The roles of human geography in disaster studies

Assriyani¹ and Hastuti²

¹Master Program of Geography Education, Graduate School of Yogyakarta State University, 55281, Indonesia
²Departement of Geography Education, Faculty of Social Science, Yogyakarta State University, 55281, Indonesia

Email: assriyani.2018@student.uny.ac.id

Abstract. A disaster is an event or series of events which threaten and disrupt the human lives. The studies of disaster are constantly considered related to humans because humans act as the causative factor, victim and at the same time the executant of the effort in disaster handling. Pioneered by Gilbert White and pursued by other experts, human geography later shows the roles in examining issues in disaster studies especially in disaster mitigation. Based on several research and notions, many experts in human geography agree that there is nothing natural in natural disaster. Although the disasters are often affected by geosphere physical phenomenon but various human actions and activities on the face of the earth cause certain population to be more prone to natural disaster. If the risks toward disaster need to be reduced, bigger attention needs to be given to minimize population vulnerability, increase people capacity to overcome disaster and strengthen people capability to adapt to disaster area in a long term. Currently, UN as the responsible party in reducing risk of international disaster has been doing community resilience effort adopting Hyogo Framework for Action (HFA) 2005–2015: building the nation and community resilience towards disaster, followed by Sendai Framework for Disaster Risk Reduction (SFDR) 2015-2030: reducing disaster risk and loss.

1. Introduction
Humans and nature live in harmony from time to time. Along with the development of human civilization, the nature keeps leaving their traces in the community, one of them has the quality to destroy and we know it as a disaster. Various disasters, such as flood, earthquake, landslide, tsunami, drought and many others keep coming and threatening the life of humans [1]. These disasters caused various and significant loss and damage in many sectors in human lives [2]. Even though they are often linked by geological, meteorological and hydrological process which underlie but an event can be called a disaster is not based on the cause but the consequences arise because of the interaction between the danger and community vulnerability [3], [4]. The Cambridge dictionary defines a disaster as an event that results in great harm, damage, or death, or serious difficulty which means that an event cannot be classified as a disaster unless human is involved in it [5].

In the beginning, a disaster was considered a punishment sent by God or other supernatural power for the mistake or sin committed by humans on earth [6]. However since the Lisbon earthquake in 1755, the paradigm of supernatural force of disaster began to shift into new paradigm that a disaster is not an interpretation but a phenomenon which can be controlled and predicted [7], [8]. Dranseika (2017) [6] in his writing emphasizes that a disaster is a series of events which can be worsen or lessen by human actions. A disaster can be massive or small depends on how humans prepare themselves through the
choices they make. Kulatunga (2010) [2] states that several natural disasters have sharply increased all over the world and the studies on them are currently a global attention (Figure 1).

Figure 1. Data of the World Disasters Based on the Types (1970 -2020)
Source: EMDAT (2020): OFDA/CRED International Disaster Database, Universite catholique de Louvain – Brussels – Belgium [9]

Humans are the subject and the object of disaster and at the same time the main target of the countermeasures [6], [10]. Many human ideas, behavior and actions have affected how and what disasters that happened in human civilization from time to time. Therefore, human geography, as a branch of geography which focuses on the existence of humans on earth, is considered need to contribute its role in disaster studies [11], [12].

Human geography progressed from determinism and possibilism towards the appearance of probabilism as a compromise from both [13] [14]. This understanding emphasizes in reciprocal relationship between humans and nature in which the environment can affect the human lives and human have rooms to do some actions that can affect the environment [12], [14], [15]. Probabilism paradigm shows that based on their character, humans are more likely to make a certain decision compared to the environment. Hence, even both influence one another but the human roles as objects are more dynamic and can be seen as more dominant [16]. The emergence of probabilism in human geography has significantly bought out various new interests and studies of nature and humans such as the interest in cultural ecology and risk and hazard study [17]. Entering the twentieth century the human geography study becomes increasingly diverse, interesting and challenging. Research of the relationship of nature and humans in this discipline keep developing through new perspectives [17], [18]. Related to stated development, Montz and Tobin (2011) [19] agree that geographical research of nature and its danger which at first only focused on the physical process is now moving towards the recognition of interaction between physical environment and humans.

