DISASTER RISK REDUCTION FOR SUSTAINABLE DEVELOPMENT GOALS

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Abstract: Our civilization is witnessing the devastating power of natural disasters all over the world. Unfortunately, it is evident that the number and intensity of disasters increased over time. Consequently, grate number of victims and material damage force the countries and regions to invest in development of mechanisms for forecast and responce to disasters, and also of the systems for disaster risk reduction. At present, large number of projects are being developed in order to define the influence of present and future disaster and natural disaster risks and the adequate response to their harmfully effects on human development and environmental assets. This paper is intended to support the growing body of research that attempts to encourage knowledge sharing in the field of disaster preparedness and risk reduction.

Key words: disaster, natural disaster, disaster risk, disaster risk reduction, sustainable development, sustainable development goals

1. INTRODUCTION

"In global movements of people, goods, services and other factors, countries show different levels of development" (Jednak, 2017) as well as environmental and heritage conditions, trends and pressures reflected in global and local states of environment.

It is evident that the opportunities that the planet Earth "offers" to its inhabitants are no longer reciprocal with those that refer to the limits of these the planet can "receive" from the human kind. In other words "in the world we currently inhabit, the metabolism of our economy is on a collision course with the metabolism of our planet" (Harding, Iser, & Stevens, 2007). The disturbance of the natural balance caused by people`s activities, provokes changes in global ecosystem, such as temperature and climate changes and changes in weather patterns. Such changes deteriorate the conditions of survival of many populations, including our human population, and they are all collectively called ecological crisis (UNESCO - Division of Science, Technical and Environmental Education, 1986).

"Environmental problems reached their critical point in the 21st century and continue to rapidly grow: global warming, the deterioration of living conditions, disruption of the ozone layer, the impacts of conservation, increase in the amount of solid waste, radioactive contamination, destruction of forests, the extinction of plant and animal species…" (Robert, Flood, & Carson, 1993; Mert, 2006; Bonnett, 2007; Petrović, 2016; Radaković, Petrović, Milenković, Stanojević, & Đoković, 2017). This has resulted in a rising interest in the concept of sustainable development "as a result of the perception of current actual conditions of the global human environment, which is largely unsatisfying and worrying, and demands urgent reaction of all members of the society, focused on long term environment protection and maintenance of biological stability" (Petrović, 2012; Petrović, 2016; Savić, Bogetić, Dobrota, & Petrović, 2016).

Furthermore, it can be pointed out with great certainty, that every society, regardless its technological progress, is susceptible to the consequences of a destructive influence of possible occurrence of natural disasters, which in the 94% of the cases occur as a consequence of earthquakes, tropical cyclones

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(typhoons, tropical storms), floods and droughts, in other words, climate changes (Kumar Jha, 2010).

When it comes to climate change, it should be pointed out that they represent "the biggest environmental problem facing humanity and the most serious challenge for the present and future generations because it is reshaping our understanding of progress and scientific and technological development. The seriousness of climate change issue is reflected in the fact that the United Nations recognized the link between climate change and human rights as an important step towards protecting the fundamental rights of communities across the planet" (UNEP, 2017; Radaković, Petrović, Milenković, Stanojević, & Đoković, 2017).

These disasters are unfortunately unavoidable, but what is by all means possible to do is to alleviate their consequences and thus increase resistance of societies to them. In order for this to be done, it is necessary that individuals, institutions, administrations and governments join the essential systematic development and application of effective disaster risk reduction, so that these consequences are minimised for the protection of the lives of people and animals, health and property of the people, environment and cultural heritage.

2. NATURAL DISASTERS

"Natural disasters are a clear example of people living in conflict with the environment. Disasters cause human, social and environmental losses and, sometimes, even threaten geopolitical stability, as in many less developed countries. They are also a problem of global concern, even when damage is local: the mechanisms are often dependent on global meteoro-climatic circulation" (Casale, 2004). The United Nations defined "catastrophy" as a result of exposure and insufficient ability to reduce or avoid potentially negative consequences (UNISDR, 2009).

According to ISDR data (2010), of all natural disasters, the most significant are the ones caused by floods (44% of total number of recorded situations), then storms (34%), while 10% make the disasters caused by landslides. Climate extremes (droughts and high temperatures), also make a significant part in the total number of recorded disasters (10%), while forest fires make 2%.

The Emergency Law of the Republic of Serbia (Official Gazette of the Republic of Serbia, no. 111/09, 92/11, 93/12), defines catastrophy as a state when risks, threats and other types of danger for the population, environment and material goods are of such size and intensity, that their occurrence or consequences are impossible to prevent or remove by the regular action of the authorities and services, in which case it is necessary to use special measures, powers and means with more intensive work regime, in order to lessen or remove them.

