Paper:

Exploring the Possibility of an Online Synthesis System for Disaster Risk Reduction as a Tool to Promote "Consilience" of Knowledge and Practice

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This paper proposes an international collaborative project to construct an online synthesis system initiated by the Japanese National Committee for Integrated Research on Disaster Risk (IRDR). The purpose of this project is to facilitate knowledge consilience on disaster and environmental risk reduction by improving disaster resilience, which is an indispensable element of sustainable development. This system will provide a free internet environment, named Design Trend Press, for users in each country or region. All stakeholders involved in disaster risk reduction can make and register their own contributions in various forms on this system, using their own language in terms of seven targets and four priority actions specified in the Sendai Framework for Disaster Risk Reduction (SFDRR, or Sendai Framework). To make this project successful, an international advisory board should be established to supervise the ontology of the keywords to be used for the classification and categorization of individual entries.

Keywords: national synthesis, online system, disaster resilience, Design Trend Press, Sendai Framework for Disaster Risk Reduction

1. Introduction of Sendai Framework for Disaster Risk Reduction

In March 2015, the 3rd UN Conference on Disaster Risk Reduction was held in Sendai to adopt a proposal entitled "Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030" [1]. It is the basic document to guide global activities for disaster risk reduction (DRR) at local, national, regional, as well as global levels for the next 15 years until 2030. In SFDRR, "resilience" has become the main concept for disaster risk reduction. Resilience is defined in this document as follows, based on the 2009 United Nations Office for Disaster Risk Reduction (UNISDR) Terminology [2]: "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions."

To secure the improvement of disaster resilience, SFDRR sets seven targets for disaster risk reduction in Paragraph 18: four output targets and three input targets.

The four output targets are the disaster risks to be reduced:

1) global disaster mortality;
2) the number of affected people globally;
3) direct disaster economic loss; and
4) disaster damage to critical infrastructure and disruption of basic services.

The three input targets are the tools to be used to achieve the four output targets:

1) increasing the number of countries with national and local disaster risk reduction strategies by 2020;
2) enhancing international cooperation to developing countries; and
3) increasing the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people.

To achieve its seven targets, SFDRR introduces four priority actions in Paragraph 20 to be taken "within and across sectors" at every level. They are:

Priority 1: Understanding disaster risk;

Priority 2: Strengthening disaster risk governance to manage disaster risk;

Priority 3: Investing in disaster risk reduction for resilience; and

Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction.

The word "science" appears only once in SFDRR, in Paragraph 19(g), as follows: "Disaster risk reduction requires a multi-hazard approach and inclusive risk-informed decision-making based on the open exchange and dissemination of disaggregated data, including by sex, age and disability, as well as on easily accessible, up-to-date, comprehensible, science-based, non-sensitive risk information, complemented by traditional knowledge."

The abovementioned paragraph states that DRR should result from decision-making that, based on inclusive risk-information, applies to all hazards. Thus, the role of science in DRR should be summarized to have some mechanism to fulfill the following four requirements, that is, to:

1) support open exchange and dissemination of disaggregated data;
2) provide easily accessible, up-to-date, comprehensible, science-based, non-sensitive risk information for all decision makers;
3) evaluate individual information with reference to the seven targets and four priority actions proposed by the SFDRR; and
4) be complemented by traditional knowledge.

In 2015, two other significant frameworks were agreed in addition to SFDRR: Sustainable Development Goals (SDGs) and the Paris Agreement on climate change. All of these propose that improving disaster resilience is an essential element for sustainable development [3]. It is suggested that promoting science and technology for the improvement of disaster resilience by implementing the seven targets and four priority actions of SFDRR will be vital for global sustainable development.

2. Activities of the Japanese National Committee for IRDR Sponsored by the Science Council of Japan (SCJ)

Integrated Research on Disaster Reduction (IRDR) is a decade-long initiative in the field of science and technology. It was started in 2008 to deal with the challenges brought about by natural disasters by mitigating their impact and improving related policy-making mechanisms co-sponsored by the International Council for Science (ICSU), the International Social Science Council (ISSC), and the UNISDR. The Japanese National Committee for IRDR was established in 2009 as a committee of the Science Council of Japan (SCJ). In January 2015, the Japanese National Committee in collaboration with UNISDR took the lead to organize the "Tokyo Conference on International Study for Disaster Risk Reduction and Resilience" to clarify the role of science and technology in DRR. It resulted in the draft "Tokyo Action Agenda" and "Tokyo Statement," both of which were regarded as significant inputs for the adoption of SFDRR.