Through studies about various related literature, this article will discuss further about the linkages of humans and natural disaster, the standing of human geography in disaster studies, the experts who appeared as pioneers and contribute their ideas and the roles of human geography in disaster management especially in the effort of reducing disaster risk locally or globally.
2. Result and Discussion

2.1. What is the definition of “Human Geography”? 
The term human geography started becoming known in the late 19th century when experts eventually agreed to break geography into two branches which are physical geography and human geography [12] [20]. While physical geography studies the physical geography environment for the natural elements especially geomorphology, climatology and hierology, human geography studies the relationships between the natural environment and sociocultural environment created by humans along with all spatial distribution and the impact caused by the social, economic culture and politic phenomenon all over the world [21] [22]. We cannot rely on explanations which only based on one of the disciplines. Both of them are related because socio-biophysics landscapes are diverse and not equal so in studying a phenomenon, it needs to combine explanations and perspectives of human geography and physical geography [4] [23]. That idea is strengthen by Goudie (2017) [24] who argues that currently, the interests towards both as disciplines related to one another keep growing. Some of them include the studies of disaster, hazard, vulnerability, resilience and the global change, reasons, mitigations and adaptations.

Boyle (2015) [12] defines human geography as a discipline which the effort is to give pictures and explanations about the difference of human activities on earth. Meanwhile, Knox and Marston (2004) [25] define human geography as a science that studies the spatial organization in various human activities along with their relationships with the environment. Human geography can also be defined as a study about when, where, why and how humans evolve, develop strategies to adapt to the environment, process the natural resources and transmigrate to other parts of the world [20] [26]. Based on the said definitions, it can be concluded that human geography is a study about the dynamic relationship of humans and nature in building and maintaining the civilization.

Human geography is a vast field which includes various sub-disciplines of geography such as agriculture, culture, economy, politic, social, tourism, population and many more [5] [18] [20] [27]. At the beginning of its development, human geography only focused on analyzing the population trend, social and cultural change, interpreting geo-political conflict and trying to explain economic activity all around the world in the perspective of geography [26]. At this time, the people and human geography experts start to develop analysis related to the relationship of humans and physical environment for example how humans can utilize the nature, how humans manage their activities locally or globally, how humans can make a place and how that place in certain time starts to turn and shape human lives [26] [27] [28]. The results of the analysis from human geography will always change over time. This is because humans and nature are dynamic and easily change by certain factors. Hastuti (2017) [29] states the behavior dynamic and human activities on earth are affected by the factors of resources availability, technology mastery and social culture behavior change.

Human geography can be used to study the phenomenon in the past, see the spatial changes related to human activities on earth, help overcome problems which are happening and prepare ourselves in facing the possibilities in the future. Robinson (2003) [30] argues that human geography can contribute through alternative approach to the future such as the social learning process to increase the analytical capability and participatory involvement. The statement is supported by O’Brien (2010) [31] who states that with human involvement as agent of change, human geography is able to give contributions for a better world in the future.

2.2. Gilbert White: The Pioneer of Disaster Studies in Human Geography 
An American Geography expert emerged as the pioneer and realized that the natural disaster and extreme climate needed to be the main focus of experts in human geography and not only physical geography. White developed disaster and hazard study in human geography perspective and open the knowledge of the significance role of social, economy, culture and politic process in lowering the vulnerability and increasing the humans’ capacity towards possible danger [12]. According to Hinshaw (2006) [32], White poured his approach and knowledge to his study about the hazard of disaster profoundly so he is then considered the founding father of hazard study.

White is famous as ‘the founding father of floodplain management’ because of his cognition and contribution to flood management [33]. Since he was given the responsibility to increase the floodplain
management at the Missouri River Valley in the 1930s, White began to develop various ideas about predicting, preventing, mitigating, responding and adapting to disaster [12]. White’s ideas about flood significantly contribute to human civilization as massive floods in the last few decades happened all around the world and caused high death rate and also severe damage in varied sectors.

The average of flood in many continents continues to rise every decade (Figure 2). Until now, there are many people who live in floodplain area. The data from UNEP/GRID-Arendal (2007) [34] states that 17% of the city land in the US is flood zone, 50% of Japan’s citizen live in floodplain area and even Bangladesh has a high flood risk level that flood often happens over half of the country. Although from the beginning White is known for his ideas of flood management but most of his career had also been spent to study many types of hazards on the face of the earth; moreover, his comprehensive approach in lowering flood risk can also be applied vastly to other dangerous situation [12] [35]. White states that there are numerous adaptations that can be done by each individual or community when they are faced with danger in nature; this construct is then known as the ‘dominant’ approach [36] [37]. In 1976, White established Natural Hazards Center (NHC) in Colorado University as a well-known public policy authority in the world related to natural disaster [12].

