International Knowledge Centre
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联合国教科文组织国际工程科技知识中心

Disaster Risk Reduction
Knowledge Service
防灾减灾知识服务

Summary of The Third International Workshop for Disaster Risk Reduction Knowledge Service

Institute of Geographic Sciences and Resources Research, Chinese Academy of Sciences

Disaster Risk Reduction Knowledge Service System of International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO (IKCEST)

2020.1

Summary of The Third International Workshop for Disaster Risk Reduction Knowledge Service

The Third International Workshop for Disaster Risk Reduction Knowledge Service was held on 13 and 14 December 2019, in Beijing, China. Organized by the Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR, CAS), the workshop was co-hosted by the International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO (IKCEST) and Section on Earth Sciences and Geo-Hazards Risk Reduction, United Nations Educational, Scientific and Cultural Organization (UNESCO DRR). Mr. SONG Dexiong, Director-General of the Department of General Administration of Chinese Academy of Engineering (CAE), and the executive deputy director of IKCEST; Mr. Philippe PYPAERT, programme specialist for Natural Sciences, UNESCO Office in Beijing; Prof. SUN Jiulin, CAE Member; Prof. CUI Peng, CAS Member; Dr. LIU Chang, Deputy Director of the Division of Information Infrastructure & Resources, General Administration Department of CAE, and the director of Division of International Cooperation, IKCEST; Ms. FENG Kai, Deputy Director of the Division of International Organization, Bureau of International Cooperation, CAS; Prof. GAO Xing, Deputy Director of IGSNRR, CAS; Ms. Gretchen Kalonji, former Assistant Director-General of UNESCO and the dean of the Institute for Disaster Management and Reconstruction, Sichuan University-Hong Kong Polytechnic University; Mr. HAN Qunli, Executive Director of the International Project Office of Integrated Research on Disaster Risk (IRDR); and Dr. Oyunsanaa BYAMBASUREN, Director General, Department of Forest Policy and Coordination, Ministry of Environment and Tourism, Mongolia, participated in the workshop. Nearly 80 experts and scholars from 8 countries, including China, the United States, Japan, Germany, Russia, and the Disaster Risk Reduction Knowledge Service (DRRKS) project team attended the workshop. The workshop was broadcast online to the world on the Zhiling live platform, and more than 13000 users watched it.

In the opening session, Mr. Soichiro YASUKAWA, programme specialist and coordinator for Disaster Risk Reduction and Resilience, UNESCO Section on Earth Sciences and Geo-hazards Risk Reduction, gave a video speech. Mr. PYPAERT presented a report on ‘UNESCO’s Contribution to Disaster Risk Reduction for Regional DRR and DRR in Big-data’. Mr. SONG, on behalf of IKCEST; Ms. FENG,

on behalf of the Bureau of International Cooperation, CAS; and Prof. GAO, on behalf of IGSNRR, CAS gave welcome speeches. Prof. WANG Juanle, Executive Director of DRRKS, moderated the opening ceremony.

During the keynote speech session, Prof. CUI presented a report on 'A new solution for flash flood and debris flow: Disaster prediction and integrated risk reduction'. Prof. Gretchen KALONJI delivered a speech on 'New models for multinational collaborations on undergraduate degree programs in integrated disaster sciences and management'. Mr. HAN Qunli presented a report titled 'Formulation of a new international DRR research agenda toward 2030 - an update from IRDR'. Dr. BYAMBASUREN presented a report on 'International cooperation on wildland fire management'. Prof. WANG presented a thematic report on 'DRRKS System progress in IKCEST'. Participants conducted discussions and exchanged ideas on the theme report. Dr. LIU and Mr. PYPAERT presided over the discussion of the keynote report and the thematic report, respectively.

In the panel discussion session, experts focused on the topics 'Regional Disaster Risk Reduction' and 'Disaster Risk Reduction in Big-data' and carried out academic exchange and group thematic discussions. Experts from the University of Nottingham Ningbo China; Institute for Complex Analysis of Regional Problems, Far-Eastern Branch, Russian Academy of Sciences; National University of Mongolia; Centre for Disaster Mitigation - Bandung Institute of Technology, Indonesia; Karakoram International University of Pakistan; and other institutions reported the progress of regional disaster risk reduction. Experts from Public Works Research Institute, Japan; Quaid-i-Azam University of Pakistan; Beijing Normal University; China Earthquake Networks Centre; Baidu Company of China; and other institutions reported and exchanged results on big data and information technology applications. Prof. WANG and Ms. Jutta May (an expert on information and knowledge management) presided over the panel discussion of these two topics, respectively.

Combined with thematic discussions, the participating experts and audience gave good suggestions on the vision and development of the DRRKS System of IKCEST. On the second day of the conference, the participants were taken on a culture tour of the Forbidden City.

