

EDITORIAL

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Report on the UNESCO Chair 2019 field school on Geoenvironmental Disaster Reduction in Shimane University, Japan

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Abstract

On 14–18 March 2019, the UNESCO Chair 2019 Field School on Geoenvironmental Disaster Reduction has been held in Shimane University, Japan. The field school comprised two-day field work and three-day academic lectures. Thirty three graduate students from China, Italy, Nepal, Indonesia, France, and Japan participated, and 14 visiting professors from China, Italy, Czech Republic, Belgium, France, Russia, Indonesia and Japan were invited to give academic lectures on the topic of geoenvironmental disasters reduction.

Keywords: Field school, Training course, UNESCO chair, Geo-disaster reduction

Introduction

UNESCO Chair on Geoenvironmental Disaster Reduction was established between UNESCO and Shimane University on 1 April 2018. The headquarter of the chair is located in the Center for Natural Disaster Reduction Research and Education, Shimane University, with the cooperation of the International Consortium on Geo-disaster Reduction (ICGdR). The mission of the Chair is to promote education and research for the reduction of geoenvironmental disasters, in order to improve the relationship between environment and society.

As one of the main education missions of the UNESCO Chair, the 2019 Field School on Geoenvironmental Disaster Reduction was held on 14–18 March 2019 in Shimane, Japan. 14 visiting professors and 33 graduate students from different countries participated this field school, as well as the staffs in Shimane University. The field school comprised two-day field work and three-day academic lectures. The World Heritage site Iwami Silver Mine, Mt. Sanbe and Hiikawa River system were investigated during the field work. A total of 14 academic lectures concerning geoenvironmental disaster reduction were provided by the visiting professors and the Chairholder in

the lecture section. Through the field school, the students gained the knowledge about the mechanism, monitoring methodology, prediction technique, and mitigation methods of a variety of geoenvironmental disasters.

Field works

The training course started with the field work in Iwami Silver Mine, a historic silver mine located in Oda City, Shimane Prefecture. This silver mine was built in 1526 and was the most important mining site in Japan. It was listed as a World Cultural Heritage site together with its culture landscape in July 2007. The participates of the field school visited the mineshaft and refinery ruins of the Iwami Silver Mine (Fig. 1), as well as the exhibited materials, excavated items, replica models, and video footage, to know the history of the mine and the mining technology at that time. The Omori Town, flourished as the management base of the Iwami Ginzan Silver Mine, was also visited. It is a 1.5 km long stretch of houses, shops, temples, and shrines that runs along the river valley to the north of the silver mines. Prof. Fawu Wang and Dr. Hideki Mukoyoshi from Shimane University introduced the geological setting in the Iwami Silver Mine area. An active fault crossing the silver mine area was investigated, which was the main formation cause of the river valley in the Omori Town.

On 15 March 2019, a field work around Mt. Sanbe, an active volcano in Shimane Prefecture, was carried out.

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Fig. 1 Group photo in front of the mineshaft of Iwami Silver Mine

Mt. Sanbe is a large quaternary stratovolcano, which has produced a large variety of effusive and pyroclastic deposits throughout its history. Dr. Andreas Auer from Shimane University introduced the eruptive record, depositional processes and associated hazards of the Mt. Sanbe. The participants observed a number of outcrops (Kakeya Outcrop in Fig. 2, and Shigaku Outcrop in Fig. 3) from the volcanic eruption, which illustrate a variety of eruptive styles, pyroclast transportation and deposition, and the respective hazards. Some questions regarding the petrology of the rocks as well as the stratigraphical record and the temporal evolution of Sanbe Volcano were discussed.

In the afternoon, the Sanbe-Azukihara Buried Forest Museum in the Sanbe area was visited. It is a hidden forest where many giant trees have been lying under the

ground due to the volcanic eruption of Mt. Sanbe around 4000 years ago. More than 30 Japanese Cedar were excavated and now stand in the underground exhibition hall (Fig. 4). The formation cause of the buried forest was discussed. Some of the deposits indicate elevated temperatures during emplacement suggesting primary pyroclastic flow deposits (e.g. block and ash flow), some deposits have been interpreted as debris avalanche deposits (lahars).