![Figure 2. Flood Incidence Rate Per Decade 1950 – 2000](https://www.grida.no/resources/6062)

Gilbert White’s footprints in disaster studies were followed by Robert W. Kates. Several Kates’s essays and research in disaster field take up about the form of human adaptation to earthquake in Alaska 1964 (1970), the concept of the natural hazards in the perspective of human ecology (1971), the landscape planning to face hazards (1975), the risk study of technology (1983), the assessment method of hazard and its risk (1985), and the adaptation of global climate change (2012) [38], [39], [40], [41] [42], [43]. Based on his writings and concepts, it can be seen that Kates mainly focuses on the study of hazard, adaptation and new concepts about natural hazards through other perspective that is more specific. Furthermore, many other names came up such as Kenneth Hewitt, Keith Smith, David N. Petley, J. C. Gaillard and Jonathan Rigg.

Human geography expert who is still actively contributing in disaster studies to this day is Jonathan Rigg. Rigg is a professor and also the chair of Human Geography in University of Bristol in which one of the focuses in his work is disaster and resilience. Rigg has studied issues related to human vulnerability and exposure towards various disasters such as tsunami, earthquake and climate change since 1980 covering area of Laos, Nepal, Thailand, Vietnam and Sri Lanka [44].
2.3. The Place of Human Geography in Disaster Studies

Natural hazards as earthquake, tornado, volcano eruption and tsunami appear as the word ‘disaster’ is mentioned. In fact, disaster needs to be defined based on the consequences received by humans and not based on the cause. Earthquake for example, it is merely a natural phenomenon. Even a powerful earthquake cannot be called as a disaster unless it causes casualty or damage of property. So an earthquake happened in an unpopulated area, like a huge quake every month, is solely a natural phenomenon and is not considered as disaster [45]. Apart from causing injuries, death and physical damage, big disasters also have long term social and political impact such as the tsunami happened in Indian Ocean on December 24, 2004, the monstrous earthquake happened in Kashmir on October 8, 2005 and hurricane Katrina which swept away New Orleans on August 25, 2005 [5]. Therefore, it can be said that when disaster happens, the position of human is to be the victim whose life is affected materially, physically and psychologically [46].

Further research shows that often times human are not only stand as the affected victim but also as one of the factors that triggers various hazards. Disaster caused by human actions is known as social disaster which includes war, terrorism, repressive regime and colonialism [47], [48]. Humans are also responsible for non-natural disaster including forest fires, famine, the lack of clean water, technology failures and the spread of disease outbreaks [31], [41], [49]. O’Brien (2010) [31] argues that resource scarcity, global climate change, shift in land utilization, reduction of water quality and quantity and many other issues which trigger disaster are the impact of human actions and responds towards the environment. The high rate of human mobility is directly proportional with the rising frequency and intensity of disaster on earth. Even the massive city structure expansion and the high number of urbanization have increased the exposure of infectious disease like COVID-19 which is now being a global pandemic [50], [51], [52].

![Figure 3. Exposure of Population to Natural Hazards](source: United Nations University – Institute for Environment and Human Security, 2016 [53])

Aroudn 75% of the world’s population live in the area which at least once exposed to a disaster [12]. Most of the people exposed by a disaster live in a developing country with a low human development rate (Figure 3). The development of human resource needs to be level up in order to lower the disaster risk but rushed development can only be resulted in a new disaster risk because most of the policies and massive scale development programs cannot be explicitly configured for reducing risk [16]. In this stage, humans, who formerly solely stand as victim and trigger factor, then appear and play a part in disaster management. One of the indicators for the quality of human development is the level of knowledge and in this context focuses on the knowledge related to disaster specifically vulnerability and resilience [54]. Human geography then emerged as two main constructs. The first one is the science
which examines the relationship of humans and environment that can affect the happening of a disaster. The second is a discipline which equips humans in the effort of lowering the disaster risk.

2.4. There is Nothing Natural about the Natural Disasters

Are natural disasters purely caused by nature? In the previous section, it has been discussed about how humans play a role as the causing factor of social and non-natural disaster. In this section, referring to the argument of Kenneth Hewitt (1983) [36], humans are also pictured as the cause of natural disaster. Flood for example cannot be considered that the cause of it is heavy rains. Heavy rains will never be a disaster if the region has a well water absorption area and a good conditioned river. Flood happens because of river siltation caused by the actions of dumping trash and industrial solid waste into the river and also the lack of water absorption area caused by the fact that the soil is covered with concrete and asphalt. Along with that Hewitt’s idea, Henderson [55] states his notion that disaster risk, especially the ones in the city, is now more likely come from factors such as pre-disaster building constructions, environment topography and economic human resource in certain areas caused by the rapid development.

Another misunderstanding about natural disasters that often happens is that the population most at risk is the ones who unfortunate enough to be born in an exposed area. However, natural hazards are only a function from uneven distribution on earth so in reality, it is humans who put the population at a certain risk level by using the ability to manage vulnerability [12]. Meanwhile, there are various types of disasters happened to human race and most of the damage which follows the hazards might not be the direct effect of the hazards but it comes from the varied vulnerability which is not supported by capacity.