To secure the role of science and technology at the implementation phase of SFDRR, the Japanese National Committee held another international conference in October 2017 entitled "Global Forum on Science and Technology for Disaster Resilience 2017" to facilitate discussions and pursue steady implementation of the four action priorities of SFDRR. In the concept note for this forum, a concrete goal was set to motivate all stakeholders to implement four priority actions by developing the following two outputs by cooperating in an interdisciplinary and transdisciplinary way:

1) Guidelines for Strengthening DRR National Platforms and coordination mechanisms through enhanced contribution of Science and Technology and
2) Periodic Synthesis Reports on the state of Science and Technology for Reducing Disaster Risk.

Based on this forum, periodic synthesis is believed to be an important tool to promote the use of science in policy-making as well as to enhance coordination among scientific and technological research activities at national, regional, and global levels. Synthesis of scientific evidence should be realized in a timely, accessible, and policy-relevant manner. The report should include comprehensive knowledge and information on the state of science and technology related to the identification of disaster risks, the assessment of the socio-economic impact of disasters, and existing tools and methodologies for substantial reduction of human and economic losses. The information should be presented in a clear, easy-to-understand way for application by policy-makers and other decision-makers worldwide.

The Forum originally intended the development of integrated synthesis reports through the coordination of international scientific and technological research initiatives. This report would be published periodically (i.e., mid-term and final reports during the period of the Sendai Framework) to assemble the best practice for implementing four priority actions for the realization of the seven SFDRR targets. Collaboration should be strengthened not only among disaster risk reduction communities, but also in other areas closely related to disaster risk reduction, such as those concerning climate change mitigation, adaptation measures, and achievement of the sustainable development goals.

3. Plenary Session on Periodic Synthesis Reports at the Tokyo Resilience Forum 2017

In accordance with the forum's intention as set out above, a plenary discussion on the synthesis was held between 14:40 and 16:00 on the second day, titled "Plenary Discussion 7 Synthesis." It was co-chaired by Haruo Hayashi (NIED, Japan), Brian Doherty (EC JRC), and Rajib Shaw (Keio University, Japan), with five panelists and three commentators representing different disciplines, countries, and stakeholders.

The names and affiliations of the co-chairpersons, panelists and commentators are as follows:

The co-chairs for this session were Mr. Brian Doherty, Workpackage Leader/EC Joint Research Centre; Dr. Haruo Hayashi, President/National Research Institute for Earth Science and Disaster Resilience; and Prof. Rajib Shaw, Professor/Graduate School of Media and Governance, Keio University.

The six panelists were Prof. Alik Ismail-Zadeh, Secretary-General/International Union of Geodesy and Geophysics (IUGG); Dr. Brendan Barrett, Program Manager/RMIT University; Dr. Fumiko Kasuga, Senior Fellow/National Institute for Environmental Studies; Dr. Lauren Alexander Augustine, Director/Risk and Resilience Program National Academy of Sciences; Dr. Wei-Sen Li, Secretary General/National Science and Technology Center for Disaster Reduction, Taiwan; and Brian Doherty, Workpackage Leader/EC Joint Research Centre.

The three discussants/commentators were Prof. Charles Scawthorn, Professor/University of California, Berkeley; Dr. Rodrigo Rudge Ramos Ribeiro, postdoctoral researcher/São Paulo State University; and Mr. Aslam Perwaiz, Deputy Executive Director, Asian Disaster Preparedness Center.