The facilities of counter measures for major floods in the Hiikawa River system were also visited during the field school. The Hiikawa River system has a maximum length of 153 km from the mouth of the Sakai Strait, connecting the Nakaumi Lake and the Sea of Japan, and is the largest river system in eastern Shimane Prefecture,



Fig. 2 Investigation at Kakeya Outcrop, SW of Unnan City



Fig. 3 Investigation at Shigaku Outcrop at the rim of the Sanbe caldera



Fig. 4 Underground exhibition hall of The Sanbe-Azukiara Buried Forest Museum

Japan. The Shitsumi Dam and the drainage canal connecting the Hiikawa river and Kandogawa River were visited (Fig. 5), both of them were constructed to control the flood disasters in this area.

Opening ceremony

The opening ceremony of the field school was held on the morning of 16 March 2019 in Shimane University. Prof. Fawu WANG, the Chairholder of the UNESCO Chair presided the ceremony. Dr. Yasunao HATTORI, the president of Shimane University, gave a welcome speech at the beginning of the ceremony. He declared the field school to open on behalf of the organizers, and welcomed all the distinguished visiting professors and energetic students from all over the world. Mr. Mitsuhiro IKEHARA gave a congratulatory remark on behalf of the International Affairs, Ministry of Education, Culture, Sports, Science and Technology (MEXT) and Japanese National Commission for



Fig. 5 Participates in the Shitsumi Dam

UNESCO. He stressed the effort of the Japanese government to support the work on geoenvironmental disasters reduction and to promote the UNESCO Chair. Dr. Miguel CLÜSENER GODT, the Director of the Division of Ecological and Earth Science, UNESCO, gave an opening speech. He introduced the Division of Ecological and Earth Science in UNESCO, and expressed his hope that the UNESCO Chair and the field school could improve the relationships between geoenvironment and society. All of the speeches are attached at the end of this paper. The opening ceremony ended up with a group photo as shown in Fig. 6.

Academic lectures

In this field school, totally 14 academic lectures were provided, as listed in Table 1. The topics of the academic lectures involved a variety of geoenvironmental disasters, such as earthquake, landslide, tsunami, marine geological hazards, and the geoenvironmental problems caused by climatic change. The mechanism, monitoring methodology, prediction technique, and mitigation methods of those disasters were introduced. Heated discussion has also been made after each presentation, see Fig. 7. The students were divided into four groups, and each group made a presentation after the academic lecture section to show their achievements during this field school. One best group was selected by the professors and awarded in the farewell party.

At the end of the field school, Dr. Akishiga YUKIKUNI, the Vice President of Shimane University, issued the certificate for each student who completed 40-h training course during this field school, as shown in Fig. 8. His closing speech is attached at the end of this paper.

After the field school, students are requested to submit a report in free style. Form the reports, eight reports were evaluated as “Excellent Report of the 2019 UNESCO Chair Field School in Shimane”.

Attachments:

- 1) Welcome speech by Dr. Yasunao HATTORI, the president of Shimane University

Dear Mr. Miguel CLÜSENER-GODT, the Director of Division of Ecological and Earth Science, UNESCO.

Dear Mr. Mitsuhiro IKEHARA, the Deputy Director-General for International Affairs, Ministry of Education, Culture, Sports, Science and Technology (MEXT) / Senior Deputy Secretary-General, Japanese National Commission for UNESCO.

Dear Visiting Professors and participants of the UNESCO Chair Field School in Shimane University 2019,

Dear distinguished guests and colleagues, Ladies and Gentlemen,



Fig. 6 Group photo of the participants of the UNESCO Chair 2019 Field School on Geoenvironmental Disaster Reduction

On behalf of Shimane University, I would like to express our warmest greetings to all of the participants of the UNESCO Chair Field School in Shimane University 2019, and welcome you all to Shimane Prefecture, Japan.

Geo-disaster Reduction is always a hot topic in Japan. Located at the joint position of great tectonic plates, and the passing path of Typhoon, Japan often suffers from earthquake, Tsunamis, volcano eruption, flooding and

landslides. Located in the western side of Japan, Shimane Prefecture has a long history to fight with flooding and landslides in the mountainous area, and there is also tsunami record along the coast line of Japan Sea.