Kenneth Hewitt, a Canadian geographer, seriously considers the roles of the community in increasing and worsening the deathly hazards from natural disasters. In his book, Interpretations of Calamity: From the Viewpoint of Human Ecology (1983) [36], Hewitt shows that natural hazards are always threatening but they are only becoming disaster when humans chase after development without realizing that they are raising their vulnerability. In his other book, Regions of Risk: A Geographical Introduction to Hazards (1997) [56] Hewitt explains the claim by showing that a disaster is caused by three factors: hazard, vulnerability and capacity.

\[
R = \frac{H \times V}{C}
\]

\(R = \text{Risk}\)
\(H = \text{Hazard}\)
\(V = \text{Vulnerability}\)
\(C = \text{Capacity}\)

There is nothing natural about natural disasters, even if the natural phenomenon such as earthquake, tsunami and volcano eruption affects humans’ habitation, the impact might not be considered as massive calamity depends on the level of human vulnerability and capacity in the impacted area [12]. A natural disaster is a product built socially hence the trend depends on how big the interaction between the physical and social environment [3], [58]. Instead of understanding it as purely natural, disasters are more like a complex mosaic created by numerous factors of politics, technology, nature and moral [4].
Most countries around the world who have their disaster risk index in ‘medium’ to ‘very high’ are poor or developing countries with high vulnerability or low capacity (Figure 4). The vulnerability against hazards is affected by several social and demographical factors such as race, class, gender, age and education [11], [57]. Hazards create higher vulnerability for certain communities for example women, children, poor, minorities, refugees, people with low education experience and those who have no family [12], [59], [60], [61], [62]. Boyle (2015) [12] identifies six ways in which social, political and cultural process enhance population vulnerability exposed by natural hazards which are poverty, social exclusion, poor governance, war and violence, rapid urbanization and environment degradation. Experts agree that the most vulnerable zones against disasters are those inhabited by communities of poor families, immigrants and marginal people [5], [63]. In the disaster prevention and response, it is important to consider those vulnerabilities and how we can minimize them [64].

When the vulnerability cannot be minimized, building capacity or resilience locally, nationally or even globally is the effort that can be done to lower the disaster risk index. The capacity of a community to respond to hazards is influenced by the physical force and the economic and social relationships which underlie to act critically, respond to hazards positively and make a quick recovery from the impact [57], [65]. Emergency management plan in reducing disaster risk have to be able to build community capacity for resilience and in this case the resilience which involved several serious potential conflict such as stability and dynamics [65], [66].

The sustainably physical and human development plays a significant role in increasing the vulnerability through disaster adaptation and mitigation [67]. When two areas are exposed by hazards, the area with higher physical and human development will have a lower risk and impact compared to the other area with lower development index (Figure 4). For example, the earthquake happened in San Fernando, California in 1971. This earthquake has the magnitude of 6.4 Richter scale but the area around San Fernando Valley (with the population of more than seven million people) was only suffers small damage and 58 deaths. Two years later, an earthquake of 6.2 Richter scale hit Managua, Nicaragua and ravaged the city into ruins and killed 6,000 people [45]. Another case, for example, is the drought study done by Kates (2012) to compare the danger of drought for agriculture in Australia and Tanzania. The drought happened in Australia, from around 13 million populations, only one million were at risk with almost no record of death. Meanwhile in Tanzania, the number of deaths caused by the drought hit approximately 40 million from the total 12 million at risk. These two examples show that San Fernando and Australia have better human development compared to Managua and Tanzania in terms of disaster mitigation hence with the same disaster, Managua and Tanzania were calculated to have bigger disaster but not with San Fernando and Australia. This human development index is one of the capacities in decreasing the disaster risk.
Keith Smith and David N. Petley, in their book Environmental Hazards: Assessing Risk and Reducing Disaster [68], state that disaster studies have developed four main paradigms with each paradigm see hazards and approach mitigation in certain manners. (1) Before 1950, the engineering paradigm dominated. In this paradigm, the nature condition was considered as the root cause of disasters so the solution through engineering and technology development was recommended to protect humans. (2) Between 1950 and 1970, the behavior paradigm emerged. This paradigm focused on spatial planning to direct the use of land in the future to be a safe location against disasters. (3) The period of 1970 – 1990 was the era of development paradigm when underdevelopment and poverty in developing countries were considered as the main source of vulnerability. (4) In 1990 and so on, appeared the paradigm of complexity which aims to help the community in disaster prone areas to better manage the interaction between the people and nature to minimize their vulnerability against hazards.

