Journal of Development and Integrated Engineering

Journal homepage: https://ejournal.upi.edu/index.php/jodie

DISASTER RESPONSE MOSQUE:

A Mosque as a Center for The Rescue of The Ummah

Yudhi Gunardi[*]*, M. Syaom Barliana*

Master of Architecture, Universitas Pendidikan Indonesia, Bandung, Indonesia

*Correspondence: E-mail: *yudhi.gunardi@upi.edu*

ABSTRACT

Disaster events are almost impossible to predict accurately when, where and how big so that the preparedness of all elements of society in various regions is a basic need so that the impact of disaster risk can be minimized. The number of mosques in various parts of Indonesia, both institutionally and physically, is a strategic means as a center for saving people from disasters, so that they become interesting objects for research. This study aims to describe the strategic role of planning and designing mosques to reduce disaster risk. The results of this study indicate that planning and designing mosques to reduce disaster risk can be carried out through three stages as follows: (1) Pre-disaster stage through planning: mitigation programs (non-physical), infrastructure planning (physical), site selection, building planning and environment. (2) In the emergency response stage, the design of the mosque must be adaptive to readiness as an information post, volunteers and logistics, medical service facilities, refugee shelter facilities, refugee sanitation facilities, public kitchen facilities, and trauma healing facilities. (3) Post-disaster stage through metal/trauma healing rehabilitation, community economic empowerment program, evaluation, and capacity building to deal with disasters.

ARTICLE INFO

Article History:
Submitted/Received 17 May 2021
First Revised 15 June 2021
Accepted 29 June 2021
First Available online
Publication Date 30 June 2021

Keyword:
Disaster
Mitigation
Disaster Management
Disaster Response Mosque

1. INTRODUCTION

Indonesia is an archipelagic country that is surrounded by the most active earthquake path in the world (the Ring of Fire), so it often experiences earthquakes and volcanic eruptions (Utomo, 2019). In addition, Indonesia is also in the subduction zone of three Indo-Australian tectonic plates, the Eurasian Plate, and thePacific plate, the movement of one of these plates can cause earthquakes, tsunamis, and volcanic eruptions(Gunardi et al., 2021).

Based on the law of Republic of Indonesia No. 24 of 2007, these geographical, geological, hydrological, and demographic conditions cause Indonesia to be prone to disasters, whether caused by natural factors, non-natural factors, or human factors that can cause human casualties, environmental damage, property losses, and psychological impacts that under certain circumstances can hinder national development, thus requiring systematic, integrated, and coordinated disaster management. The trend of disaster events in Indonesia can be seen in Diagram 1.

Figure 1. Diagram Trends in Natural Disasters in 2010-2020
Source: National Disaster Management Agency and Disaster Management Institute of Indonesia

The data in Diagram 1 shows that the trend of natural disasters in Indonesia tends to increase, with the most dominating events being floods, tornadoes, landslides, and forest fires. The lowest incidence occurredin 2011 with 1,619 cases, and the highest incidence occurred in 2019 with 3,814 cases.

Disaster events are almost impossible to predict accurately when, where and how big so that the preparedness of all elements of society in various regions is a basic need so that the impact of disaster risk can be minimized.

DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165

The prevention methods applied in each region will likely be different, because it is influenced by the geographical location of the region, the potential for disaster vulnerability that commonly occurs in the region, and the social conditions of the community (Susanti, I., et al., 2018) (Zahro et al., 2014).

Indonesia, based on data from the World Population Review 2020, has a Muslim population of 87.2% and according to data from the Ministry of Religion of the Republic of Indonesia, there are 741,991 mosques spread throughout Indonesia (Supriatna & Handayani, 2021) (Susanti, I., et al., 2020).

The number of mosques in various regions of Indonesia, both institutionally and physically, is an interesting object to be studied from various disciplines, so that the results of the research will enrich the repertoire of discussions on comprehensive disaster management efforts. In the field of architecture, the discussion of architects in reducing the impact of disasters still needs to be improved.