The main content discussed at the conference included the following points.

1. Disaster risk reduction is a global common mission. Disaster risk reduction has increasingly become an important concern for the United Nations. It is a common mission of the Sendai Framework for Disaster Risk Reduction 2015-2030, the United

Nations Sustainable Development Goals, and the Paris Agreement on global climate change, as well as a long-term focus and service area of UNESCO.

2. Positioning of the DRRKS System. DRRKS, promoted by UNESCO and IKCEST, aims to provide data, information, and knowledge services for disaster risk reduction. DRRKS is positioned as a user-oriented service system, which has insight into user needs and provides user-oriented solutions. DRRKS is also a platform for cooperation. It can act as a bridge and hub of disaster risk reduction knowledge through cooperation at global, regional, national, local, and other levels.

3. Progress of the DRRKS System. DRRKS expanded disaster metadata in 2019 and improved its draft standard. DRRKS completed the construction and upgrade of 74 disaster data resources, with 444,600 data volumes, and compilation of data resource catalogues. DRRKS also upgraded three knowledge applications, including the knowledge application of Map Visualization Services of China Historical Disasters, and added three new knowledge applications, including Application of Hazard-formative Environments Knowledge Service of 'the Belt and Road' region. DRRKS also completed the upgrade of the DRR system portal. The number of users visiting the portal has increased steadily, with 17,973 views per month, and the international visits account for 48.45% on average. The international cooperation network is expanding every year.

4. Disaster monitoring and simulation system. Chinese scholars have initially constructed a disaster simulation and risk analysis system for mountain areas, with functionalities such as disaster simulation, risk prediction, risk governance, and risk management. In addition to a prototype of the system, a demonstration system was initially established in the Liangshan area of Sichuan. Through this demonstration project, it was hoped to increase the vegetation cover by 20%, increase the engineering effect by 50%, reduce the disaster incidence by 50%, reduce the scale of the disaster by 30%, and ensure the safety of 10,000 people and their property.

5. Role of Big data in disaster risk reduction. DRRKS has carried out the public sentiment analysis of disaster events based on the information gathered from social media, and established the post-disaster emotional change network diagram. The I-REACT system of European Union is conducting a similar research. Experts from Beijing Normal University also shared the Weibo information mining and utilization in the typhoon event Lekima, the Weibo data analysis after the Changning earthquake, and the application of algorithms to obtain and optimise the seismic intensity maps and assess the population and loss in the disaster area.

6. Progress has been made in rapid disaster mapping. Based on high-resolution satellites, modelling analysis is conducted to identify the buildings damaged by earthquakes. The experiment shows that the model parameters can be trained in five days, and the rapid information acquisition and mapping can be completed in three minutes. At present, Sentinel-2A satellite images are being used to obtain the monitoring results in urban areas with a resolution of 10m-2.5m. Preliminary experiments were carried out in Qingdao, Shanghai, Wuhan, and other cities; in Yushu, Lushan, Ludian, and other earthquake-stricken areas; and in Japan, Indonesia, and other earthquake-prone countries.

7. University education on disaster risk reduction. It is hoped to create new interdisciplinary undergraduate disaster education courses that focus on the health effects of disasters. In addition to the compulsory courses, students must participate in international cooperative research projects. In this process, students will be encouraged to find a real project. That means, you really need data to solve this problem. At present, the Himalayan University Alliance, headquartered in Kathmandu, the capital of Nepal, includes 50 to 60 universities in the area. It is hoped that more schools will join the alliance in 2022.

8. Disaster risk reduction and development security. In looking forward to the future, IRDR points out that it is necessary to be able to prevent risks and manage uncertainties. That is, we start from the science of disaster risk reduction and end at how to use science so as to ensure development security. In the next round of discussions, IRDR will focus on issues, such as what is the concept of risk in today's fragile and complex environment, and how can we conduct scientific and academic research on disaster risk reduction more quickly and effectively.

9. Disaster prevention in coastal areas. Chinese scholars shared cases of disaster prevention in coastal areas. Typhoons can cause storm surges, which will raise the water level, and may result in direct inundation. Hong Kong and Macao are susceptible to typhoons. For example, the seawater poured into a parking lot during a disaster in Hongkong, eight people sat in the car and were drowned within one minute. The rise in sea level caused by climate change is a threat to coastal areas. As per reports, the sea level could rise by 0.59 metres in 2100. Therefore, the government needs to do a lot of work to improve coastal infrastructure, for instance, the establishment of breakwaters. In some cases, the seawater backflow in coastal areas may also impact freshwater aquaculture. In response to disasters in the coastal areas, public sectors are cooperating by helping residents transfer supplies and resettle. The

government has established huge floodway to divert flood water away from the city centre. Optimum use of multi-source big data to provide more information services is needed. For example, the Water Resources Department of Guangdong Province provides information services not only to Guangdong region but also to Hong Kong and other surrounding areas.