2.5. Human Geography, GIS and Big Data in Disaster Management

Disasters have a long term impact for humans and spaces. Therefore, the emergence of human geography in disaster management often helps with the statistics, mathematics and space mapping technology such as GIS (Geographic Information System) who play significant role in spatial analysis [69] [70]. As one of the characters in geographical studies, spatial approach appears in human geography to show how each aspect of disasters can be mapped to understand the process on site. Because it is under the branch of human geography, the mapping done is focused on distributing the social process rather than the physical process [71].

The use of GIS in analyzing disaster studies cannot be separated from the needs of data which posse comprehensiveness, variation, resolution, indexation, accuracy and flexibility. Those needs are no longer a difficult matter to fulfill because right now we are in the era of big data where we can obtain information and use most of the data to create better and accurate understanding about the complexity of physical and social process [72], [73]. Most of the big data has spatial and temporal attributes so it gives a big potency for human geography including analyzing disaster [72]. Some experts agree that big data era can open numerous new possibilities for disaster management such as proposing and testing frameworks, planning physical recoveries and visualizing, analyzing and predicting disasters [74], [75], [76].

Hualou (2011) [16] states the roles of human geography that helps GIS and big data in disaster management:

1. Assessing Human-created Vulnerability: To a great extent, disasters are resulted from vulnerability as a consequence of various human activities concerning industrial revolution, natural resources exploitation and concentration of population. He methods of human geography and GIS are widely applied to vulnerability assessment aiming at disaster prevention and disaster management.

2. Assessing Human-created Vulnerability: The development of rapid industrialization and urbanization in developing countries often bring technological disaster due to the lack of adequate or effective countermeasures for risk reduction. In this field, geographical research mainly focuses on how to deal with the distribution, removing poisonous waste and their proximity to other land uses such as residential areas and farmland.

3. Developing Disaster Monitoring and Simulation Systems: Remote sensing, GIS and related technologies have been utilized to provide real-time value-added data and information to authorities in areas of natural resources and environmental management and the its role in detecting, modeling and monitoring natural hazards. Using GIS and remote sensing, natural disaster monitoring, situations assessment system and regional disasters reduction capacity assessment system can be established to prevent and manage diversified disasters.

4. Post-Disaster Recovery and Reconstruction: It is necessary for local post-disaster recovery plans to elicitting positive recovery outcomes that the plans include a sound participatory process and establish a nexus between local needs and policy objectives. The characteristics of human geography equipped by GIS with the quantitative statistic method have special advantages in this kind of plan such as the restoration and reconstruction post-earthquake.
2.6. The Roles of United Nations in Disaster Risk Reduction

Boyle [12] says his responsibility to promote and coordinate the international effort to minimize disaster risk falls under the shoulder of United Nations (UN). Since the first founded in 1945, the UN adopted at least four different approaches for disaster risk reduction:

1. 1st Phase (1946–1970): In this phase, the focus is to coordinate the stakeholders and partners after the natural hazards happened to give assistance and to help the countries to get back to their normal situation.

2. 2nd Phase (1971-1999): In the second phase, a series of formal policy frameworks and institutional arrangements were pioneered to help increase the countries’ readiness, ability to countermeasure and capacity to lower the damage.

3. 3rd Phase (2000 – now): In the third phase, the focus is on disaster risk reduction. In 2005, the UN adopted Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters (UNISDR, 2005).

4. 4th Phase (the future): According to some experts, we are now standing in the verge of a new approach of disaster risk reduction which emphasize on integration of disaster risk management to social, political and economic policies.

The central concept promoted in Hyogo Framework for Action 2005–2015 is the concept of “resilience”. Although it is possible to reduce the amount ad frequency of the disasters, it is possible that the strategies of disaster management in the future will focus on lowering the population vulnerability to natural hazards. These strategies will fortify the vulnerable community from hazards, strengthen the capacity of numerous community to cope better to hazards and make it possible for all community members in establishing and conducting long term strategies especially adaptation enhancement [12]. Previously, Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters [77] gave the most authoritative frameworks in which the countries were rising up to confront the challenge of public policies faced with natural hazards. Approving with the International Conference on Disaster Reduction held in Kobe, Japan in 2005, Hyogo Framework for Action (HFA) had signed more than 168 countries and had a function as 10 years strategy in which the damage caused by hazards can be minimized [12].