This study aims to describe the strategic role of planning and designing mosques as centers for saving the community to reduce disaster risk. The problem in this research is formulated as follows:

1. What preparations should the mosque do in the pre-disaster stage?
2. What kind of mosque design is adaptive in the emergency response stage?
3. What is the role of mosques in the post-disaster stage?

Literature Review:

Disaster

Disaster is large-scale damage to the ecology, both physically and functionally between humans and their environment, caused by nature or humans, in the form of visible or invisible events (or later, as in drought), which cannot be handled by existing resources and Affected communities require extraordinary efforts to deal with the damage caused, even requiring assistance from the international community (Wijaya and Permana, 2018).

Another definition is given by an international institution under the United Nations that handles disasters internationally, namely UNISDR, this institution defines international disasters as follows:

1. There is a disruption (disruptive) to the progress of civilization seriously.
2. The disturbance includes losses that hurt humanity, material, economy, and the environment.
3. This disturbance exceeds the community's ability to deal with the impact of the disaster, with itsresources.

In the Law of the Republic of Indonesia No. 24 of 2007 concerning Disaster Management, disasters are described as follows:

1. A disaster is an event or series of events that threatens and disrupts people's lives and livelihoods, whether caused by natural or non-natural factors or human negligence, resulting in loss of life, loss of property, psychological impact, and environmental damage.
2. A natural disaster is a disaster caused by an event or series of events caused by natural factors such as earthquakes, tsunamis, volcanic eruptions, floods, droughts, hurricanes, and landslides.
3. Non-natural disasters are disasters caused by non-natural events or series of events such as epidemics, disease outbreaks, technological failures, and failed modernization.
4. A social disaster is a disaster caused by an event or series of events caused by humans, such as thesocial conflict between groups or between communities, and terror.

DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165

5. The implementation of disaster management is a series of efforts that include the establishment of development policies that are at risk of causing disasters, disaster prevention activities, emergencyresponse, and rehabilitation.
6. Disaster prevention activities are a series of efforts made to eliminate or reduce the threats and impacts of disasters.

Classification of Disasters Based on Their Nature

Every disaster has a magnitude of impact that it causes. Based on these characteristics, not all events that cause damage or loss are categorized as disasters. In a disaster, there is a difference between event, disaster, and catastrophe. For example, a mosque fire that can be handled by firefighters is included in the event category, not a disaster. Catastrophe (catastrophic) has a more devastating impact than a disaster.

According to his book that called Disaster Theory: An Interdiciplinary Approach to Concepts and Causes, Etkin said that an event is categorized as catastrophic if:

1. Has a huge impact on almost or all of the community's infrastructure.
2. The local government cannot carry out its duties properly and even continues until the post-disasterrecovery period.
3. Almost everyday community activities are disrupted.
4. The closest community cannot assist.

Classification of Disasters Based on Management Capability

Based on the ability to manage, according to Coppola (2015) disasters can be divided into three, namely:

1. Local disasters, namely the scale of disasters that can be handled by local governments such as cities/provinces. If it cannot be handled, it will become a national disaster.
2. National disaster, namely the scale of the disaster that can be handled by the national/local stategovernment. If the national (local) government can't handle it then it becomes an international disaster.
3. International disasters, namely the scale of disasters that must be handled by internationalinstitutions or coalitions of several countries that assist in disaster management.

Classification of Disasters Based on the Speed of Occurrence.

Etkin (2016) said on his book that disasters can also be classified according to the speed of occurrence, namely slow disasters and rapid disasters.

1. Slow disaster

Slow onset disaster or creeping disaster is a type of disaster that occurs slowly without even showing symptoms. After the damage, suffering in proportionate amounts, and requiring massive emergency measures, the symptoms of a new disaster appear. Examples are epidemics of disease, famine, drought, and desertification.

Judging from the number of occurrences, there is only one type of disaster (single disaster) and some occur more than one disaster (compound disaster). In compound disasters or complex disasters, disasterevents occur at the same time and place and can magnify, worsen and add to the damage.

DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165

2. Rapid disaster

Meanwhile, a rapid disaster is a disaster that occurs suddenly or a sudden-onset disaster that occurs with little or no early warning and usually has a devastating effect for hours or days. Examples include earthquakes, tsunamis, landslides, volcanoes, floods, and tornadoes. The human ability to respond and provide assistance to victims in this disaster can last in a matter of weeks to months, even up to a year, such as a drought, famine, soil salinization, AIDS epidemic, and erosion.

Classification of Disasters Based on Causes of Occurrence

Based on the causes, disasters can be categorized into three (Permana, A. Y., et al., 2019), namely, disasters caused by nature (natural disasters), disasters due to technology or technological-caused disasters, and disasters caused by humans or human-caused disasters (Rinaldi and Permana, 2019).

1. Natural Disasters

The incidence of natural disasters is expected to continue to increase due to several factors, namely (1) variations in natural cycles such as solar maxima, earthquakes, and volcanic activity; (2) minimal globalwarming could increase lethal storm activity and drought in some areas; (3) The increasing variety of diseases and diseases caused by vectors due to global warming; and (4) Changes in seasons, weather conditions and ambient temperature and humidity that cause adverse effects on food reserves, allergen production and human health issues. According to Keim (2015) natural disasters can be classified into 3, namely:

a. Disasters due to biological events (biological disasters). These disasters are caused by bacterial or viral pathogens that can take the form of a pandemic, epidemic, or epidemic of infectious disease. In the Dictionary of Disaster Medicine and Humanitarian Relief, it is stated that biological disasters are disasters caused by exposure of living organisms (biomass) in large quantities to radiation, toxic substances, or bacteria.
b. Disasters due to hydro-meteorological events (hydro-meteorological disaster). This disaster can be caused by low or high rainfall. Disasters due to low rainfall include drought, sometimes in conjunction with dust storms, uncontrolled forest fires, and heatwaves. Disasters due to high rainfall, namely floods and storms include windstorms, blizzards, tropical cyclones, and tornadoes.
c. Disasters due to geophysical events (geophysical disasters). This disaster is caused by various events resulting from geophysical energy. This disaster is divided into three, namely (1) disasters due to seismic energy such as earthquakes and tsunamis; (2) disasters due to volcanic energy such as volcanic eruptions and flow of mountain larvae; and (3) disasters due to gravitational energy such as landslides (debris avalanches, mudslides, volcanic lava avalanches, and avalanches).

2. Industrial disasters

An industrial-induced disaster is a disaster that occurs due to industrial activities or processes, including trials, creation, application, or failure in the application of science and technology.

Technological developments produce industrial hazards such as industrial waste and radiation as well as chemical disasters. Hazardous materials are brought into densely populated areas every day, where each material has the potential to be lethal. Examples of technological disasters are the nuclear tests at Bikini Atoll on the Marshall Islands in 1946, at Three Mile Island Pennsylvania in 1976 and at Chernobyl Ukraine in 1986.

DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165

3. Human-caused disasters

Manmade disaster/natural-induced disaster is a disaster that is the result of a human-made error or malicious intent and any event that occurs when it occurs is abandoned by the perpetrator with the assumption that when a disaster occurs again the community can prevent it.

2. RESEARCH METHODS

This research is a qualitative descriptive study, using a literature study approach. The author collects research literature related to disaster response mosques. The research was initiated through www.scholar.google.com which allowed an initial search for sources that met the objectives of this study.

The keywords used were "Disaster", "Mitigation", "Disaster Management" and "Disaster Response Mosque", then downloaded 20 articles with relevant topics, each article was read and the information obtained was enriched by reading books relevant to the topic. research, readings are then analyzed, grouped, and written into stages of disaster management, including (1) Pre-disaster Stage, (2) Emergency Response Stage, (3) Post-Disaster Stage.

3. RESULTS AND DISCUSSIONS

Disaster and Mosque Disasters and mosques often tell of interesting phenomena, such as when the 2004Aceh Tsunami, despite being hit by a disaster, still stands strong among the rubble of other buildings that have been destroyed in the vicinity, as shown in Figure 1

Figure 2. Left: Aceh Baiturrahman Mosque 2004; Right: Aceh Rahmatullah Mosque 2004
Source: vioaindonesia.com; Source: liputan6.com

Meanwhile in Japan, during the second world war in 1945, when the cities of Hiroshima and Nagasaki were devastated by the US atomic bombing, the Kobe Mosque, which was built in 1928, remained strong even though the surrounding buildings were destroyed. the outer walls and all the windows were shattered. Japanese soldiers who took refuge on the ground floor of the mosque with the weapons they hid there managed to survive the attack and the mosque became a place of refuge for the victims.

