Geoenvironmental Disasters

EDITORIAL Open Access

Report on the UNESCO Chair workshop on geoenvironmental disaster reduction 28th April - 1st may, 2019, Palu - Jakarta, Indonesia

Fikri Faris[1], Teuku Faisal Fathani[1] and Fawu Wang[2*]

Abstract

The UNESCO Chair Workshop on Geoenvironmental Disaster Reduction was held on 28 April – 1 May 2019 in Palu City and Jakarta, Indonesia. Firstly, this article introduces the background and objectives of the workshop, reports the field trip around disaster area of 7.4 M_w 2018.9.28 Palu-Donggala earthquake, and then reports the ICGdR 2019 Council Meeting and UNESCO Chair Workshop in UNESCO Office, Jakarta. Finally, this article oulines the visit on Indonesian Meteorological, Climatology and Geophysical Agency (BMKG), Jakarta.

Keywords: International Consortium on Geo-disaster Reduction (ICGdR), UNESCO Chair workshop, Palu earthquake

Introduction

The UNESCO Chair Workshop on Geoenvironmental Disaster Reduction was held as the extended program of International Consortium on Geo-disaster Reduction (ICGdR) and UNESCO Chair on Geoenvironmental Disaster Reduction.

The objectives of the workshop included the following:

1. Increase collaboration and coordination between ICGdR members
2. Increase knowledge and visibility about recent geoenvironmental disasters that happened in Palu, Indonesia
3. Discuss about ICGdR working plan and 17th ISGdR Preparation
4. Share knowledge between members and Indonesians stakeholders about geoenvironmental disasters reduction.

The sequence of the workshop consisted of two major agendas: field trip at Palu City on 28 April to 30 April 2019, and UNESCO Chair meeting on 1 May, 2019 in Jakarta, Indonesia. The activities of the workshop are listed in the Table 1.

Palu City field trip

The venue of the workshop registration was in Santika Hotel, Palu City, Indonesia on 28 April. The field trip was participated by 16 members from five countries listed in Table 2. The participants departed from hotel at 08:00 local time to the Sibalaya and Jono Oge village by bus.

Ground flow of Sibalaya and Jono Oge Village

The first location of the field trip was Sibalaya village which is located at Sigi Regency, Central Sulawesi Province. The village is located about 40 km from Palu City and can be reached in one hour by bus. It is one of the villages that was damaged by large scale ground flow due to the earthquake triggered liquefaction. The ground flow affected 125 houses and area sized around 53 ha (Abidin, 2018).

The geomorphology of the terrain are alluvium and colluvial fan of the eastern mountains range which contains cobbles, gravels, sand and silt deposits. Before the earthquake, Sibalaya village was mainly utilized as paddy field, supported by irrigation line that took water from Palu River. The irrigation channel was dredged and

* Correspondence: wangfw@riko.shimane-u.ac.jp
[2]Department of Earth Science, Shimane University, Matsue, Shimane 690-8504, Japan
Full list of author information is available at the end of the article

Table 1 Workshop Activities

No.	Date	Activities	Venue
1	April 28th, 2019	Registration	Santika Hotel, Palu City
2	April 29th, 2019	Field trip	Sibalaya and Jono Oge Village Donggala City Palu Bridge IV
		Welcome dinner	Raja Kuring Restaurant
3	April 30th, 2019	Field trip	Petobo and Balaroa District
		Check out and leaving Palu	Mutiara SIS Al-Jufri Airport, Palu City
4	May 1st, 2019	ICGdR Council Meeting	UNESCO Office, Jakarta
		UNESCO Chair Workshop	
		Visit INATEWS and MEWS Headquarter	Indonesian Meteorological, Climatology and Geophysical Agency (BMKG) Office, Jakarta
		Meet and discuss with the minister of BMKG	

Table 2 Participants of Palu Field Trip

No	Name	Institution
1	Prof. Masakatsu Miyajima	Kanazawa University, Japan President of ICGdR
2	Prof. Fawu Wang	Shimane University Secretary General of ICGdR
3	Prof. Tonglu Li	School of Geological Engineering and Geomatics, Chang'an University, China Vice President of ICGdR
4	Prof. Ping Li	School of Geological Engineering and Geomatics, Chang'an University, China Vice President of ICGdR
5	Prof. Teuku Faisal Fathani	Universitas Gadjah Mada Vice President of ICGdR
6	Prof. Vit Vilimek	Charles University, Prague
7	Prof. Sandro Moretti	Florence University, Italy
8	Prof. Yonggang Jia	Ocean University of China
9	Prof. Shan Hongxian	Ocean University of China
10	Prof. Masaho Yoshida	Fukui College, National Institute of Technology
11	Prof. Takao Hashimoto	Fac. of Science and Technology, Kokushikan Univ
12	Dr. Mikio Kubo	ETP Japan in collaboration with Kanazawa Univ
13	Mr. Shuheng Sun	Liaoning Investigation Institute of Hydrogeology and Engineering Geology, China
14	Dr.Fikri Faris	Universitas Gadjah Mada
15	Egy Erzagian	Universitas Gadjah Mada
16	Diana Atik	Universitas Gadjah Mada