Sendai Framework for Disaster Risk Reduction (2015-2030) emerged as the next step of Hyogo Framework for Action (2005-2015). SFDR is a voluntary non-binding agreement in the span of 15 years which acknowledge that a country holds a significant role in overcoming disaster risk. That role can be distributed to local governments, private parties and others. These frameworks aim to achieve outcome in the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries [78]. The framework for disaster risk reduction adopted on 14 – 18 of March, 2015 in Sendai, Miyagi, Japan established the Seven Global Targets which were expected to be reached in the span of 15 years [78]. The seven targets are:

1. Substantially reduce global disaster mortality by 2030.
2. Substantially reduce the number of affected people globally by 2030.
3. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services.
5. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
6. Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of the present Framework by 2030.
7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

In the mission to implement disaster risk reduction globally, Sendai Framework for Disaster Risk Reduction (2015-2030) referring to the four priorities for action which are:

1. Understanding disaster risk.
2. Strengthening disaster risk governance to manage disaster risk.
3. Investing in disaster risk reduction for resilience.
4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

3. Conclusion

Human geography, as a big sub-discipline in geography, is currently developing its analysis related to physical environment specifically about human position in disaster studies. The studies of disasters are always considered related to humans because humans hold the position as the causing factor, victim and at the same time the one who put on the effort of disaster management. Gilbert White, an American geographer emerged as the disaster studies pioneer in human geography. White developed hazard and disaster studies in the perspective of human geography and also open the idea of the important role of social, economic, cultural and political process in minimizing the consequences from disasters. Other experts who later follow White are Robert W. Kates, Kenneth Hewitt, Keith Smith, David N. Petley, J. C. Gaillard and Jonathan Rigg.

Human geography experts agree that there is nothing natural about natural disasters because there is always human involvement in it. Although the global variation in the risk caused by natural disasters are partly the result of exogenous and endogenous force but numerous human behavior and activities on earth caused certain population to be more vulnerable to disasters. Population vulnerability on a specific area is affected by the factors of poverty, social exclusion, poor governance, war and violence, rapid urbanization and environment degradation. If the risk related to natural hazards need to be lowered, bigger attention needs to be given to minimize the population vulnerability, increase their capacity to cope with disasters and strengthen their ability to adapt in a long term period.

Human geography equipped with GIS and big data has significant roles related to disaster management; they are assessing human-created vulnerability, assessing human-created vulnerability, developing disaster monitoring and simulation systems, post-disaster recovery and reconstruction. In the real action in a global scale, the United Nations have promoted and coordinated the efforts in disaster risk reduction in which one of them is adopting Hyogo Framework for Action (2005-2015) which focuses on building the resilience of nations and communities to disasters and followed by Sendai Framework for Disaster Risk Reduction (2015-2030) which emphasize on reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

Acknowledgments

Gratitude was expressed to the lecturers of master program geography education department for their many helpful suggestions which improved the original manuscript.