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p- ISSN 2798-2246 e- ISSN 2798-2165

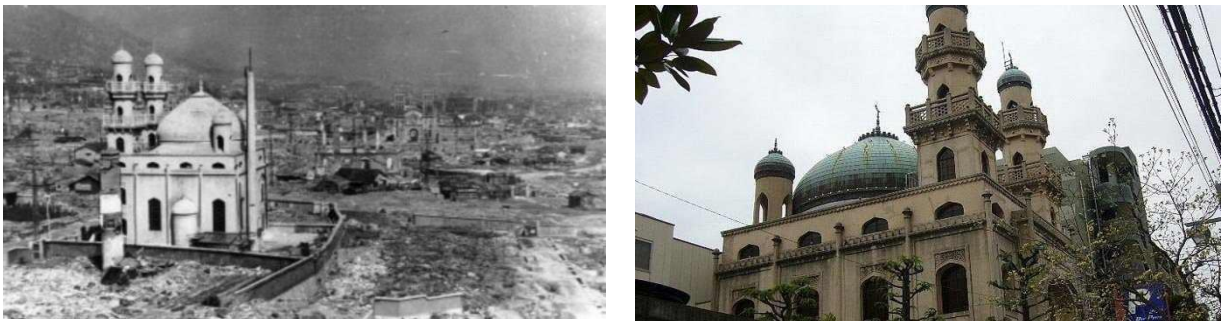

Figure 3. Left: Kobe Mosque after the 1945 bombing; Right: Kobe Mosque after the 1995 Earthquake

Source: afaisalmarzuki.blogspot.com; Source: tribunnews.com

The strength of the Kobe Mosque was tested again when the earthquake shook Kobe, South Hyogo, Hyogo-Ken Nanbu, and surrounding areas in 1995 and remains standing tall. Experts say the cause of the earthquake was the collision of three plates, namely the Philippine plate, the Pacific Plate, and the Eurasian plate. Although it only lasted 20 seconds, this earthquake claimed the lives of 6,433 people and caused great damage in a city covering an area of 20 kilometers from the epicenter (Utaberta et al., 2013).

The cause of the destruction of these mosques still invites various question marks from various circles. Apart from various assumptions that still cannot be proven empirically, this phenomenon has created a stigma among people who think that a mosque is a safe place when a disaster occurs. This stigma was proven at the end of 2012 when the Tsunami issue would again occur in Aceh, and Acehnese people flocked to mosques to seek shelter, as quoted by MilisNews in the following:

"Until 17:00 WIB, they were still standing at the Baiturrahman Grand Mosque, Wednesday afternoon, April 11, 2012, when they felt an earthquake shaking, a tremendous panic occurred, hundreds of Banda Aceh residents immediately ran into the Baiturrahman Grand Mosque to save them from a possible tsunami. Thetrauma of the December 26, 2004 tsunami has not disappeared from the minds of the people. Residents are competing to get to higher ground, some are running, some are using motorbikes, some are using cars."

During the emergence of a stigma in society that mosques are considered a safe place of refuge when a disaster occurs, on the other hand in some cases, mosques become dangerous places. For example, during the 2018 Lombok Earthquake, the NTB News reported that 115 mosques were badly damaged and could not be used (Setiawan et al., 2021)

Figure 4, Jamiul Jamaah Mosque in Lombok, NTB, which was destroyed by the earthquake

Source: antarfoto.com

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p- ISSN 2798-2246 e- ISSN 2798-2165

Meanwhile, in Central Sulawesi, the 7.4 SR earthquake, followed by a tsunami and liquefaction, in Sigi, Donggala, Parigi Moutong, and Palu City, resulted in 191 mosques being seriously damaged, some were missing, tilted, and collapsed so that they could no longer be used.

