

Understanding and Identifying Natural Hazard for Bandung City Preparedness and Mitigation against Natural Disaster

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Abstract. Understanding Natural Hazard is an important aspect for the City Planning and Implementation of Policy and Development. The Local Government of Bandung City is developing a map of Hazard and Disasters based on the Natural Condition, Geography and Existing Condition. This paper discuss the scenario of the natural and main emphasis on geological hazard in the City of Bandung related to the Mitigation and Disaster Management as an input that should be adopted by the Local Government. The City is surrounded by active volcanoes and a number of faults that might cause natural disasters including earthquakes, volcano eruptions, flood and landslides. on the other hand the city development can be directed towards the mitigation and risk reduction against these hazards.

1 Introduction

In most city development, hazard and disaster have become important aspects to be considered. Much of the data has been collected through research and investigations, and many has been due occurrence in the past. One of the challenge of the city is due to uncontrollable development which were not well planned and many of them have caused disasters, which could not be avoided. However understanding and awareness of the hazard will help a better plan for future development of the city.

Bandung is the capital of the West Java province with population of about 2.5 millions. Due to the fact of the surrounding mountain in boundary of the city, future development will face challenges for instance to build houses and infrastructures on difficult soil condition such as deep soft deposit at the lowland of Bandung area or on the slope which might not be stable. In fact the city is recently advised by a team consisting of experts from universities, government research centers and practical engineers for buildings and infrastructures permit before implemented. However the regulations are still not well understood.

This paper discuss some evidence and data which shows aspects of the geological hazard which may affect the development and to be considered as strategy in the management of the disaster as outlined by the Indonesian Law no 24/2007. According to

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the law, the disaster management should be focussed on the preparedness to reduce the risk of disasters rather than the management during or after disasters.

The understanding of common people on the disaster management so far has been focussed on action during and after disaster which is very weak for the mitigation purposes. Hence the mitigation plan should be socialized among planners, educators, developers, stake holders and designers and education on natural disaster should be part of the instruction for students of all level since elementary school to universities.

1.1 Development and master plan of Bandung City

Bandung City is located at high elevation of 675-1050 m above sea level with areas of 16.729,650 Ha consisting of 30 Kecamatan and 151 Kelurahan. With 2.5 million of population, Bandung City is the third largest city in Indonesia, after Jakarta and Surabaya. Fig. 1, shows the Bandung City Area with boundaries of Kabupaten Bandung Barat and Kabupaten Bandung at the north, the City of Cimahi at the west boundary, and Kabupaten Bandung at the east and south boundaries.

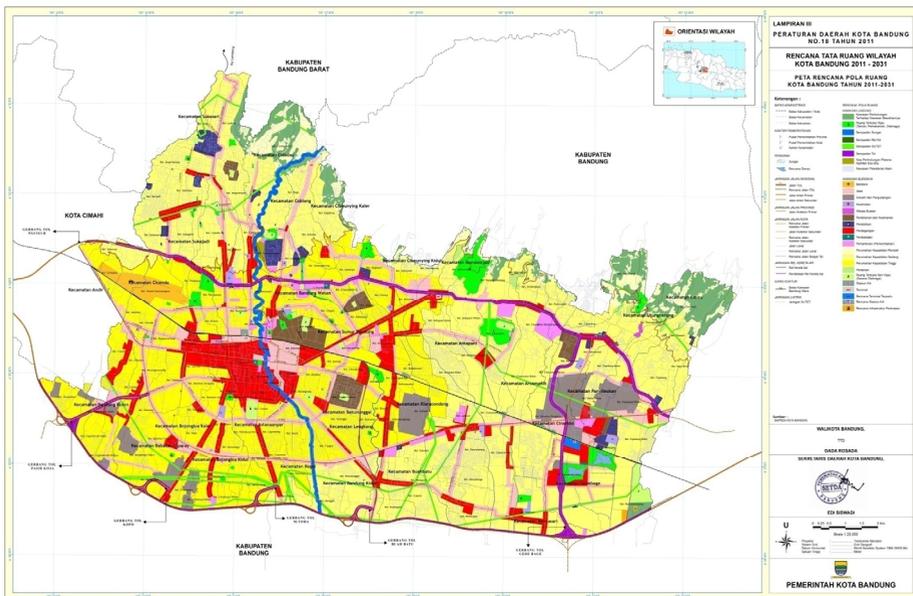


Fig. 1. The city of Bandung map (source : Government of Bandung city [5])

1.2 The underlying law for preparedness and mitigation of Bandung City

The impact of natural disasters are fatalities, the loss of people's belonging including houses, the loss of jobs, the damages of infrastructures, difficulties in the supply of food, electricity, communication and transportation. All of those will cause economic loss, chaos, trauma, backward of the city development etc.