10. Flood and typhoon disaster prevention. Japanese scholars have shared their experience in flood and typhoon disaster prevention, which mainly focuses on three aspects. The first is research, which focuses on the water disaster models. Using satellite image data and ground observation data in the model, the probability of precipitation and flood can be predicted. The second is capacity-building. Masters and doctoral students will participate in it, and they will also cooperate with international institutions; for instance, many students partner with UNESCO. The third is the work of the Typhoon Committee. The Typhoon Committee is an intergovernmental agency under the World Meteorological Organization. As the head of the working group on hydraulics, Japan has made a significant contribution to the Typhoon Committee. For example, guidelines are provided for flood hazard mapping.

11. Earthquake disaster prevention. Rocks contain elements such as Radon and Uranium, which are substructures contained in the rock structures. Pakistani scholars shared research cases in which Radon was used to monitor earthquakes. Radon concentrations were very high during the Haripur earthquake in 2010 and Pala earthquakes in 2015 in Pakistan. Some active volcanoes can also be monitored by Radon. Experts from the China Earthquake Network Centre introduced the data transmission of China's earthquake monitoring. In the next few years, more earthquake monitoring stations will be built, which can realise about 50,000 data packets per second. The data collected can be used to describe and analyse various aspects of research on earthquakes.

12. Wildfire disaster prevention. Mongolian scholars introduced the global wildfire monitoring network, which currently has 14 regional nodes. The characteristics and causes of wildfires are different in different areas. The problem of burning agricultural land mainly exists in Eastern Europe and extends to the Polar regions. Areas in many Eastern Europe countries are abandoned, vegetation is left unmanaged, and fires are prone to occur because of which people move to the big cities. Some countries make full use of local resources to improve the ability to prevent forest fires. For example, in the eastern part of Germany, abandoned tank cars are transformed into forest fire rescue vehicles. The fire monitoring centres have been

able to calculate the movement and source of fire in real time, and enhance the sharing of information.

13. High temperature and heatwave disasters. Two institutions in Russia are researching the impact of climate change on human health. One such institution is in Russia, whose research is mainly focused on the changes in microorganisms, which is a comparatively micro research. Another is located in Birobidzhan, and the research focus of this institution is the relationship between climate change and cardiovascular diseases. The hardest thing about doing this research is finding the right data. At present, it can only be measured by mortality rate on daily scale. The study found that young people and the elderly over 60 years of age are the most vulnerable groups. During high temperature and heatwave, humidity in many places is very high, which puts more burden on the human body.

14. Regional disasters in Mongolia. Mongolia is a large agricultural country, and the number of livestock is increasing rapidly. Recently, the number of livestock exceeded 60 million, while the population here is only 3 million. The central and western regions of Mongolia are areas with high livestock density. The northern and central regions are places with a high frequency of natural disasters. The classification of natural and man-made disasters shows that the main disasters are forest fires, plain fires, building fires in urban areas, and biological disasters. Winter snow disasters have a great impact on livestock, and a lot of livestock die from hypothermia, especially in the western region of Mongolia. The arid areas are mainly in the southern and western regions of Mongolia. The mortality rate due to natural and man-made disasters was on the upswing before 2008, but declined until 2014, and is now rising again. The disaster with a high mortality rate are water-related disasters. Many people drown in summer, but they also die in winter because of ice cracks in the rivers and lakes. The mortality rate from building fires is also high. In addition, there are accidents related to illegal mining activities. Nowadays, Mongolia is facing serious desertification problems in the western and southern regions.

15. Disasters along Karakoram Highway in Pakistan. The Karakoram highway is surrounded by the Karakoram Range, the Himalayas, and the Hindu Kush Mountains and encompasses about 550 square kilometres. The mountain areas have a large elevation drop, ranging from few kilometres to 8,600 metres, and have the second highest mountain in the world. This area is connected to the Indian plains. Disasters such as falling rocks, floods, mountain floods, and glaciers occur frequently. Glaciers are very easily affected by climate change. The melting of glaciers in

Gilgit-Baltistan (GB) area is very serious, and the glacial lake collapse disaster will affect other areas. There are two well-known glaciers in the region, the Shisper Glacier and the Hunza Glacier, which are very active. Floods caused by melting glaciers can create barrier lakes. There are more than 3,400 glaciers in the region, 36 of which are potentially dangerous glacial lakes. In addition, the weather is extreme and harsh, and more than 7 million people in GB and KP are at risk. An overall 1.2% of the GB area is covered by forest, 1.66% by mixed forest, 32% by grassland, 1.36% by agricultural land, 28.60% by glaciers, and 0.34% is water. Glaciers begin to melt in the summer season, resulting in landslides. This region is backward and introduced higher education only in 2008. Therefore, there is an urgent need for disaster prevention and international cooperation in the region.