In the panel session, Haruo Hayashi provided the overall direction of the synthesis report, focusing on its why, what, whom, and how. Ismail-Zadeh gave examples of previous attempts at synthesis reports and provided some crucial viewpoints on the issues to be addressed to ensure a reliable and well-accepted synthesis report. Augustine supported the concept of the synthesis report and commented on how science technology advancement has affected the progress of disaster risk reduction in the USA. Li provided an example from Taiwan, focusing on how science technology is currently used in high-level decision-making. Following this, two examples of science technology regional status reports were provided, one by Doherty on the European Union, and the other by Shaw on Asia. Both cases clarified the importance of periodic reports on science and technology in DRR. Kasuga provided examples of Future Earth initiatives and emphasized the need for integrated research and co-design of risk reduction solutions. Finally, Barrett provided examples of effective science communication at the inception stage of the periodic report. Subsequent to these interventions, Scawthorn commented on the need for an online synthesis report system, keeping in mind the evolutionary nature of technologies. Ribeiro pointed out the need for local-level examples to be included in the periodic report, and Perwaiz emphasized that the synthesis report needed to be multi-stakeholder in nature. An open discussion was conducted, which also highlighted the need to incorporate young researchers in the synthesis report. It was re-emphasized that the online system and report should be published by reliable sources.

Based on the above discussion, it was agreed that:

1) science and technology (S&T) solutions and development needed to be co-designed and co-delivered with other stakeholders, especially with the targeted users;
2) S&T advancement in DRR needed to have a balance of i) using S&T in decision making, ii) having appropriate investment in S&T, and iii) linking S&T to implementation and people's needs;
3) issues to consider are: i) synergy, ii) mechanism of realization, iii) stakeholders to work on the report, and iv) ways to enhance the impact of the report; and
4) periodic monitoring of S&T utilization was necessary for implementing SFDRR at national and sub-national levels.

The following recommendations stemming from Plenary Session 7 were put forward:

1. Produce an online synthesis system/platform on S&T;
2. Synthesize the online information periodically as the basic facts and findings for periodic reports to be compiled by the reliable authority/agencies;
3. Make the online system participatory by allowing people to use their own language;
4. Use automatic translation functions so that the system will be multi-layered with diversity in language, user groups (from policy makers to citizen to students), intervention level (from global to local), and age group (from senior to young scientists);
5. Link the online system to regional reports/synthesis initiatives;
6. Develop an appropriate governance structure where an authoritative body can monitor and control the quality of information, including its system updating and maintenance mechanisms; and
7. Make science communication the core of the synthesis report from its inception stage.

As for the relationship between regularly published reports and the online system, it is suggested that the regularly published reports would be a yardstick of S&T incorporation in SFDRR implementation, which has been accumulated and monitored continuously on the national online system. The online system will also enhance development of national S&T plans, provide good examples from different countries and regions, and contribute to higher DRR education in the country.

4. Online Synthesis System on Science and Technology on Disaster Risk Reduction

The plenary session concluded that an online synthesis system is preferred over periodic reports issued by some authoritative initiatives as the tool for promoting synthesis on science and technology on disaster risk reduction.

The next step should be to clarify the specifications of the proposed online synthesis system. At least the following six questions should be answered as for the system specifications:

1) Why do we need online synthesis reports?
2) What are the online synthesis reports?
3) What is included in the online synthesis reports?
4) To whom are the online synthesis reports addressed?
5) How often are the online synthesis reports updated?
6) What are the outcomes from the online synthesis reports?

1) Why do we need online synthesis reports?

Disaster risk reduction is inter-disciplinary and trans-disciplinary in nature, requiring different kinds of stakeholders to work together. It is important for everyone to have a clear understanding of what DRR is and what they should do. Online synthesis reports will be executive summaries of science and technology for DRR, with succinct updates of important points.

2) What are the online synthesis reports?

The online synthesis report is the national database system which will be operated for users' input and search in their native languages. This system will cover articles published for academic journals in the field of disaster risk reduction. The system will also accept any information products featuring local and national attempts at practicing disaster risk reduction with flexible input formats.

3) What is included in the online synthesis system?

The online synthesis system will emphasize a holistic approach, integrating all branches of science: natural, social, and applied sciences to cover all aspects of climate and DRR. The system will cover all phases of the disaster management cycle: mitigation, preparedness, response, and recovery. It will accumulate important facts and findings published not only by IRDR but also by Future Earth, Human Health and Wellbeing, etc., to secure the breadth of the content covered.

4) To whom are the online synthesis system addressed?

The online synthesis system should be the tool to bring various communities together: science, policy, and operation communities. People at risk or affected, policy makers/practitioners, the business sector, educators and the science and technology community, all of these stakeholders will be the users of this online synthesis system.

5) How often are the online synthesis reports updated?

Existing published reports on DRR tend to be published only every two to three years in conjunction with major international conferences. In contrast, the online synthesis system provides "real-time" and "continuous" updates as the basis for future published reports.