The term "natural disaster" refers to those disasters that are triggered by natural phenomena, however the term can be misleading because it implies that the disasters are solely a result of natural hazards – when in fact, human endeavour are a major contributing factor in creating a disaster. The complete realm of disaster related activities is "disaster management". Generally people tend to think of disaster management only in terms of post

disaster actions taken by relief and reconstruction officials; yet disaster management covers a much more broader scope, and many modern disaster managers may find themselves far more involved in pre-disaster activities than in post-disasters response. Disaster management can be defined as the range of activities designed to maintain control over disaster and emergency situations and to provide a framework for helping at risk persons to avoid or recover from the impact of the disaster. Disaster management deals with situations that occur prior to, during and after the disasters to reduce or avoid the human, physical and economic losses suffered by individuals, by the society and by the country at large, to reduce personal suffering and to speed the disaster recovery.

The underlying Indonesian law covers the preparedness and the management of disaster as shown at UU No. 24/2007 about the response to disaster and reduce risk due to natural disaster. The Law No. 26/ 2007 on the Land Use (Penataan Ruang) and the City Regulation Perda Kota Bandung No. 18/2011 on the Development of the City of Bandung 2011-2031.

Indonesian law UU RI no. 24 and 26 year 2007 changed paradigm of disaster management into management of disaster focusing on ‘preparedness’ for mitigation before they occur. Land use planning that consider hazard and disaster aspects are best to be implemented to reduce the negative effect of disaster.

2 The geology of Bandung City

Million years ago, Bandung was land with are influenced by tectonic activities and noth of Bandung are mainly lahar formations. At north of Bandung City, the Tangkuban Perahu volcano is an active volcano in the close proximity to Bandung City and combined with the existence of Lembang Fault which is still active and many people live near Lembang Fault. Fig. 3 shows the location of Lembang Fault. At the south of Bandung City there are Patuha Volcano and Malabar Volcano, even though not reported as active volcanoes however they are registerd as being active.

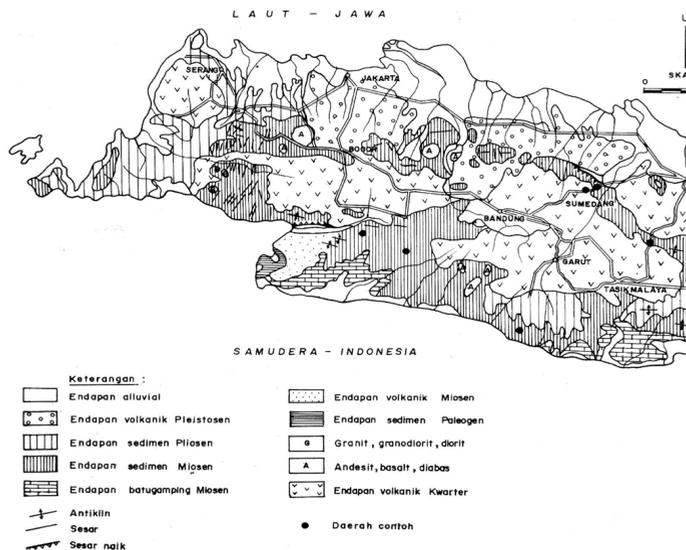


Fig. 2. The geology map of West Java (source : Direktorat Geologi Bandung [5])

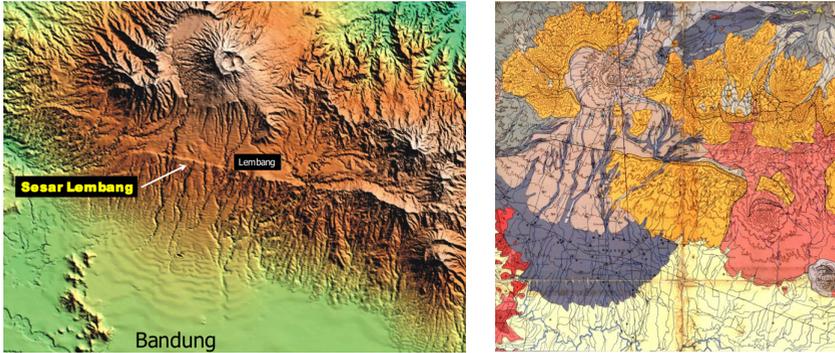


Fig. 3. Lembang fault and northern Bandung geology (source : Direktorat Geologi Bandung [5])

However south of Bandung is a big difference, this area is mainly lowland that was originated from two ancient big lakes. Fig. 1 shows the schenario of the lakes. They were very deep (more than 30m) and hence all sediments into the lakes create soft layers. The geotechnical hazard is any buildings in these areas will be prone to settlement or land subsidence which will damage the houses and infrastructures. Many of the people in Bandung not realizing this fact and many of the development failed. Moreover Bandung City is planning to develop new territory south of Bandung which is known as Bandung Technopolis. This development will be affected by the soil condition.