16. Big data disaster risk reduction technology analysis. Baidu introduced the big data analysis concept of human social information, space and physical world. It mainly showed application of big-data in fire monitoring and assessment, tailing ponds monitoring and assessment, buildings and facilities loss assessment, and emergency rescue road network analysis of chemical industry parks, etc.

17. Cooperation from all walks of life. U-INSPIRE is a platform for disaster risk reduction established by young people and young professionals in science, engineering, technology, and innovation. It was started in Indonesia in 2018. It has branches in eight different regions, including Tajikistan, Philippines, Maldives, and Vietnam. U-INSPIRE conducts earthquake and flood disaster emergency drills on Matava Island, uses GIS technology to compile disaster risk maps, and submits them to local governments. U-INSPIRE cooperates with private companies, especially nongovernmental organisations. For example, U-INSPIRE has cooperated with ASB from Germany and has created a baseline for a safe school project. In Mongolia, insurance companies have participated in cooperation projects for disaster risk reduction. For example, compensation should be given in case of a large number of livestock deaths. Disaster risk reduction in Russia is carried out with government support, and no private enterprises are involved. The China-Pakistan Joint Research Centre for Earth Science, jointly established by the Chinese Academy of Sciences and the Higher Education Commission of Pakistan, will also play an important role in regional disaster risk reduction.

18. Suggestions for the DRKKS System. (1) There are common problems related to scientific and operational use of disaster data, such as data acquisition, data quality, and data sharing. 35 different transport institutions sat together and

emphasised how we can make full use of the information and data after the 2016 Kaikōura earthquake in New Zealand. Six countries in the Pacific region and four Asian countries can be seen in the world risk index 2019 among the top 20. However, small Pacific countries with a population of less than 10,000 have not joined this index. The index data representing 27 indicators comes from statistical models while not being validated by each country. (2) DRRKS's foreign visitors are increasing. The demand for user interaction should be known and the understanding and analysis of users should be strengthened. (3) The assessment of disaster risk. From the perspective of the government or organisation, how to predict disaster risk and provide decision support to the government so as to avoid possibility of bigger disasters in the future if a building or infrastructure is built in this place. (4) How to further tap social media data to serve disaster risk reduction. For example, we can see people mood changes after the disasters. How can we make better planning decisions and rebuild after the disasters? (5) International training continues to expand DRRKS' effectiveness and influences. For example, some students in Pakistan do not know how to use these platforms and whether there is a standard process. Is it possible to establish a WeChat group of Chinese students studying abroad to spread awareness of the DRRKS System and training content? (6) How can some of the government's experience in disaster risk reduction be shared? (7) How can the databases of different countries be connected with DRRKS? The users can also see the link of our database when they visit the webpage (Resource Directory). (8) How can disaster risk reduction education be carried out? It may be achieved by linking education to university courses: for example, by joining corresponding education groups or by setting up interdisciplinary disaster risk reduction education courses in colleges and universities. (9) How can one get experts to actively participate in the network of international knowledge centres? Through these centres, we can build a system of shared information and data services. At the same time, it also helps in brainstorming or decision-supporting similar to expert think tanks. (10) How can the cooperation between various sub-platforms within IKCEST be strengthened? For instance, between risk reduction and city planning.

19. The continuing mechanism of the international workshop on disaster risk reduction. This international conference is a live online communication activity. Nearly 80 representatives from China, Russia, Pakistan, the United States, Japan, Germany, Belgium, Thailand, Indonesia, and other countries attended the meeting. The live online broadcast attracted over 13,000 user clicks, which greatly expanded

the impact of this conference. The fourth workshop will be held in 2020 and will continue to form an international exchange platform for DRRKS.

20. Acknowledgement. UNESCO thanks IKCEST for its outstanding efforts in this series of conferences. The Chinese Academy of Sciences praised the exchange activities of the series of conferences as a model of international cooperation.

For more questions or comments, please contact the Disaster Risk Reduction Knowledge Service Team in IKCEST:

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Attached photos:

Figure 1 Opening speech by Mr. SONG Dexiong, the director of IKCEST.

Figure 2 Mr. SOICHIRO Yasukawa makes a video speech.

Figure 3 Conference site

Figure 4 Discussion

Figure 5 Discussion

Figure 6 Discussion

Figure 7 Discussion

Figure 8 Discussion

Figure 9 Thematic discussion.

Figure 10 Issuing the report certificates.

Figure 11 Issuing the report certificates.

Figure 12 Visiting the Forbidden City

Figure 13 Group photo