Seismic, meteorological and hydrological occurrences are natural occurrences which are essential part of the life on Earth. But if we take into consideration an increase of the number of extreme climate occurrences, as well as the fact that a number of people is increasing rapidly and that more and more people are settling in the high-risk zones, experts anticipate that in the period to come, a number of casualties and material damage caused by natural disasters will dramatically increase.

It should be pointed out that throughout history, natural disasters have represented an integral part of the life on Earth for millions of years, and that we, as a civilisation, have incessantly faced a destructive influence of the earthquakes, volcanoes, floods and various epidemics.

Table 1 shows a review of numerous natural disasters that through centuries brought about a great number of human casualties within societies and the economics of disastrous material damages.

Table 1: Review of natural disasters through history (Kumar Jha, 2006; Kellett & Sense, 2017)

Disaster	Country	Year	Number of Casualties/Human Impact
1. Earthquake on the Mediterranean	Egypt and Syria	1201.	1,100,000
2. Shaanzi earthquake	China	1556.	830,000
3. Typhoon in Culcutta	India	1737.	300,000
4. Bengal – epidemic of hunger	India	1770.	15,000,000
5. Hurricane on the Caribbeans	Martinique, st Eustatius and Barbados	1780.	22,000
6. Tamboro volcano	Indonesia	1815.	80,000
7. Kangra earthquake	India	1905.	19,000
8. The flu epidemic	global	1917.	20,000,000
9. Flood on the river Yang Tse	China	1931.	3,000,000
10. Hunger	Russia	1932.	5,000,000
11. Earthquake in Bihar- Nepal	India and Nepal	1934.	50,000
12. Bengal- hunger epidemic	India	1943.	3,000,000
13. Cyclone in Bangladesh	Bangladesh	1970.	300,000
14. Tangshan earthquake	China	1976.	655,000
15. Indian-Ocean Tsunami	Indian-Ocean Regia	2004.	230,000
16. Haiti earthquake	Haiti	2010.	200,000
17. East African drought	East Africa	2010-2011.	258,000

Until recently, the great Tangshan earthquake in China, which occurred in 1976. has been considered a catastrophe with the largest number of casualties in the 20th century. This earthquake happened during the night when the majority of population was at home. However, this disaster, as well as the consequences of Sichuan earthquake, in 2008. when 68,000 people were killed and 367,000 people were wounded, cannot be compared to the catastrophic consequences of the Spanish flu epidemics, which in 1917. killed around 20 million people globally (Coppola, 2006).

Types of natural disasters and their influence on people and material goods depend on geographic position, climate and the level of vulnerability of a region. Natural disasters are divided into three main groups:

- geophysical (volcano eruptions, earthquakes, land slips, landslides, avalanches);
- hydrometeorological (floods, droughts, stormy winds, extreme temperatures) and
- biological disasters (epidemics, hunger).

3. NATURAL DISASTERS IMPACT AND THE MILLENNIUM DEVELOPMENT GOALS

Examples of natural disasters and their impacts on the seven of eight Millennium Development Goals (MDG) are given bellow (Kellett & Sense, 2017):

- *MDG 1 - Eradicate poverty and hunger*:
  - Natural disaster: In Aceh, the 2004 tsunami is estimated to have increased the proportion of people living below the poverty line from 30 – 50%.
  - Impact on MDG: Better land use planning enhances food productivity and strengthens sustainability.

- *MDG 2 - Achieve universal primary education:*
  - Natural disaster: The 2008 Sichuan earthquake destroyed 7,000 classrooms.
  - Impact on MDG: Only through building earthquake-proof schools can seismic-prone countries and regions protect children and their education.
- *MDG 3 - Promote gender equality and empower women:*
  - Natural disaster: During the 2005 Pakistan earthquake, the estimated number of pregnant women in the affected areas was 40,000.
  - Impact on MDG: Shelters built to protect communities against natural hazards can function as medical facilities or schools in times of disaster.
- *MDG 4 - Reduce child mortality:*
  - Natural disaster: The 2005-2006 Drought in the Horn of Africa increased child wasting up to 8%, and up to 25% for pastoralist communities.
  - Impact on MDG: Training schoolchildren in a knowledge of disaster risk, first aid and emergency lives, saves both theirs and adult lives.
- *MDG 5 - Improve maternal health:*
  - Natural disaster: During the 2005 Pakistan earthquake, the estimated number of pregnant women in the affected areas was 40,000.
  - Impact on MDG: Shelters built to protect communities against natural hazards can function as medical facilities or schools in times of disaster.
- *MDG 6 - Combat HIV/ AIDS, malaria and other diseases:*
  - Natural disaster: There were over 17,000 cases of diarrheal disease after flooding in Bangladesh in 2004.
  - Impact on MDG: Water and sanitation systems built to hazard-resistant standards, can resist becoming a breeding ground for disease.
- *MDG 7 - Ensure environmental sustainability:*
  - Natural disaster: Cyclone Nargis affected about 16,800 ha (41,514 acres) of natural forest and 21,000 ha (51,892 acres) of forest plantations.
  - Impact on MDG: Switching from traditional trades in woodcutting in drought-prone areas to sustainable agriculture, can both reduce deforestation and provide a more secure form of income.

