risk management actions in Europe and the scientific evidence base and its practical use in various areas of disaster risk management [5]. Further comprehensive efforts are requested to overcome the challenges in a comprehensive and sustainable way. Each national platform should play an active role as a focal organization where the scientific and technological community meets other relevant stakeholders, such as policymakers, practitioners, private enterprises, and citizens' groups, to discuss issues from multiple perspectives; nurture transdisciplinary collaboration among society and the scientific and technological community; and, thereby, increase each nation's disaster preparedness, coping capacity, and resilience. This paper reviews the efforts that have been expended to formulate DRR science and technology and promote evidence-based DRR decision-making in national platforms since the World Conference on Disaster Reduction was held in Kobe in 2005 and proposes a new DRR approach developed by the scientific and technological community to be adopted by all stakeholders.

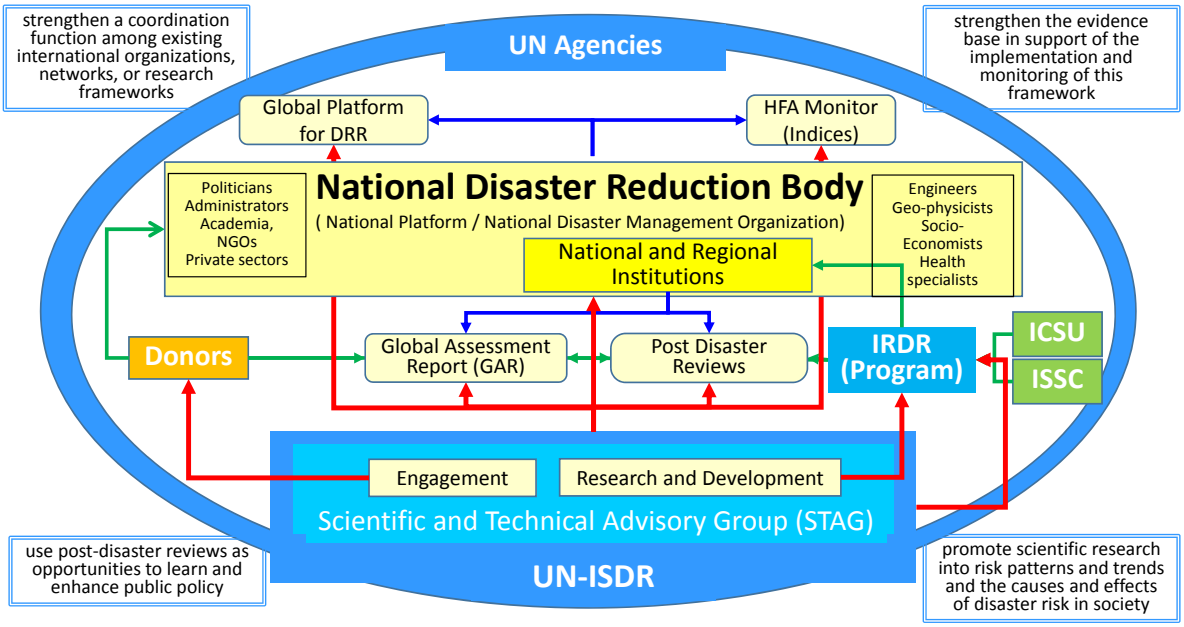
2. From HFA to the Sendai Framework

In response to HFA, much effort has been expended on the incorporation of science and technology in DRR decision-making processes in intergovernmental cooperative frameworks.

2.1. Efforts by Intergovernmental Frameworks

In 2007, based on the information provided by government officials engaged in the national platforms of China, France, Germany, Iran, Italy, Japan, Madagascar, Nigeria, Norway, Panama, Peru, Senegal, South Africa, and Uganda, the United Nations International Strategy for Disaster Reduction (UNISDR) published *Guidelines: National Platforms for Disaster Risk Reduction* [6]. The Guidelines clearly state that DRR requires scientific knowledge, as well as political and legal commitment, public understanding, careful development planning, responsible enforcement of policies and legislation, people-centered early warning systems, and effective disaster preparedness and response mechanisms. Moreover, they request national platforms to facilitate the participation of key players from scientific and academic institutions, in addition to those from line ministries, disaster management authorities, nongovernmental organizations, the National Society of the Red Cross or Red Crescent, the private sector, opinion shapers, and other sectors related to DRR purposes, and to foster collaboration and dialogue among national platform members.