References

[1] Hastuti and Widyastuti M 2018 Happiness behind the threat of disaster: women in the south merapi slope Karsa: Journal of Social and Islamic Culture 26 129-49
[2] Kulatunga U 2010 Impact of culture towards disaster risk reduction International Journal of Strategic Property Management 14 304-13
[3] Britton N R 1986 Developing an understanding of disaster The Australian and New Zealand Journal of Sociology 22 254–71
[4] Massazza A, Brewin C R and Joffe H 2019 The nature of ‘‘natural disasters’’: survivors’ explanations of earthquake damage International Journal of Disaster Risk Science 10 293–305
[5] Daniels P, Bradshaw M, Shaw D, and Sidaway J 2008 An Introduction to Human Geography: Issues for the 21st Century (4th edition) (New Jersey: Pearson,).
[6] Dranseika V 2016 Moral responsibility for natural disasters Human Affairs 26 73-79
[7] Rousseau J J 1756 Correspondence complète de Jean Jacques Rousseau ed J A Leigh 4 pp 37-50 (Translated by R Spang)
[8] Neiman S 2004 Evil in Modern Thought: an Alternative History of Philosophy (Princeton: Princeton University Press)
[9] EMDAT 2020 OFDA/CRED International Disaster Database, Universite catholique de Louvain – Brussels – Belgium (https://ourworldindata.org/exports/natural-disasters-by-type_v9_850x600.svg)
[10] Zein A M 2010 Community Based Approach to Flood Hazard and Vulnerability Assessment in Flood Prone Area: A Case Study in Kelurahan Sewu, Surakarta City, Indonesia (thesis: ITC, The Netherland)
[11] Fraser J C 2006 The relevance of human geography for studying urban disasters Space and Culture 9 14–19
[12] Boyle M 2015 Human Geography: A Concise Introduction (UK: Wiley Blackwell)
[13] Johnston R J 1983 Philosophy and Human Geography: An Introduction To Contemporary Approach (London: Edward Arnold)
[14] Flowerdew R 2009 Probabilism International Encyclopedia of Human Geography ed R Kitchin and N Thrift (Amsterdam - Elsevier Science) pp 448–450
[15] Fekadu K 2014 The paradox in environmental determinism and possibilism: a literature review Journal of Geography and Regional Planning 7 132–39
[16] Hualou L 2011 Disaster prevention and management: a geographical perspective Disaster Advances 4 3-5
[17] Turner II B L 2015 Nature–society in geography International Encyclopedia of the Social & Behavioral Sciences 2 334-339
[18] Kobayashi A 2017 Human Geography International Encyclopedia of Geography: People, the Earth, Environment and Technology ed D Richardson, N Castree, M F Goodchild, A Kobayashi, W Liu and R A Marston (New Jersey: John Wiley & Sons) pp 1–18
[19] Montz B E and Tobin G A 2011 Natural hazard: an evolving tradition in applied geography Applied Geography 31 1–4
[20] Pitzl G R 2004 Encyclopedia of human geography (London: Greenwood Publishing)
[21] NCERT (National Council of Educational Research and Training) 2006 Fundamentals of Human Geography. (New Delhi: Government of India)
[22] Zhipeng T, Zhang J, Liu W and Wu H 2012 Differences between physical and human process simulation in geography Journal of Geographical Sciences 22 497-508
[23] Lave R, Wilson M W, Barron E S, Biermann C, Carey M A, Duvall C S and Dyke C V 2014 Intervention: critical physical geography The Canadian Geographer 58 1—10
[24] Goudie A S 2016 The integration of human and physical geography revisited The Canadian Geographer 61 19–27
[25] Knox P and Marston S A 2004 Human Geography: Places and Regions in Global Context - 3rd Edition (New Jerseyy: Prentice Hall)
[26] Gibson C 2009 Human Geography (Australia: University of Wollongong)
[27] Fouberg E H and Murphy A B 2020 Human Geography: People Place and Culture (New York: John Wiley and Sons Inc)
[28] Tadaki M J, Salmond R, Heron L and Brierley G 2012 Nature, culture, and the work of physical geography Transactions of the Institute of British Geographers 37 547—62
[29] Hastuti 2017 Memahami pariwisata melalui pendekatan geografi manusia Geomedia 15 pp 20
[30] Robinson J 2003 Future subjunctive: backcasting as social learning Futures 35 839–56
[31] O’Brien K 2010 Responding to environmental change: a new age for human geography? Progress in Human Geography 35 542–49
[32] Hinshaw R E 2006 Living with Nature’s Extremes: The Life of Gilbert Fowler White (Colorado: Johnson Books)
[33] Macdonald N, Chester D, Sangster H, Todd B and Hooke J 2011 The significance of Gilbert F. White’s 1945 paper ‘human adjustment to floods’ in the development of risk and hazard management Progress in Physical Geography 36 125–33
[34] Rekacewicz and Bournay 2007 UNEP GRID-Arendal (https://www.grida.no/resources/6062)
[35] Wescoat J L 2006 Gilbert Fowler White (1911–2006) wisdom in environmental geography Geographical Review 96 700–10
REFERENCES

[36] Hewitt K 1983 *Interpretations of Calamity: From the Viewpoint of Human Ecology* (New York: Routledge)

[37] Burton I, Kates R W and White G F 1993 *The Environment as Hazard - second edition* (London: Guilford Press)

[38] Kates R W 1970 *Human Adjustment to Earthquake Hazard* *The Great Alaska Earthquake of 1964: Human Ecology, National Academy of Sciences-National Research Council Publication No 1607* pp. 7-31.

[39] Kates R W 1971 *Natural hazard in human ecological perspective: hypotheses and models* *Economic Geography* 47 438-51

[40] Kates R W 1975 Planning for hazards: in everyday landscapes *Landscape Architecture Magazine* 62 pp. 165-168 (Published by: American Society of Landscape Architects)

[41] Kates R W and Kasperson J X 1983 Comparative risk analysis of technological hazards (a review) *Proc. of the Nat. Academy of Sciences* Vol 80 pp 7027–38

[42] Kates R W, Hohenemser C and Kasperson J X 1985 *Perilous Progress: Managing the Hazards of Technology* (Colorado: Westview Press) pp 251-64

[43] Kates R W, Travis W R and Wilbanks T J 2012 Transformational adaptation when incremental adaptations to climate change are insufficient *Proc. of the Nat. Academy of Sciences* Vol 109 pp 7156–61

[44] Kinvall C and Rydstrom H 2019 *Climate Hazards, Disasters, and Gender Ramifications* (New York: Routledge Studies in Hazard, Disaster Risk and Climate Changes)

[45] Perez E and Thompson P 1986 *Natural Hazards: Causes and Effects* (US: Disaster Management Center at the University of Wisconsin-Madison)

[46] Wesnawa I G A and Christiawan P I 2014 *Geografi Bencana* (Yogyakarta: Graha Ilmu)

[47] Teich J M 2002 The informatics response in disaster, terrorism, and war *Journal of the American Medical Informatics Association* 9 97–104.