Shimane University has made great effort to enforce the scientific study on geo-disaster reduction, and made great contribution to the local community for disaster prevention. Leading by Prof. Fawu Wang, Shimane University

Table 1 Lists of the presentation in the UNESCO Chair 2019 field school

No.	Title	Presenter	Affiliation
1	Rockslides and rock avalanches in Central Asia: study of past events for better assessment of future hazards	Alexander Strom	Geodynamics Research Center, Russia
2	A new technology for prediction and monitoring of landslides	Manchao He	China University of Mining Technology, Beijing
3	Landslide monitoring and early warning at the basin scale	Filippo Catani	Florence University, Italy
4	Modelling of flowslides and debris avalanches in natural or engineered slopes	Sabatino Cuomo	Salerno University, Italy
5	Engineering Seismology, seismic noise measurements and seismological applications on volcanoes and landslides	Léna Cauchie	Liege University, Belgium
6	Geo-disasters induced by the recent earthquakes in the world	Masakatsu Miyajima	Kanazawa University, Japan
7	Marine engineering geology: in-situ test and long-term observation	Yonggang Jia & Hongxian Shan	Ocean University of China
8	Environmental geology and engineering geology problems in permafrost regions of Eastern China under the background of climate change	Wei Shan & Ying Guo	Northeast Forest University, China
9	Landslide disaster reduction in Loess area, China	Tonglu Li	Chang'an University, China
10	Advanced Seismic Designs of Buildings in Japan Seismic Isolation and Response Control Method	Yutaka Nakamura	Shimane University, Japan
11	Landslide investigations in natural and cultural heritage sites in Peru	Vit Vilímek	Charles University in Prague, Czech Republic
12	Reconstruction of paleo tsunamis hydrodynamic characteristics from the magnetic properties of their deposits	Patrick Wassmer	Université de Strasbourg, France
13	The implementation of an international standard for multi disasters early warning system	Teuku Faisal Fathani	Universitas Gadjah Mada, Indonesia
14	Prediction of long runout and rapid landslides	Fawu Wang	Shimane University, Japan



Fig. 7 Discussion between Professor Manchao He and students after the presentation

successfully applied the UNESCO Chair on Geoenvironmental Disaster Reduction in 2017, and we officially establish the UNESCO Chair in Shimane University with UNESCO in 2018. To support this activity, we established the Center for Natural Disaster Reduction Education and Research. The field school is one of the major activities of the center and the Chair.

We understand that the purpose of the UNESCO Chair is to promote international inter-university cooperation and networking to enhance institutional capacities through knowledge sharing and collaborative work. In this field school, besides our staff working on geo-disasters, we invited 14 active and famous professors from 8 countries to give lectures, and we invited 24 students and young scholars to attend the field school. In the two-day field works already conducted, I believe you have examined the situation in Shimane Prefecture. I hope you can give some suggestions and advices to us to reduce the geo-disasters in Shimane Prefecture, and we

can discuss more on how to reduce the geo-disasters worldwide more effectively.

Geoenvironmental Geo-disaster Reduction is important, but not simple. I believe, through this kind of field school, through field works and lecturers, the participants can learn from each other, and make a strong network to deal with the complicated geo-disaster problems, and make our contributions for the disaster reduction all over the world.

Finally, I hope all of the participants can enjoy your staying in our beautiful city, enjoy our food, and enjoy our history and culture.

Thank you and welcome!

- 2) Congratulatory remarks by Mr. Mitsuhiro IKEHARA, Deputy Director-General for International Affairs, Ministry of Education, Culture, Sports, Science and Technology (MEXT) / Senior Deputy Secretary-General, Japanese National Commission for UNESCO

President Dr. Yasunao Hattori,
Project Leader Professor Fawu Wang,
UNESCO Director Dr. Miguel Clusener-Godt,
Ladies and gentlemen,

I would first like to express my sincere congratulations on the holding of this field school by the Shimane University UNESCO Chair on Geoenvironmental Disaster Reduction.

Established in 1992, the UNESCO Chairs and UNITWIN Programme aims at the promotion of international inter-university cooperation and networking. It further aims at enhancing the capacities of higher education institutions through the exchange and sharing of knowledge across borders within these international networks. At present, over 780 higher education institutions in 116 countries worldwide are participating in this UNESCO Chairs Programme. At present, there are two



Fig. 8 Group photo of the students with certificates

UNITWIN universities, and nine UNESCO Chairs universities in Japan.

Established in 2018, the Shimane University UNESCO Chair on Geoenvironmental Disaster Reduction promotes education, research, and international academic exchanges for the reduction of geoenvironmental disasters in order to build a strong relationship between the environment and society. This program has the very fundamental aim of attempting to realize a society that is safe and secure for all people. Its activities are also very important from the perspective of their contribution to the achieving of the SDGs. Precisely because Japan is impacted by numerous natural disasters such as the recent powerful earthquakes and torrential rains that have caused so much damage, geoenvironmental disaster reduction is a field in which Japan can play a leading global role.