In compliance with the recommendations of the Mid-Term Review of the Hyogo Framework for Action 2010–2011, 50 countries undertook a collaborative and voluntary self-review process to initiate a comprehensive discussion on the roles played and functions performed by national platforms up to 2015 and beyond. The Review [7] encourages national platforms to facilitate the application of scientific evidence-based decision-making in DRR. Further, it includes the comments, feedback, and recommendations of the National Platforms Consultation on a Post-2015 Framework for Disaster Risk Reduction, which was held at the Fourth Session of the Global Platform for Disaster Risk Reduction (May 19–23, 2013 in Geneva, Switzerland). One of the Review's key recommendations is to promote the application of science and



Source: [9]

Fig. 1. Strategy for strengthening and supporting national platforms for DRR.

technology and social science research in DRR policy decision-making.

2.2. Efforts by the International Scientific Community

The Integrated Research on Disaster Risk (IRDR), which is co-initiated by the International Council for Science (ICSU), International Social Science Council, and UNISDR, is a global initiative to scientifically manage natural and human-induced environmental hazards so that nations are better prepared to facilitate disaster prevention and risk reduction and provide efficient disaster response [8]. In the IRDR, data and information are systematized and integrated across hazard types and beyond academic restrictions and shared among different stakeholders. It enables the exchange of knowledge, experiences, and methods to ensure the establishment of DRR methodologies through in-depth discussions. The entire process is considered an essential step in building a resilient society and leading the world to sustainable development.

In January 2015, the UNISDR, together with ICSU/IRDR, the Science Council of Japan (SCJ), and the University of Tokyo, co-organized the Tokyo Conference on International Study for Disaster Risk Reduction and Resilience (Tokyo Conference 2015) in Tokyo, Japan. The aim of the Tokyo Conference 2015 was to examine the roles and better engagement of science and technology in DRR and resilience enhancement and help reach a consensus at the Third UN World Conference on Disaster Risk Reduction (WCDRR) on a new framework for DRR that uses science and technology.

To prepare a draft conference concept, the SCJ proposed a basic strategy for implementing DRR, which suggests that each country should structure a disaster management system based on its national platform for DRR and United Nations (UN) agencies, international development organizations, and international scientific and technological initiatives should develop a support mechanism for the national platforms. In addition, the strategy emphasized the importance of increasing public awareness on DRR, claiming that everyone should play important roles in reducing disaster risks. **Fig. 1** depicts a conceptual representation of this basic strategy [9]. In this figure, a national platform is expressed as a National Disaster Reduction Body, which consists of socioeconomic sectors and scientific and technological communities. The Scientific and Technical Advisory Group of the UNISDR and the IRDR are requested to coordinate the production of reports and monitor, review, and support national and regional institutions. The strategy was presented for global discussion at a preparatory meeting for the WCDRR, which was held by the Science and Technology Major Group in October 2014 in Paris, and a general consensus was achieved following some modifications and adjustments.

The *Tokyo Statement*, which is the outcome document of the Tokyo Conference 2015 [10], identifies the following key directions:

- Policy makers and practitioners should be fully aware of the latest scientific knowledge on disasters and be capable of utilizing these scientific findings.
- National platforms should be empowered as focal fora to incorporate science and technology into real practice.

Table 1. Frequency of appearance of keywords in HFA and the Sendai Framework.

Keywords	HFA	Sendai Framework
Science, Scientific, Technology, Technical	29	63
Investment, Investing	2	17
Warning	27	11
Resilience, Resilient	18	37

The statement provides the following recommendations to governments and the scientific community:

- Governments need to empower national platforms so that they can practice evidence-based DRR for sustainable development.
- The scientific community needs to enhance forecasting and visualization capabilities of new risks and their potential social impacts in order to prevent further disasters due to intensification of hazards.