3. DISASTER RISK REDUCTION IN GOALS OF THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

When it comes to The 2030 Agenda for Sustainable Development and its perspectives on disaster risk and natural disaster risk it should be noted that the new global agenda "recognizes and reaffirms the urgent need to reduce the risk of disasters" (UNISDR, 2015). This is confirmed in documents and outcomes of the Third United Nations World Conference on Disaster Risk Reduction and the Sendai Framework.

These documents confirm that the implementation of disaster and natural disaster risk reduction would provide "an opportunity to encourage increased political commitment and economic investment to reduce risks and take development action that considers disaster resilience as critical to poverty reduction and key enabler of sustainable development" (UNISDR, 2015).

Targets of disaster risk reduction in goals of The 2030 Agenda for Sustainable Development (SDGs) are given in Table 2.

Table 2: Disaster Risk Reduction Targets in SDGs (UN, 2015)

Sustainable Development Goal	Related disaster risk reduction target
Goal 1: End poverty in all its forms everywhere	Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extremes and other economic, social and environmental shocks and disasters
Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that held maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.
Goal 3: Ensure healthy lives and promote well-being for all at all ages	Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks.
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Target 4.7: By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development. Target 4.a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all.
Goal 6: Ensure availability and sustainable management of water and sanitation for all	Target 6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with focus on affordable and equitable access for all. Target 9.a: Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island development states.
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	Target 11.1: By 2030, ensure access for all to adequate, safe and affordable and basic services and upgrade slums. Target 11.3: By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries. Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage. Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic

	product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations. Target 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015- 2030, holistic disaster risk management at all levels. Target 11.c: Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.
Goal 13: Take urgent action to combat climate change and its impacts	Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. Target 13.2 Integrate climate change measures into national policies, strategies and planning. Target 13.3 Improve education, awarenessraising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. Target 13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible. Target 13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth and local and marginalized communities.
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Target 14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.
Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Target 15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements. Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally. Target 15.3 By 2030, combat desertification, restore degraded land and soil, including land

	affected by desertification, drought and floods, and strive to achieve a land degradationneutral world. Target 15.4 By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for 19 sustainable development. Target 15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

It can be concluded that disaster risk reduction and management represent a key sustainable development issues. More precisely (Kellett & Sense, 2017):

- The reduction and management of disaster risk support sustainable and equitable development.
- Disaster risk reduction and management must be multi-sectoral and integrated in sustainable development.
- Disaster risk reduction is a crucial element of the future development agenda.

Further, in the context of disasters and their impacts must be emphasized that "the ability to measure vulnerability is increasingly being seen as a key step towards effective risk reduction and the promotion of a culture of disaster resilience. In the light of increasing frequency of disasters and continuing environmental degradation, measuring vulnerability is a crucial task if science is to help support the transition to a more sustainable world (Kasperson, Kasperson, Turner, Hsieh, & Schiller, 2005; Birkmann, 2006). This means that centre on natural disasters and their quantification must be focused on "the identification, assessment and ranking of various vulnerabilities (Maskrey, 1993; Bogardi & Birkmann, 2004; Birkmann, 2006).

4. CONCLUSION

"The more governments, UN agencies, organizations, businesses and civil society understand risk and vulnerability, the better equipped they will be to mitigate disasters when they strike and save more lives." - Ban Ki-moon, United Nations Secretary-General

By its nature, the environment goes beyond political and legal frameworks and boundaries set by menkind (European Commission, 2014). Therefore, all disasters that have impacts on the nature are essential if we want to sustainably deal with these challenges that affect us all.

It should be noted that disaster risk reduction requires investment in efforts toward achieving sustainable development goals as well as a preparedness for catastrophic events in the future (Abolmasov et al., 2017). "Thus, disaster risk reduction involves every part of society, every part of government, and every part of the professional and private sector" (UNISDR, 2017).

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