6) What are the outcomes from the online synthesis system?

By promoting participation by all stakeholders, the online synthesis system helps to identify gaps and opportunities in scientific knowledge for future research funding, as well as in education curricula for increasing awareness of disaster risk reduction.

5. Lessons to Be Incorporated for Improving Our Online Synthesis System

5.1. Lessons from "Science for DRM" by DRMKC

The Disaster Risk Management Knowledge Centre (DRMKC), an initiative of the European Commission, publishes its "Science for Disaster Risk Management (DRM)" report every three years. The latest report was published in 2017, and the next one is being prepared for publication in 2020. This report series may well be assessed as one of the best existing regional syntheses in the field of disaster risk reduction in terms of both quality of contents and the fairness of its editing processes.

As a good example of the subjects covered in the synthesis report on science and technology for disaster risk reduction, let us consider the contents of "Science for DRM" by comparing the chapter titles of the 2017 and 2020 editions. If the contents of these two editions are consistent, it suggests that what is to be synthesized would be apparent in this field. **Table 1** reflects the comparison results.

It is determined that there are at least three common premises upon which the two reports are edited:

1) multi-hazards approach;
2) disaster management cycle approach; and
3) mainstreaming of disaster risk reduction.

However, the table of contents for each edition was different. There was only one common chapter in both editions, namely disaster risk communication. However, what is covered under disaster risk communication differs in the two reports, even though they have the same chapter title. Each report emphasizes different but indispensable aspects of the synthesis of disaster risk reduction. Thus, it is suggested that there is no established standard content structure for reporting synthesis of disaster risk reduction. Creating such standard contents structure will be a new initiative to be accomplished by determining which individual contribution would be systematically categorized for the synthesis of knowledge.

As a first approximation for such standard content structure, the following table of contents may be used as a starting point for synthesis, based on the contents covered in the two reports of "Science for DRM" under review. This set of knowledge seems to be useful to evaluate and monitor the implementation of SFDRR priority actions numbers 1 to 4.

Table 1. Tables of contents of "Science for DRM 2017 and 2020."

Science for DRM 2017	Science for DRM 2020
1 Current status of disaster risk management and policy frameworks	1 Introduction
2 Understanding disaster risk: risk assessment methodologies and examples	2 Integrating the Risk Management Cycle
3 Understanding disaster risk: hazard related risk issues	3 Assets at Risk and Potential Impacts
4 Communicating disaster risk	4 Communicating Disaster Risk to All
5 Managing disaster risk	5 Global Synergies of EU
6 Future challenges of disaster risk management	6 Conclusions and Final Recommendations

1. Current status of disaster risk management and policy frameworks (Priority Action: PA 1)
2. Integrating the Risk Management Cycle (PA 1)
   2.1 Risk Assessment
   2.2 Risk Management Planning
   2.3 Implementing Risk Management Measures
3. Understanding disaster risk: hazard-related risk issues (PA 1)
   3.1 Geophysical risk
   3.2 Hydrological risk
   3.3 Meteorological, climatological, and biological risk
   3.4 Biological risk: epidemics
   3.5 Technological risk
4. Assets at Risk and Potential Impacts (PA 1)
   4.1 Methodologies for Disasters Impact Assessment
   4.2 Population
   4.3 Economic Sectors
   4.4 Critical Infrastructures
   4.5 Environment and Ecosystems
   4.6 Cultural Heritage
5. Communicating disaster risk (PA 2)
   5.1 Public perception of risk
   5.2 Decision-making under uncertainty
   5.3 Last-mile communication
   5.4 Good practices and innovation in risk communication
   5.5 Linking stakeholders, sectors, and governance levels
   5.6 Citizen participation and public awareness
   5.7 Integrating tools for prevention and response communication systems
6. Managing disaster risk
   6.1 Prevention and mitigation: avoiding and reducing new and existing risks (PA 4)
   6.2 Preparedness and response (PA 4)
   6.3 Recovery and avoiding risk creation (PA 4)
   6.4 Risk transfer and financing (PA 3)
7. Future challenges of disaster risk management
   7.1 To scientists
   7.2 To policy-makers
   7.3 To practitioners