Along with approximately 400 participants from 27 countries and various stakeholders, the Tokyo Conference 2015 confirmed the commitment of the scientific and technological community to contribute to the safety of communities and regions worldwide and the sustainability of the global society.

2.3. A New Step Defined by the Sendai Framework

The Sendai Framework lists four priorities for action: 1) understanding disaster risk; 2) strengthening disaster risk governance to manage the disaster risk; 3) investing in DRR for resilience; and 4) enhancing disaster preparedness to facilitate effective response and "build back better" in recovery, rehabilitation, and reconstruction. Further, the framework establishes seven global targets, as follows: 1) disaster mortality, 2) number of affected people, 3) economic losses, 4) damage to critical infrastructure, 5) number of countries with DRR strategies in place, 6) international cooperation, and 7) availability of and access to multi-hazard early warning systems. The aspects emphasized by the Sendai Framework can be identified by comparing between the Framework and HFA, which forms the content of the outcome documents of the two world conferences on disaster reduction and DRR conducted in 2005 and 2015 with approximately 8,700 and 10,000 words, respectively.

Table 1 depicts the frequency of appearance of several keywords in the two documents. Since HFA was adopted three weeks immediately after the December 2004 Indian Ocean Tsunami at a time when a tsunami warning system did not exist, the keyword "warning" was repeatedly referred in HFA. Comparatively, the Sendai Framework uses "science," "technology," and their related words more often, as well as "investment" and "resilience." In particular, the Sendai Framework better emphasizes the key role assumed by the scientific and technological community to facilitate a science–policy interface and support effective decision-making in disaster risk management. **Table 1** clearly depicts the transition from HFA to the Sendai Framework. The Sendai Framework reflects the efforts made by intergovernmental frameworks and the international scientific community.

3. Implementation of the Sendai Framework

3.1. 2016 UNISDR International Science and Technology Conference (a Summary Based on [11])

To discuss how the scientific and technological community can best support the implementation of the Sendai Framework, the UNISDR Science and Technology Conference on the Implementation of the Sendai Framework was held in Geneva in January 2016. It brought together diverse stakeholders, including scientific and technological community members, policy makers, practitioners, and researchers from all geographical regions at local, national, regional, and international levels. The conference further launched the UNISDR Science and Technology Partnership to enable the collaboration of major institutions, research centers, and academia pursuing studies in different disciplines in developing and applying science and technology to reduce disaster risks. Moreover, it adopted the Science and Technology Road Map, which presents expected outcomes and proposed key areas of action for each of the four priorities of action outlined in the Sendai Framework. The UNISDR Science and Technology Partnership will undertake the listed actions to achieve the goals of the Sendai Framework. Further, it highlights systems for monitoring progress and reviewing needs [11].

3.2. DRR Indicators and Terminology

During 2015–2016, the open-ended intergovernmental expert working group on indicators and terminology related to DRR (OIEWG) developed a set of 38 indicators to measure global progress in the implementation of the Sendai Framework and revised the 2009 Terminology for Disaster Risk Reduction. The OIEWG concluded its work in November 2016 by submitting recommendations for endorsement to the United Nations General Assembly (UNGA). On February 2, 2017, the UNGA endorsed the indicators and terminology by A/RES/71. Currently, based on the global set of indicators, countries are working on the development of nationally determined targets and indicators to facilitate their monitoring and reporting.

3.3. Tokyo Forum 2017 (a Summary Base on [12])

To facilitate discussions and pursue the steady implementation of the four priorities for action of the Sendai Framework and concrete action, the UNISDR, ICSU, IRDR, and SCJ co-organized the Global Forum on Science and Technology for Disaster Resilience 2017 (Tokyo

Forum 2017) in Tokyo in November 2017 in collaboration with the Public Works Research Institute and National Research Institute for Earth Science and Disaster Resilience. As highlighted in Priority 2 of the Sendai Framework, strengthened disaster risk governance at national, regional, and global levels is a basic strategy for achieving effective DRR and building resilience. The Sendai Framework proposes establishing and strengthening multi-stakeholder, multi-sectoral, and multi-hazard governmental coordination forums at all levels, particularly, national and local platforms. Therefore, the active engagement of scientific and technological entities in these platforms is critical for the provision of relevant scientific and technological knowledge for the development and effective implementation of evidence-based policies, strategies, and plans by 2020, as requested by Target E of the Sendai Framework. Furthermore, UN agencies, international development organizations, and international scientific and technological initiatives should develop a mechanism to provide support to national platforms and coordination mechanisms for DRR.