I have heard that many researchers and graduate students from across Asia and Europe are participating in this year's field school. I expect that the participants will be able to make use of what they have learned at this field school to contribute to the reduction of

geoenvironmental disasters in their own countries.

I also hope that, as a UNESCO Chair, Shimane University will continue to disseminate and share the educational and research outcomes you have achieved up to now, and I look forward to seeing the efforts of your university receiving further international recognition.

Finally, I would like to express my highest respects to all of you gathered here for your efforts to hold this Field School, and I sincerely hope that the activities of the Shimane University UNESCO Chair will advance from now and achieve every success. Thank you very much.

- 3) Opening speech by Dr. Miguel CLÜSENER GODT, the Director of the Division of Ecological and Earth Science, UNESCO

Dear President of Shimane University, Prof Hattori; Dean of the Faculty of Natural Science and Technology, Dr. Hiromitsu; Deputy director of Japan NatCom for UNESCO, Mr. Ikehara, Ladies and Gentlemen, Distinguished guests,

It gives me a great pleasure to address you all at the Opening Ceremony of the Field School organized by Shimane University. I would like to particularly thank Prof Yasunao Hattori, President of the Shimane University for inviting me to the worldwide centre of excellence on geo-hazards risk management. I also would like to thank Prof. Fawu Wang, Director of the Research Centre on Natural Disaster Reduction and Head Professor of the Dept. of Geoscience, Faculty of Science & Engineering, for organizing this ceremony.

The 2030 Agenda, adopted in 2015 by the United Nations, represents a significant step forward in terms

of recognizing science, technology and innovation (STI) as a driving force for sustainable development in its three pillars, environmental, social and economic. As the only UN agency that includes science in its mandate, UNESCO finds itself at the heart of this initiative. It implements its activities through its global network of field offices, international scientific programmes, centres, institutes, and the UNESCO Chairs and UNITWIN Networks.

The UNITWIN/UNESCO Chairs Programme is celebrating its 25th anniversary in 2017. Today, there are more than 700 UNESCO Chairs and UNITWIN Networks around the world, and more than 170 of these specialise in the fields covered by the Natural Sciences Sector of UNESCO. They provide a unique scientific expertise in the United Nations context and significant global, regional and local impacts, in a wide array of relevant fields. The UNESCO Chairs and UNITWIN Networks in Natural Sciences have an important role to play in the shared efforts to link science, policy and society through adopting open science practices to implement the 2030 Agenda for Sustainable Development and other United Nations development agendas.

Every year, disasters caused by natural hazards affect millions of people around the world. The resultant human losses are tragic and highlight the vulnerabilities shared by our societies.

Recent events have illustrated the devastating effects of natural hazards.

- The State of Kerala in India, for example, experienced in August 2018, the worst episode of flooding since 1924. Many hundreds of people lost their lives and more than 200,000 had to be evacuated.
- In Japan, in the summer of 2018, 221 people died as a result of flooding in the west of the country, and 153 persons as a result of a heatwave.
- Indonesia has tragically been struck by an earthquake and a tsunami: human losses stand for the moment at over 1400 people.

Economic losses are estimated at approximately \$250 billion to \$300 billion per year. The financial impact had considerable implications in densely populated areas.

During the last decade, geo-hazards, especially earthquakes were the biggest cause of death among natural hazards. Japan is unfortunately infamous for its proneness to natural hazards. It is striking to know that around 20% of large-scale earthquakes occur in Japan while the country covers only 0.25% of the land area of the planet. In addition, because of geographical, topographical and meteorological conditions, Japan is subject to frequent natural hazards, such as torrential rains, typhoons and heavy snowfalls.

UNESCO operates at the interface between natural and social sciences, education, culture and communication playing a vital role in constructing a global culture of resilient communities. UNESCO plays a vital role among the UN systems to support Member States to implement the Sendai Framework for disaster risk reduction (DRR) 2015–2030. UNESCO supports Member States on DRR through a) establishing / strengthening platforms for knowledge exchange and cooperation among experts, b) strengthening capacities for disaster risk reduction (DRR), c) making disaster risk reduction (DRR) a priority through policy recommendations. UNESCO's approach is multi-disciplinary within UNESCO's wide mandates.