To decide what individual information to include in the synthesis report, some kind of international authoritative mechanism should be established to discuss, decide, and update the structure for synthesis of knowledge for DRR. The DRMKC adopts participatory, holistic, and transparent procedures for compiling "Science for DRM." This provides an example of good practice for the process to be used for the synthesis of knowledge on DRR. Let us review the soliciting process for potential contributions accepted by the DRMKC. A public call was made for soliciting possible authors, reviewers, and advisors who wish to contribute from December 2017 to February 2018 to the "Science for DRM 2020" report, based on the specific workplan. In June 2018, selected contributors will be informed and asked to develop their inputs and proposed contents. In this selection process, DRMKC made available four documents that regulate the contributor solicitation process:

1) Terms of reference;
2) Workplan;
3) Table of Contents description; and
4) Table of Contents matrix.

Terms of Reference defines "Background" as describing what the report is; "Expectations" as defining the objectives of the report; "Scope" as specifying the types of potential contributors; "Organizational Structure" as describing the editing processes; and "Assessment Criteria" for selecting the contributors. "Workplan" indicates a draft calendar of key milestones toward the publication of the report.

The editing style adopted by DRMKC for creating "Science for DRM" reports seems to follow the "peer review" practice used for academic journals, which is widely accepted in the field of material sciences. The question is whether the current peer review system is the best method to select high-quality performance for knowledge synthesis relevant to disaster risk reduction because accumulated information tends to be biased or limited to English language contributions mainly by academically trained people. In SFDRR, to understand disaster risk, the use of "traditional, indigenous and local knowledge and practice" is emphasized in paragraph 24(i) to "complement scientific knowledge" in disaster risk reduction. It is suggested that collecting scientific knowledge may not be good enough. Traditional/indigenous/local knowledge and practice should also be systematically collected as an indispensable element for knowledge synthesis in disaster risk reduction. It is a new task for the synthesis to establish a mechanism to systematically collect both traditional/indigenous/local knowledge and scientific knowledge of high quality in each field of the four priority actions and seven targets. The significant feature of this report is the breadth and thoroughness of the subjects it contains, as well as its participatory, holistic and transparent creation process.

5.2. Lessons from "Chinotogo" or Consilience of Knowledge by the Science Council of Japan (SCJ)

Despite many challenging attempts to publish periodic synthesis reports on disaster risk reduction, losses due to disasters are still increasing in both developed and developing countries [3]. It might be the result of too much fragmentation and specialization of knowledge in the current science and technology for disaster risk reduction. A "sense of unity" may be lost, which will hamper a total understanding of the problems. To achieve a significant reduction in mortalities and losses due to disasters, it will be required to integrate all kinds of knowledge and wisdom in a coherent manner. Thus, significant realization of knowledge consilience is required. In this paper, consilience of knowledge is defined as "transdisciplinary unification of science and technology" [4]. Even though consilience or unity of knowledge – "Chinotogo" by SCJ – has been recognized as an important topic among science and technology communities as exemplified by a series of three recommendations issued by SCJ on "Chinotogo" between 2007 and 2017, there is no standard method in practice yet to unify the necessary knowledge. Our online synthesis system is intended as an attempt to propose a possible standard method for unifying the necessary data, information, knowledge, and wisdom for disaster and environmental risk reduction.

In the first recommendation issued by SCJ in 2007, three types of sciences were introduced as sub-categories of sciences, based on their respective order principles, or nature of sciences: material, bio, and social. The order principle for material sciences is "law," which will not allow any exceptions or changes. "Genetic program" is the order principle for bio sciences, which will allow changes but no exceptions. Social sciences follow "linguistic program" as their order principle, which may allow both changes and exceptions. How could the science and technology for disaster risk reduction be defined? Can it be defined as a discipline of material sciences or does it extend to including bio sciences and social sciences in addition to material sciences? Research on hazards may fit in with material sciences, but both disaster management cycle and mainstreaming of disaster risk reduction clearly include the subjects contained in bio-sciences and social sciences. It suggests that order principles of science and technology for disaster risk reduction may be a mixture of laws, genetic programs, and linguistic programs. To unify the necessary data, information, knowledge, and wisdom in the field of disaster risk reduction, these differences in order principles should be taken into account in designing an online synthesis system.