To promote the use of scientific principles in DRR policy making and enhance coordination among scientific and technological research activities at national, regional, and global levels, scientific evidence should be synthesized in a timely, accessible, and policy-relevant manner. Such a synthesis requires comprehensive knowledge and information on scientific and technological principles for the identification of disaster risks, the assessment of the socioeconomic impact of disasters, and existing tools and methodologies for the substantial reduction of human and economic losses. The information should be presented in a clear, easy-to-understand manner to policy makers and other decision-makers worldwide.

Twenty cochairs selected by the cohosting organizations, that is, the UNISDR, ICSU/IRDR, and SCJ, organized seven working groups and operated eight plenary discussion sessions, twelve working discussion sessions, and three working lunch sessions. The results were reported and discussed further at a high-level session, and then, the *Tokyo Statement 2017* was adopted [12]. Many of the working-group cochairs also contributed to this special issue by publishing the scientific papers that were based on the discussions held at the Tokyo Forum 2017. The Forum identifies the requirements under the four priorities for action of the Sendai Framework. In addition, it emphasizes the needs to adopt interdisciplinary approaches, perform periodic synthesis, and enable the scientific and technological community to contribute to national platforms. Subsequently, it recommends the development and implementation of the following documents through close collaborative work between relevant stakeholders and the scientific and technological community:

1) Guidelines for strengthening the national platforms for DRR and coordination mechanisms by increasing the contribution of science and technology.
2) Periodic synthesis reports on the state of science and technology for reducing disaster risk.

4. Designing the Next Step of Implementation

The Tokyo Forum 2017 agreed to formulate guidelines for supporting national DRR platforms by making the best use of science and technology and to produce a synthesis report on DRR-related science and technology. Since each state is expected to lead the implementation of this agreement according to their regional conditions, states should develop a mechanism that allows all stakeholders to share information on science and technology for DRR in their own language. The national platform of each country should review the status and issues of the latest DRR efforts that they have implemented based on scientific and technological knowledge. Subsequently, the national platform should enhance multi-sectoral discussions on how DRR should be implemented in the country and reach consensus on the practical DRR measures to be designed and implemented from a holistic perspective. This series of actions to be implemented by the national platform of each country is called "Nation's Synthesis," in general, and it is proposed that this synthesis should be promoted under international cooperation. The international community is expected to establish a supporting mechanism that assists each country in this effort by giving advice and sharing experience and expertise in disaster science and technology, capacity development, and financing.

To realize Nation's Synthesis, development of the following four functions is necessary:

(1) Function to collect and store scientific knowledge and information on various activities related to DRR in each country

   1) This function should enable each country's scientific and technological community, in cooperation with other relevant stakeholders in their respective fields, to archive information, such as scientific and technological knowledge accumulated by the country related to the four priorities for action of the Sendai Framework and basic information on the social systems and policies of each country, in their own language. The information to be archived should be classified into three categories: "understanding," which refers to academic papers, reports, and documents on social systems, and "development" and "dissemination," which pertains to measures for DRR.
   2) This function should include a portal function for a group of stakeholders to search for and share information provided by other groups of stakeholders.
   3) It is noted that UN agencies and international academic organizations provide information on globally accepted scientific and technological knowledge related to the four priorities for action of the Sendai Framework. This function should enable users to search for and select information relevant to their country from all such information and archive the selected information in their own lan-

guage.
4) This function should enable users to search for and select information related to the seven global targets (three input and four outcome targets) and archive the selected information in their own language.