unlined, so water can easily infiltrate surrounding soil and saturated the deposits westward. The irrigation channel was highly damaged due to ground movement (Fig. 1). The road and houses were dragged about 350 m to the West due to ground flow (Miyajima et al., 2019). Figure 2 shows the path of ground flow in the village. Interestingly, the moving road and houses was still relatively intact with some minor damages. It was reported that three people were dead due to building collapse.

From this village, an earthquake-triggered landslide was noticed in Western mountain range, which could be a symptom of specific high earthquake acceleration of the area. Further research is needed to clarify the ground flow phenomena in the near future.

Jono Oge Village was the second destination of the field excursion. It is located about 10 km southward from Palu City, at Sigi Regency. The village was struck by massive ground flow, which affected 210 ha land and 496 houses (Abidin, 2018). One of the damage which is resulted by the ground movement is shown in Fig. 3.

The geological feature is similar with the previous location, which comprises of mainly sediment deposit from alluvial and colluvial fan. The area has gentle slope with an average of 1.9% slope (Miyajima et al., 2019). However, the ground flow travel distance is interestingly the furthest among the other similar prone areas. The affected area reached more than 3 km to the west.

Similar to Sibalaya village, the land was mainly rice paddy fields which were watered by primary irrigation lines. The irrigation channel was heavily damaged due to the ground movement. From the landslide scrap, sediment layers can be observed. Some loose fine sands which prone to liquefaction were noticeable. However, more detailed research should be conducted to clearly clarify the mechanism of ground flow.

Donggala City

The next visited location is Donggala City which is located about 25 km North from Palu City. Donggala is an old city that was built by the Dutch during colonialism era as a harboring point. The city was severely damaged by the earthquake. It damaged about 680 houses and took 171 fatalities.

In addition to the strong ground shock, the city was affected by several earthquake-related phenomenon like submarine landslide, land subsidence and tsunami. One distinct phenomenon that was visited in the field trip was a "disappearance" of some waterside village at Donggala coastline (Fig. 4). This event could be the evidence of submarine landslide that triggered by the earthquake. However, further examinations, such bathymetric and geological surveys, are needed to confirm the situation.

Fig. 1 Highly damaged irrigation channel in Sibalaya Village

The remain of Palu IV bridge

The last visit of the day was the remains of an iconic bridge of Palu City that collapsed due to the earthquake followed by tsunami. The bridge was first constructed in 2006 by the city government. It had two beautiful arches spanned over Talise Bay which made the bridge as one of the most popular tourist spots in Palu City.

The central government plans to rebuild the bridge to restore the national road connection and to fasten the reconstruction process of Palu City. The new bridge is planned to be reconstructed near the previous location. During the visit, some construction activity had already taken place and most of the old bridge remains had been removed.

Ground flow of Petobo and Balaroa District

The next morning, April 30th of 2019, the workshop members set off from hotel to visit Petobo district, one of the most heavily devastated areas by liquefaction-triggered ground flow (Fig. 5). Petobo area was a residential housing area in which more than 700 houses were destroyed and hundreds of people died by a massive ground flow that affected around 150,000 m^2 area. Petobo district is situated on a gentle slope of the eastern hilly range. Based on the topography, one can conclude that the area is actually colluvial deposits originated from the hills.

The last visited area was Balaroa district where another major ground lateral movement took place. The district was a densely populated area, in which the disaster buried around 1700 houses in 38,000 m^2 affected area and took more than six hundred lives which is more deadly than Petobo (Fig. 6). Morphology of the area is pretty much similar with Petobo, except that Balaroa is situated near western hill range where the slope is quite gentle. Unlike another ground flow affected area, there is no irrigation channel in Balaroa. The most likely factor of massive liquefaction is high natural ground water in the area which is controlled by topographic feature of colluvial fan. The groundwater is high because it was naturally a swamp before it got reclaimed for housing around 1978. A group photo was taken in Balaroa after the field trip (Fig. 7).