A 2007 SCJ recommendation made another insightful distinction between the types of science: "cognizing science" and "designing science." "Cognizing" science is the science of studying and exploring "what it is" as exemplified by material sciences. In contrast, "designing" science studies "what it should be." Science and technology for disaster risk reduction exist for reducing damage and losses due to disasters. Thus, science and technology for disaster risk reduction will not resort within material sciences only. In other words, designing science is also needed for science and technology for disaster risk reduction science since it contains aspects of bio-sciences and social sciences. It should be noted that this does not mean that there are two separate sciences – one for cognizing and another for designing. Every scientist and engineer should be aware in their own research and development that exploring what it is and making it what it should be are two sides of one coin. Since the present status of the three priority actions from SFDRR – governance, investment, and practice for Build Back Better – needs to be changed for improvement, designing science for disaster risk reduction should be part of knowledge synthesis for disaster risk reduction.

In the field of disaster risk reduction, the latest and advanced science-based technological solutions are not always the best solution. Cases of local technology, which have been used for many years, may often work effectively and affordably. In the former case, those who find or invent such solutions may receive high peer assessments from their professional community, while nothing will happen in the latter case. This might put biased pressure on them to look for a new and advanced solution for disaster risk reduction without considering the feasibility of its implementation. However, it is important to evaluate any solution in terms of the real contribution it can make to reduce the damage and losses due to disasters, and not by whether it is a new solution in that particular area. Thus, it is suggested that a proper social scientific evaluation should be performed of each science-based technological solution in terms of effectiveness, affordability, and sustainability as a solution for disaster risk reduction.

Thus, in this paper it is proposed to divide designing science further into two subcategories: "innovation" and "implementation" sciences. The "innovation" aspect of designing science focuses on the development of such solutions, which the peer professional community may accept as a totally new solution. Such solution could be engineered in nature. It could also be an invention of a new legal system for DRR. In contrast, the "implementation"

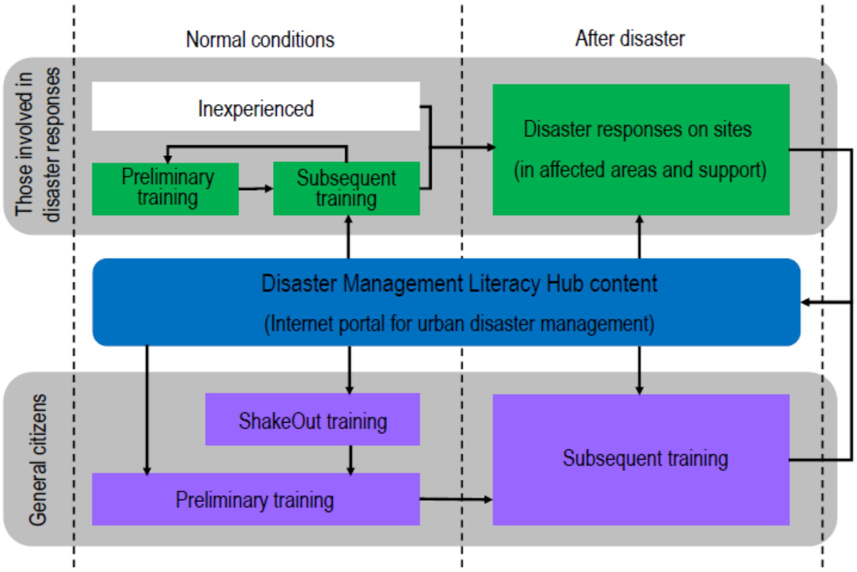

Fig. 1. Four major use cases of Disaster Management Literacy Hub.

aspect of designing science focuses on the dissemination of the best available solutions as traditional and indigenous knowledge. They may be verified somewhere else as being useful and will become a suitable and satisfactory solution for the target locality. No matter how different the style of these two aspects of designing science may appear, they should be treated as equally valuable attempts in the practice of designing science for DRR.

In a 2011 recommendation from SCJ, it is proposed to have the right time, right place, and right people to realize the consilience of knowledge. In other words, it is necessary to establish a forum where potential leaders for promoting consilience can gather to seize the opportunity for its realization. As the first step, it emphasized the importance of constructing an integrated knowledge base. A 2017 SCJ recommendation proposed that major research projects to design some social systems tend to serve as opportunities to facilitate consilience of knowledge. It is our conclusion that we should initiate the development of an online synthesis system as the first step toward the consilience of knowledge for disaster risk reduction.