(2) Function to collect and store lessons learned from previous efforts and good practices of DRR designed and implemented based on scientific and technological principles
1) This function should enable users to archive, in their own language, lessons learned and good practices, in which the four priorities for action of the Sendai Framework have been effectively implemented based on science and technology in collaboration with the scientific and technological community and relevant stakeholders of each country.
2) In addition, UN agencies, international academic organizations, and other countries provide information on lessons learned and good practices, in which the four priorities for action of the Sendai Framework have been effectively implemented based on science and technology. This function should enable users to search for and select information relevant to their country from all such information and archive the selected information in their own language.

(3) Function to promote dialogue
1) This function should enable users to search for, integrate, and visualize the information mentioned in (1) and (2) and share it between the scientific and technological community and other relevant stakeholders, as well as the society, in general.
2) This function should be able to support bilateral information exchange and active networking between the scientific and technological community and other relevant stakeholders.

(4) Function to promote international cooperation to support individual countries
1) Global and regional academic organizations
(a) Global and regional academic organizations should conduct workshops and provide other opportunities for scientific and technological communities worldwide to enable the latter to commonly understand and practice a transdisciplinary approach using disaster-relevant science and technology.
(b) Global and regional academic organizations should establish an international advisory committee to provide advice each country on the interoperability (multilingual function, metadata design and registration, ontology management, etc.) and operation of the information infrastructure.
2) UN agencies and international donor agencies
(a) UN agencies and international donor agencies should examine approaches to increase incentives for countries to implement Nation's Synthesis using scientific and technological knowledge.
(b) UN agencies and international donor organizations should provide consulting and financing services to formulate DRR strategy goals and road maps based on Nation's Synthesis.

Figure 2 depicts the aforementioned functions in a holistic manner. In each country, a country-specific portal should be established by the collaborative efforts of the scientific and technological communities and other stakeholders for promoting dialogue between the two parties. The international and regional scientific and technological communities support the development and maintenance of the international portal, which can share data, information, knowledge, and experiences among countries and global and regional societies. UN agencies and international donor agencies are requested to support the efforts of each country and the international and regional scientific and technological communities.

By using these functions, the national platform of each country can facilitate dialogue between the scientific and technological community and other relevant stakeholders regarding the issues that should be addressed for the implementation of DRR measures using shared information and scientific knowledge, as well as the direction, goals, and actions that reflect the conditions of each country to contribute to the development of a DRR strategy that should be finalized by 2020 in accordance with the Sendai Framework. In addition, each country can promote these efforts so that they are extensively practiced in society and, more specifically, they become rooted at the municipal level, resulting in the countrywide improvement of disaster literacy. By sharing knowledge and experiences and co-designing the mechanism, global and regional academic organizations can support the scientific and technological community of each country. Moreover, UN agencies and international donor organizations can actively increase the DRR awareness of and finance the development and implementation of DRR measures in each country.

5. Conclusions

In 2015, the world agreed on the milestone accords pertaining to DRR, that is, the Sendai Framework for Disaster Risk Reduction 2015–2030. This agreement clearly emphasizes the global intention to build disaster-resilient communities and share scientific knowledge on disaster risks and DRR approaches. The Tokyo Forum 2017 agreed on the formulation of guidelines supporting national platforms for DRR by making the best use of science and technology and produced a synthesis report on disaster science and technology. Since countries are expected to lead the implementation of this agreement in