For an example of expert networking, the seismology and seismic engineering platform has developed 2 technical guidelines to secure building safety against earthquakes that we are using in our projects in Latin America. The UNESCO Chair programme is also a good example of expert networking and I would like to express the highest appreciation on the establishment of the UNESCO chair by Shimane University as a centre of excellence focusing on the nexus of the Geo-environmental Disaster Reduction Improving the Relationship between Geo-environment and Society.

For an example of capacity building, UNESCO developed a multi-hazards risk assessing school facility tool called VISUS and we have assessed more than 1500 schools in 9 countries. More than 500,000 children and teachers would be saved by the assessment. The UNESCO chair of Udine University supports UNESCO in this context.

For an example of policy recommendation, UNESCO works on the EU funded project OPERANDUM to develop the efficiency and effectiveness of ecosystem DRR solution to multi-stakeholders including decision makers.

Our division also works on the sustainable usage of natural resources notably through the Man and the Biosphere Programme and the International Geoscience and Geoparks Programme. I would like to share with you our programmes as well.

To understand and address the key challenges facing our world, the MAB Programme, through its World Network of Biosphere Reserves - which currently counts 686 sites in 122 countries all over the world, including 20 transboundary sites - and its regional and thematic networks, will strategically address the SDGs 2030 through sustainable development actions in biosphere reserves. This is carried out in partnership with all sectors of society, to ensure the well-being of people and their environment.

The MAB Programme is an important tool to mainstream sustainable development at all levels, integrating economics, social and environmental aspects and recognizing their vital interlinkages, in order to achieve sustainable development in all its dimensions.

It is my great pleasure to point out that Japan has always been an important partner in the MAB (Man and the Biosphere) Programme. The country has nine biosphere reserves in the World Network of Biosphere Reserves and recently proposed Kobushi as a new Biosphere Reserve. The proposed area is located in central Honshu Island of the Japanese archipelago, spanning an area that includes parts of the three prefectures of Saitama, Yamanashi, and Nagano, as well as Tokyo Metropolis. It may be interesting to mention that the site has established well-functioning forms of cooperation and partnership with universities.

By connecting local actions and global challenges, and the role of local culture as a crucial tool to achieve global sustainability, the UNESCO Global Geoparks can also be considered as best practice examples and a source of inspiration for SDGs. UNESCO Global Geoparks are living, working landscapes with exceptional geological heritage where science and local communities engage in a mutually beneficial way.

There are 140 UNESCO Global Geoparks within 38 Member states, covering a total area of 250,000 km². Oki Island just across the sea is a UNESCO Global Geopark, where our former ADG Flavia Schlegel visited in 2017. We have learnt that there are a number of programs that aim to raise awareness about the sustainable use and preservation of local resources such as sustainable educational programs, from pre-elementary school up to secondary school. I wish that you all will have a chance to visit the UNESCO Global Geopark or Biosphere Reserve.

Through the adoption of the SDGs, World Heritage, tangible or intangible, cultural, natural or geological, is recognised as a driver and enabler of sustainable development. It is worth to continue activities which focus on the complementarity of various UNESCO designation schemes (Biosphere Reserves, World Heritage sites, UNESCO Global Geoparks), which are called to work together in the support of the Agenda 2030 implementation.

To conclude my opening remarks, UNESCO is committed to playing an active role to develop and strengthen collaboration with you for disaster resilience. We are ready to cooperate with you. After the field works in the last few days in the Iwami Silver Mine and active volcano Mt Sanbe, I wish that all the lectures today will provide you with a good theoretical perspective on geohazard disaster risk reduction.

Thank you very much for your attention and I am looking forward to continuing fruitful cooperation.

- 4) Closing speech by Dr. Akishiga YUKIKUNI,
Trustee and Vice President of Shimane University

At first, I would like to say thanks for the successful completion of the training of the UNESCO chair with your cooperation.

Japan has typhoon in summer and heavy snow in winter. Many natural disasters occur throughout the year, including landslide disasters caused by heavy rainfall and collapse of houses caused by heavy snow. In addition, there are many damages caused by earthquakes and tsunamis. However, Japanese people are always familiar with nature and stand up to disasters without giving up. Japanese people feel sadness and beauty in changing events, as many Japanese like falling cherry blossoms. I think this is also an emotion acquired in a country with many natural disasters. Along with studying natural disasters, please also learn about Japanese culture and Japanese way of thinking.

Finally, I hope all persons gathering here are good at health and developing good future.

Congratulation today.

Authors' contributions

FW made the working plan and led the activity. FW and MC-G wrote and approved the final manuscript. ZD provided the figures in the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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