[48] Harding S 2015 Man-made disaster and development *International Social Work* 50 295–306

[49] Rose-Redwood R, Kitchin R, Apostolopoulou E, Rickards L, Blackman T, Crampton J and Buckley M 2020. Geographies of the COVID-19 pandemic *Dialogues in Human Geography* 1-10

[50] Song X, Zhang Q, Sekimoto Y and Shibasaki R 2014 Prediction of human emergency behavior and their mobility following large-scale disaster *Proc. of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining - KDD ’14*.

[51] Acuto M 2020 COVID-19: lessons for an urban(izing) world *One Earth* 2 317-19

[52] Connolly C, Ali S H and Keil R 2020 On the relationships between COVID-19 and extended urbanization *Dialogues in Human Geography* pp 1-4

[53] Comes M et al. 2016 *World Risk Report 2016* (Published by: Bündnis Entwicklung Hilft and United Nations University – Institute for Environment and Human Security)

[54] Donovan A 2014 *Geopower Progress in Human Geography* 41 44–67

[55] Henderson A 2006 The human geography of catastrophe: family bonds, community ties, and disaster relief after the 1906 San Francisco earthquake and fire *University of California* 88 pp 37-70

[56] Hewitt K 1997 *Regions of Risk: A Geographical Introduction to Hazards* (New York: Routledge)

[57] Hutton D and Haque C E 2004 Human vulnerability, dislocation and resettlement: adaptation processes of river-bank erosion-induced displacees in Bangladesh *Disasters* 28 41–62

[58] Weichselgartner J 2001 Disaster mitigation: the concept of vulnerability revisited *Disaster Prevention and Management* 10 85–95

[59] Cupples J 2007 Gender and hurricane mitch: reconstructing subjectivities after disaster *Disasters* 31 155–75

[60] Hastuti 2016 Peran perempuan dalam menghadapi bencana di Indonesia *Geomedia* 14 13-21

[61] Moreno-Walton L and Koenig K 2016 Disaster resilience: addressing gender disparities *World Medical & Health Policy* 8 46–57

[62] Gaillard J C, Gorman-Murray A and Fordham M 2017 Sexual and gender minorities in disaster *Gender, Place & Culture* 24 18–26
[63] Rigg J, Law L, Tan-Mullins M and Grundy-Warr C 2005 The Indian Ocean tsunami: socio-economic impacts in Thailand The Geographical Journal 171 374–79
[64] Hanson R 2007 Catastrophe, Social Collapse, and Human Extinction (Virginia: Department of Economics, George Mason University)
[65] Maguire B and Hagan P 2007 Disasters and communities: understanding social resilience The Australian Journal of Emergency Management 22 16-20
[66] Alexander D E 2013 Resilience and disaster risk reduction: an etymological journey Natural Hazards and Earth System Sciences 13 2707–16
[67] Kelman I, Gaillard J C and Mercer J 2015 Climate change’s role in disaster risk reduction’s future: beyond vulnerability and resilience International Journal of Disaster Risk Science 6 21–27
[68] Smith K and Petley D N 1991 Environmental Hazards: Assessing Risk and Reducing Disaster (London: Routledge)
[69] Kitchin R and Tate N J 2000 Conducting Research in Human Geography: Theory, Methodology and Practice (Singapore: Addison Wesley Longman)
[70] Komac B 2009 Social memory and geographical memory of natural Disasters Acta Geographica Slovenica 49 199–226
[71] Curti A and Jacqueline W M 2010 GIS, Human Geography, and Disasters (California: Cognella Academic Publishing)
[72] Kitchin R 2013 Big data and human geography Dialogues in Human Geography 3 262–67
[73] Graham M and Shelton T 2013 Geography and the future of big data, big data and the future of geography Dialogues in Human Geography 3 255–61
[74] Papadopoulos T, Gunasekaran A, Dubey R, Altay N, Childe S J and Fosso-Wamba S 2017 The role of Big Data in explaining disaster resilience in supply chains for sustainability Journal of Cleaner Production 142 1108–18
[75] Akter S and Wamba S F 2017 Big data and disaster management: a systematic review and agenda for future research Annals of Operations Research
[76] Yu M, Yang C and Li Y 2018 Big data in natural disaster management: a review Geosciences 8 pp. 165
[77] UNISDR 2005 Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (Japan: World Conference on Disaster Reduction)
[78] UNISDR 2015 Sendai Framework for Disaster Risk Reduction 2015-2030 (Japan: World Conference on Disaster Reduction)