5.3. Lessons Learnt from "Disaster Management Literacy Hub"

As an attempt at constructing an online synthesis system, the "Disaster Management Literacy Hub (DMLH)" project collects, creates, and transmits various contents on disaster management over the internet. The DMLH project, which was funded by the Japanese Ministry of Education, Culture, Sports, Science and Technology, has been in use since 2014. It is powered by "Design Trend Press (DTP)" as its online information management engine. DMLH has been named with the objective to increase the literacy of both the general public and those involved in disaster management before, during and after disasters (**Fig. 1**). As of May 2018, DMLH contains over 5,000 websites on DRR available in Japanese. Users can browse all relevant websites by entering keywords on topics they want to research.

Design Trend Press was originally constructed for an individual contributor to post his/her content that may be helpful to improve disaster management literacy. This system allows contributors to easily transmit and share anything from a single image to an entire website. Posted content is tabulated on tiles within the common area. Collected information in the common area will be classified and organized by its site manager. Then, by searching and comparing structured information, new information products will be created. The common area can be displayed in long vertical or horizontal rectangular tiles based on keywords as shown in **Fig. 2**. This can be switched using the switch button on the right-hand side of the screen. In the vertically long tiles display, six content entries can be tabulated per line to grasp a big picture easily. In contrast, in the horizontal long tiles display, description texts are easily read because more content will be displayed for each entry. Design Trend Press provides a set of predetermined keywords which can be used as filters to assist searches, e.g., responses immediately after a disaster, safety confirmation, evacuation, shelters, temporary houses, housing, fire, extinguishing, ease of mind and body, volunteer, lifeline, and infrastructure. In addition, any user can provide his/her own keywords to find relevant entries for their own search. Users can also refresh their keyword list whenever they want to. More details are available in a JDR paper by Kimura et al., published in 2017 [5].

Design Trend Press can be used as the information processing engine for the synthesis of information and knowledge for disaster reduction, at least for Japan. It would be welcomed if this engine could be adopted as na-