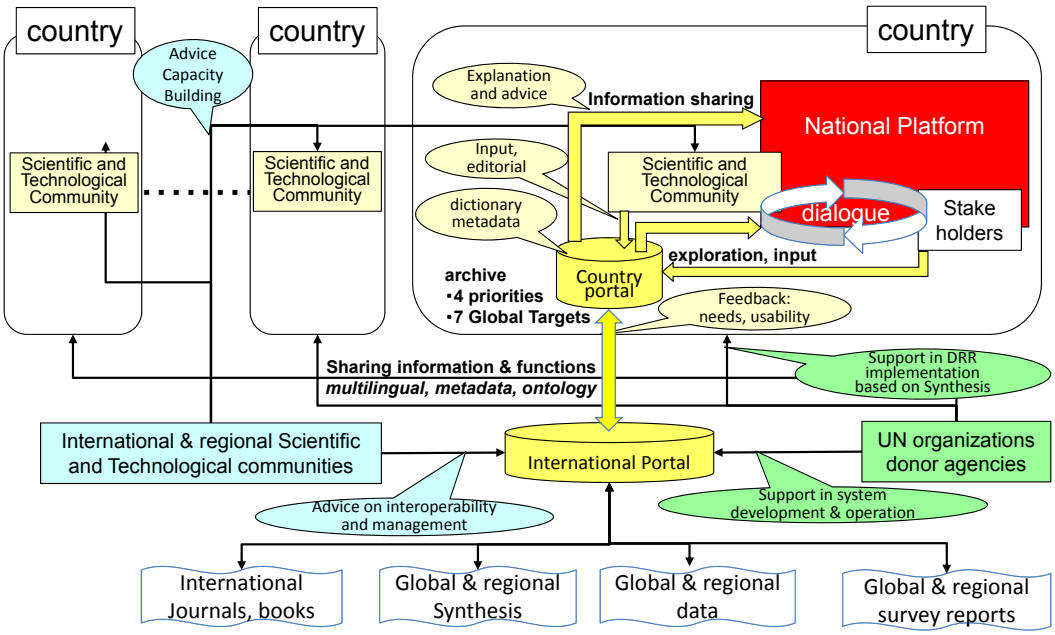


Fig. 2. Information infrastructure for Nation's Synthesis on DRR.

accordance with their regional conditions, they should develop a mechanism that allows all stakeholders to share information on DRR science and technology in their own language.

This paper proposes the development of Nation's Synthesis, which is defined as a mechanism that allows all stakeholders to share information on DRR science and technology, review the status and issues of ongoing DRR efforts based on scientific and technological knowledge, and enhance multi-sectoral discussion for designing and implementing practical DRR measures from a holistic perspective. To realize Nation's Synthesis, this paper proposes to develop functions for sharing information, knowledge, lessons learned, and good practices and promoting dialogue among various stakeholders, as well as international cooperation, to support individual countries and scientific communities in DRR activities.

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• A. Kawasaki, P. Koudelova, K. Tamakawa, A. Kitamoto, E. Ikoma, K. Ikeuchi, R. Shibasaki, M. Kitsuregawa, and T. Koike, "Data Integration and Analysis System (DIAS) as a platform for data and model integration: Cases in the field of water resources management and disaster risk reduction," Data Science J., Vol.17, No.29, pp. 1-14, 2018.
• A. Kawasaki, M. Henry, and K. Meguro, "Media preference, information needs, and the language proficiency of foreigners in Japan after the 2011 Great East Japan Earthquake," Int. J. of Disaster Risk Science, Vol.9, No.1, pp. 1-15, 2018.
• A. Kawasaki, N. Ichihara, Y. Ochii, R. A. Acierto, A. Kodaka, and W. Z. Win, "Disaster response and river infrastructure management during the 2015 Myanmar floods: a case in the Bago River Basin," Int. J. of Disaster Risk Reduction, Vol.24, pp. 151-159, 2017.

Academic Societies & Scientific Organizations:
• Sustainability Science Journal, Editor (2015-)
• Turkish Journal of Geographical Sciences, Editorial Advisory Board (2017-)
• Science Council of Japan (SCJ), Member (2018-)

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2005-2006 Japan Institute for Construction Engineering
2006-2008 Hokuriku Regional Bureau, MLIT
2008-2011 Kumamoto Prefectural Government
2011-2013 Japan International Cooperation Agency
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Selected Publications:
• "4. Effective planning for disaster risk reduction," I. Davis, K. Yanagisawa, and K. Georgieva (eds.), Disaster Risk Reduction for Economic Growth and Livelihood: Investing in Resilience and Development, pp. 67-82, Routledge, 2015.