Fig. 2 The path of ground flow in Sibalaya Village

Fig. 3 Road Damaged in Jono Oge Village due to ground movement

Fig. 4 A sunken village in Donggala

Fig. 6 Rumbles in Balaroa

ICGdR council meeting

In May 1st, 2019, the council meeting of ICGdR took place at UNESCO office Jakarta (Fig. 8). The first session of the meeting started at 09:00 o'clock local time, which was opened by a welcome speech from Prof. Shahbaz Khan, the Director of UNESCO Jakarta Office; followed by opening speeches of Prof. Masakatsu Miyajima as the President of ICGdR and Prof. Dwikorita Karnawati, the head of Indonesian Meteorological, Climatology and Geophysical Agency (BMKG). The meeting was continued by Prof. Fawu Wang as the Director-General of ICGdR, which discussed the modifications of statutes and bylaws, new membership introduction, working plan for 2019 and preparation of 17th ISGdR. A group photo was taken in UNESCO office, Jakarta after the ICGdR council meeting (Fig. 9).

The second session was occupied with presentation from Prof. Faisal Fathani about reconstruction and recovery of Palu City. In the presentation, it was reported that some of the reconstruction activities were the development of disaster risk reduction action plans, training in disaster risk assessment methodologies and the use of risk modeling techniques such as RiskScape and the Seismometer in Schools program, with purpose to increase education about the seismicity of Central Sulawesi, as well as earthquake and tsunami mitigation and preparedness. The next presentation was by Prof. Agus Setyo Muntohar from Muhammadiyah University Yogyakarta. He delivered the post disaster research and activities related to Palu earthquake which was conducted by his team. Prof. Masakatsu Miyajima also presented interesting report of Palu earthquake field investigation. He delivered some fact-finding of geotechnical damages in the 2018 Palu earthquake, especially on ground displacements that was induced by fault movement and large-scale ground flow. The presentation gave some insight discussions about phenomena that had been observed during field excursion. Prof. Dwikorita Karnawati, which is also the Chairperson of Inter-Governmental Coordination Group for Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS), made a closing presentation about general introduction of BMKG and its contributions on disaster mitigation as the Indonesian non-departmental government agency for meteorology, climatology, and geophysics with an authority to deliver official information about earthquakes and weather. She presented issues about earthquake and tsunami monitoring in Indonesia, as well as the specific issues on eruption-triggered tsunami of Mount Anak Krakatau.

Fig. 5 Panoramic View of Upper Part of Petobo Liquefied Area

Fig. 7 Group Photo in Balaroa

Fig. 8 UNESCO Chair and ICGdR Council Meeting

Fig. 9 Group Photo in UNESCO Office, Jakarta

Fig. 10 Visiting InaTEWS Headquarter in BMKG

Visiting Indonesian meteorological, climatology and geophysical agency (BMKG)

The following session was a visit to BMKG office on Central Jakarta, particularly to take a look at the headquarters of Indonesia Early Warning System (InaTEWS) and Meteorology Early Warning System (MEWS). The visit was guided by Dr. Weniza as the head of BMKG's tsunami early warning sub-section (Fig. 10). InaTEWS is a comprehensive early warning system that implements Decision Support System (DSS) which processes data from seismic and tsunami monitoring, post-earthquake crust deformation and considers tsunami simulation to support accurate decision making and evaluation related to tsunami early warning in Indonesia. The office also consists of MEWS monitoring room (Fig. 11). MEWS is purposed to provide daily and weekly weather report in order to support the prediction of meteorological disasters such as floods, landslides, wildfires and drought.

Fig. 11 BMKG officer was explaining Meteorology Early Warning System (MEWS)

The visit was also accompanied with a light discussion with Prof. Dwikorita Karnawati, the head of BMKG and Dr. Muhammad Sadly, the deputy of geophysics BMKG, with talks about the potential strategic cooperation between BMKG and ICGdR in researches and human resource development in the frame of disaster risk mitigation.

Authors' contributions

The lead author prepared the first draft. The second and third authors read and approved the final manuscript. The third author made the outline of the activity, and the second author made the working plan and led the activity. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Centre for Disaster Mitigation and Technological Innovation (GAMA-InaTEK), Faculty of Engineering, Universitas Gadjah Mada, Yogyakarta 55281, Indonesia. [2]Department of Earth Science, Shimane University, Matsue, Shimane 690-8504, Japan.

Received: 17 July 2019 Accepted: 30 July 2019
Published online: 13 August 2019

References

Abidin, H. Z. (2018) Roles of Geospatial Information for Disaster Risk Reduction Management in Indonesia, http://ggim.un.org/unwgic/presentations/3.4_Hasabyddub_Zainal_Abidin.pdf. (last visit: 15 July 2019).

Miyajima, M., H. Setiawan, M. Yoshida, et al. 2019. *Geoenviron Disasters*. Vol. 6, 6 doi: 10/1186/s40677-019-0121-0.

Publisher's Note