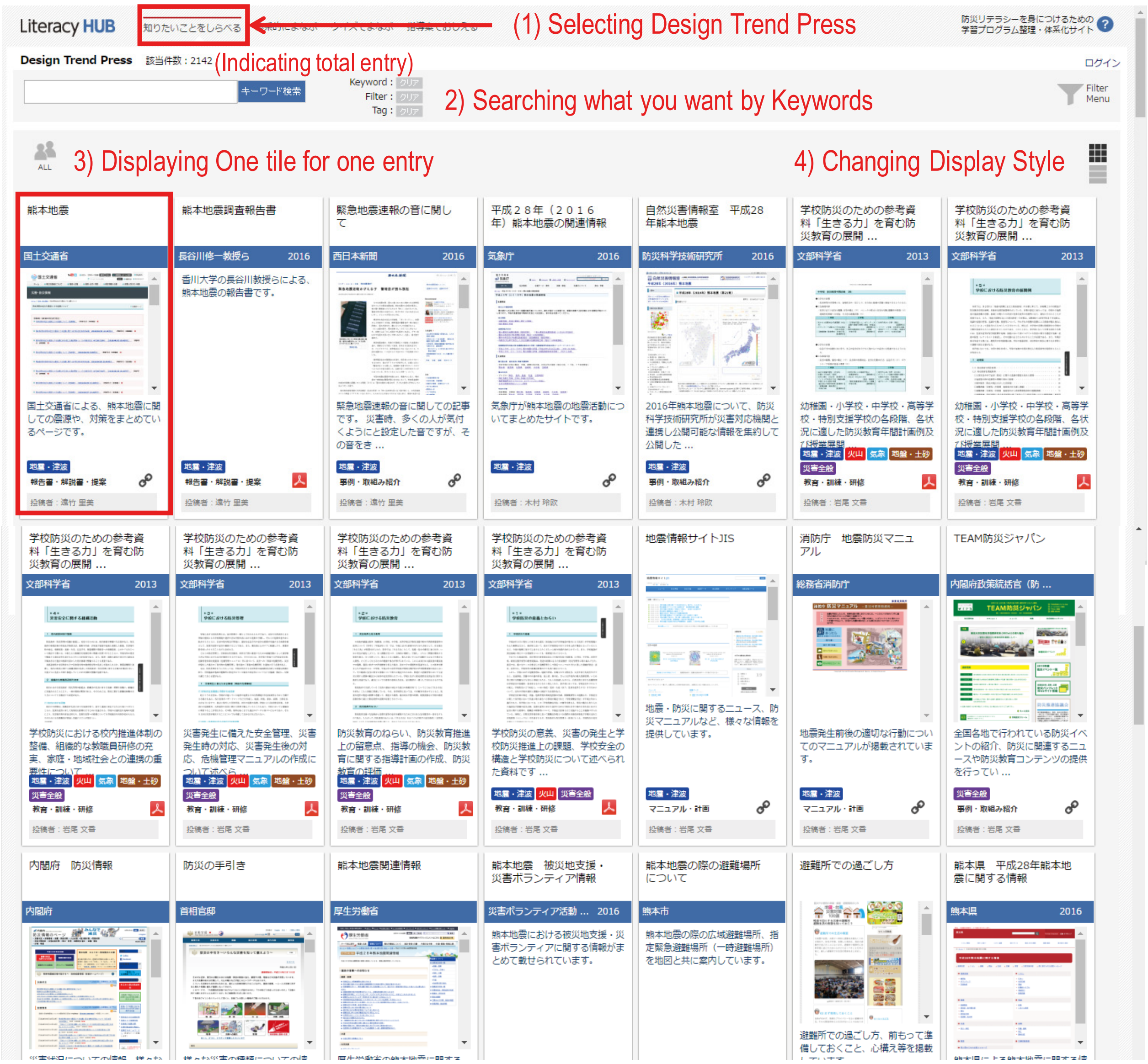

Fig. 2. Images of individual entry to Design Trend Press.

tional platforms for other countries or regions to function as a common basis for synthesis of knowledge in the field of disaster risk reduction. In adopting Design Trend Press in other countries or regions, automatic language translation tools such as Google translator will be added so that all stakeholders in that country or region can create their own nation's synthesis mechanism in their own language. It is our intention that such online synthesis system will not only lead to deeper academic understanding of disasters in the target country or region, but also improve governance, facilitate disaster investment, and prepare for building back better.

6. Conclusion

The Japanese National Committee for IRDR will launch an international collaborative project to construct an online synthesis system to facilitate the consilience of knowledge on disaster and environmental risk reduction. This project intends to

1. contribute to improve disaster resilience which is an indispensable element for sustainable development;
2. monitor continuously all significant progress made in the seven targets and four priority actions specified in SFDRR at local, national, regional, and global levels;
3. provide a free internet environment for each country or region by which all stakeholders involved in disaster risk reduction can make and register their own contributions in various forms, using their own language;

4. use Design Trend Press as an engine for information processing with the support of automatic translators such as Google;
5. establish an international advisory board to supervise the ontology of keywords which will be used for classification and categorization of individual entries;.
6. solicit some country or regional entity interested in this project to start a small prototype project to explore the feasibility of an online synthesis system in collaboration with the Japanese National Committee for IRDR;
7. appreciate any financial support for the eco-system of this project by donors who want to contribute to disaster risk reduction.

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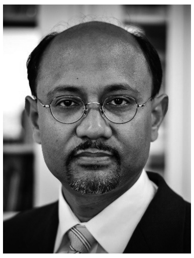
Academic Societies & Scientific Organizations:
• Institute for Social Safety Science (ISSS)
• Japan Society for Natural Disaster Science (JSNDS)
• Japan Emergency Management Association (JEMA)



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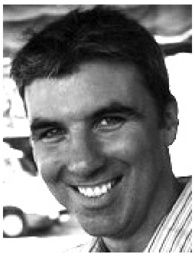
2004- Kyoto University
2016- Integrated Research on Disaster Risk
2017- Keio University

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:
• Japan Society of Natural Disaster Science



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Selected Publications:
• F. Riccardo, M. Shigematsu, C. Chow, C. J. McKnight, J. Linge, B. Doherty, M. G. Dente, S. Declich, M. Barker, P. Barboza, L. Vaillant, A. Donachie, A. Mawudeku, M. Blench, and R. Arthur, "Interfacing a Biosurveillance Portal and an International Network of Institutional Analysts to Detect Biological Threats," Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science, Vol.12, Issue 6, pp. 325-336, 2014.