Academic Societies & Scientific Organizations:
• Japan Society of Civil Engineers (JSCE)

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1992-1993 Visiting Scientist, Cornell University
1994 Associate Professor, Kyoto University
1998 Professor, Kyoto University

Selected Publications:
• "Encyclopedia of Natural Hazards and Disaster Risk Reduction," Maruzen Publishing, 2011 (in Japanese).
• "A high-resolution large-scale flood hazard and economic risk model for the property loss insurance in Japan," J. of Flood Risk Management, Vol.9, pp. 136-153, 2016.

Academic Societies & Scientific Organizations:
• Japan Society of Civil Engineers (JSCE)
• Japan Society for Natural Disaster Science (JSNDS), President
• Japan Society of Hydrology and Water Resources (JSHWR), President
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2016- Division Head, Disaster Management Bureau, Cabinet office

Selected Publications:
• Resilient Cities (OECD)
• Ageing in Cities (OECD)

Academic Societies & Scientific Organizations:
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Selected Publications:
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2013- Vice-President, Japan Water Agency

Selected Publications:
• "Disaster Risk Reduction for Economic Growth and Livelihood," I. Davis, K. Yanagisawa, and K. Georgieva (eds.), Chapter 6, Routledge, 2015.
• "From Yokohama Strategy to Hyogo Framework: Sharing the Japanese Experience of Disaster Risk Management," Asian J. of Environment and Disaster Management, Vol.2, No.3, pp. 249-262, 2010.
• "Incorporating Science and Technology for Disaster Reduction, The Japanese Experience," Planet@Risk, Vol.3, No.1, pp. 95-106, 2015.

Academic Societies & Scientific Organizations:
• Institute of Social Safety Science (ISSS)
• Business Continuity Advancement Organization (BCAO)
• Science Council of Japan (SCJ), Member

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2006-2009 Associate Professor, Research Center for Natural Hazard & Disaster Recovery, Niigata University
2009-present Professor, Risk Management Office/Research Center for Natural Hazard & Disaster Recovery, Niigata University

Selected Publications:
• K. Tamura and M. Inoguchi, "Proposal of Elements for Creating Scenarios for Those Needing Support During National Disasters," J. Disaster Res., Vol.11, No.5, pp. 870-880, 2016.

Academic Societies & Scientific Organizations:
• Institute of Social Safety Science (ISSS)
• Japan Society for Natural Disaster Science (JSNDS)
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2015- Vice President, College of Land, Infrastructure, Transport and Tourism, Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
2018- Professor, National Graduate Institute for Policy Studies (GRIPS)

Selected Publications:
• "Success Factors in Realizing Major Recommendation Items of "United Nations Secretary-General's Advisory Board on Water and Sanitation," an International Advocacy and Discussion Process on Water and Sanitation," J. of Japan Society of Hydrology and Water Resources, Vol.27, pp. 269-285, 2014.
• "Approaches by World Water Forum in Realizing Major Global Actions Related to Water and Sanitation," J. of Japan Society of Hydrology and Water Resources, Vol.27, pp. 286-303, 2014.

Academic Societies & Scientific Organizations:
• Japan Society of Hydrology and Water Resources

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2004- Kyoto University
2016- Integrated Research on Disaster Risk
2017- Keio University

Selected Publications:
• R. Shaw, K. Shiwaku, and T. Izumi, "Science and technology in disaster risk reduction: Potentials and challenges," p. 525, Elsevier Academic Press, 2017.
• R. Shaw, A. Rahman, A. Surjan, and G. Parvin, "Urban Risk Reduction: Asian perspective," p. 370, Elsevier Publisher, 2016.
• T. Izumi and R. Shaw, "Disaster management and private sectors: challenges and potentials," p. 342, Springer, 2015.

Academic Societies & Scientific Organizations:
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2015 Doctor of Engineering, Kyoto University
2017- Chief Researcher, ICHARM

Selected Publications:
• "Evaluation of the effects by implementing and improving the Flood Hazard Mapping Training Course," J. of Flood Risk Management, Vol.4, Issue 4, 2011.
• "World Water Actions – Making Water Flow for All," Earthscan Publications, 2003.

Academic Societies & Scientific Organizations:
• Japan Society of Civil Engineers (JSCE)
• Japan Society of Hydrology and Water Resources (JSHWR)