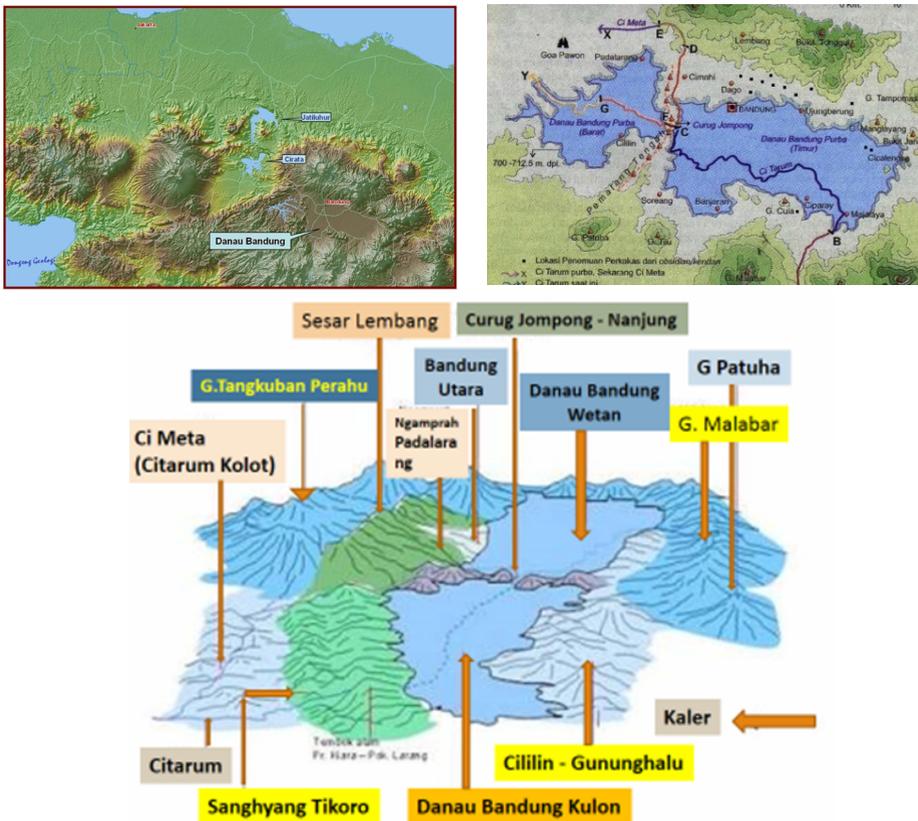


Fig. 4. Bandung soft soils originated from two large ancient lakes

3 The natural hazard of Bandung City and mitigation plan

Geohazard in Bandung City includes Earthquakes where Cimandiri Fault and Lembang Fault are very near to the city, Landslides specially north of Bandung, however landslides could also be due to man made slopes such as north of Bandung City. The main reason would be the existence of colluvial which people might not aware of or non engineered fill material, Volcano Eruption (there are several active volcanoes surrounding Bandung City. One of the most active volcanoes are Galunggung which is located near Tasikmalaya and Tangkuban Perahu which is located north of Bandung.

The soft soils condition south of Bandung will be worst during earthquakes. Hence building regulation at this area must be very strict. Moreover, this area is low land with the main river Citarum flowing the water from east to west. The low elevation and the fact that Bandung is like a cup cause south Bandung to be frequently flooded.

Flood frequently occurred in combination with landslides, specially because of the high rain intensity, then land subsidence commonly occurred at Bandung south due to very specific deep soft soils originated by sedimentation through the ancient Bandung Lake as described in the previous section.

There is already plan for evacuation at Bandung City based on Local government regulation (Peraturan Daerah Kota Bandung) No. 18 year 2011 on the Land Use at Bandung City (Peraturan Daerah tentang Rencana Tata Ruang Wilayah Kota Bandung Tahun 2011 – 2031, pasal 58). Development Plan for Evacuation Area of Bandung City against Disaster:

- i) Development of flood evacuation plan is directed at Taman Tegallega at Kecamatan Regol and the Main Stadium Gelora Bandung Lautan Api at Kecamatan Gedebage
- ii) Development of Landslide evacuation plan is directed at Taman Gasibu and Sasana Budaya Ganesha located at Kecamatan Bandung Wetan and Taman Pacuan Kuda (Kecamatan Arcamanik)
- iii) Development of parks in the scale of community called Taman Rukun Tetangga (RT), on the scale of Rukun Warga (RW), sports area, or open public space for evacuation points in the residential area
- iv) Development for evacuation during earthquakes by taking advantage of open public space like alun alun or soccer field, open area at public buildings like schools and other area at the city scale
- v) Development for evacuation due to fires at the parks at Rukun Tetangga and Rukun Warga scales, sport halls and public open space

4 Conclusions summary

- i) There is urgent need for socialisation of natural hazard to the Bandung City Community and how to live in harmony with the nature.
- ii) There is need to develop hazard map and the scenario of disaster and prepare evacuation plan, muster points the location for help for every region.
- iii) There is need for coordination plan both the public sector and the role of the private party for Bandung City Mitigation Plan.
- iv) It is necessary to enforce law specially for infrastructure and buildings, they need to follow the hazard map and the regulation for save structures.
- v) Master Plan and Development Plan of Bandung City must follow the hazard map.
- vi) Education of Hazard and How to live with nature is a necessity for curriculum since elementary school to university students for better understanding of the hazard and mitigation.

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