Figure 5. Baiturrahman Mosque, Palu City, Central Sulawesi, Destroyed by the Tsunami
Source: tribun-timur.com

The various phenomena of mosques and disasters above show the importance of mosque design in reducing the impact of disasters so that the mosque functions as a safe place to take refuge when a disasteroccurs. The nature of the mosque which is open to all people regardless of social status, economy, age, and education is the capital so that the mosque is closed to the community (Wisesa, 2021).

Disaster Response Mosque

In disaster-prone areas, mosque design can also be directed as an institution that provides various facilities to handle disasters both preventively and evaluatively (Utaberta et al., 2013). These steps are systematically applied through disaster management, which is a science and collaborative application by various disciplines and government authorities, to the decision-making process, technical management as well as resource utilization, to take part in the disaster management process, starting from prevention, preparedness planning, rapid response, destruction reduction, reconstruction, and development.

Disaster response mosque is a place of worship for Muslims that is prepared to have resilience in dealingwith and minimizing the impact of disaster risk. In line with the Law of the Republic of Indonesia No. 24 Regarding Disaster Management, in planning a Disaster Response Mosque, disaster management measuresmust be prepared at the time of pre-disaster, during emergency response, and during post-disaster with the following description:

A. Mosque Preparation in the Pre-Disaster Stage

At the pre-disaster stage, the planning that must be done includes non-physical preparations, namely preparing the people and physical preparations, namely preparing the facilities with the following details:

1. Program Planning (Non-Physical) (Hadi & Hadiguna, 2016), (Algamar & Bahar, 2019), (Khairul Rahmat & Kurniadi, 2020), described as follows:
   - Prepare mosque administrators with disaster-related programs, both conducting disastereducation through Friday sermons/study as well as with relevant training and coordination with related parties.
   - Collecting data and mapping the congregation in the mosque environment with government officials. This data collection can map who in the mosque area has special needs, how many children, teenagers, adults, and seniors, so that all elements understand what actions to take whena disaster occurs.
   - Prepare the mosque community as a subject in disaster management by conducting

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p- ISSN 2798-2246 e- ISSN 2798-2165

emergency response simulation training regularly, as well as recruiting potential volunteers as a disaster preparedness task force.

2. Infrastructure (Physical) Planning, is described as follows:
   - The selection of planners with professional experts, with good planning spatial planning, will be optimal and accommodating to the mitigation process. The structure and construction of the building are calculated properly, taking into account geological factors, soil bearing capacity, earthquake factors, hydrological factors, wind factors, and so on.
   - There is sufficient budget and time for planning, if the budget is insufficient, the planner will usually reduce the number of experts, this has the potential that the quality of planning is not optimal. In addition to the availability of the budget, the availability of planning time must also be sufficient, if the time provided for planning is too short, the design process will also experience cuts, so that the design may not be mature enough.
   - The existence of research and definition of the scope of planning. Research before planning is needed so that the design decisions taken will be more weighty and on target.
3. Location Selection Planning (Utomo, 2019), is described as follows:
   - Not located in a disaster-prone geological area, as much as possible the selection of a mosque construction site is not in a disaster-prone zone, this can be strengthened by expertrecommendations, according to disaster vulnerability in the area.
   - Safe from the vulnerability of being affected by disasters, the location of the mosque must be considered from the safety of the surrounding area, for example from the threat of flooding, or landslides in the area.
   - Having easy accessibility, including during emergency response, ease of access will facilitate the process of evacuating victims, heading for further treatment sites such as the nearest clinic or hospital.
   - There is an abundant source of clean water throughout the year, when a disaster occurs sometimes the infrastructure such as the PDAM network does not work so that if the mosque is located near a water source such as near a river or lake, this will be very helpful both for the emergency response process.
   - There are alternative energy sources other than electricity, when a disaster occurs sometimes PLN electricity does not work, so the presence of sun, wind, water, or geothermal energy can be used as alternative energy during emergency response.
4. Building and Environmental Design (Prianto et al., 2018), are described as follows:
   - Planning considers improving the quality of the environment, the existence of a mosque must play a role in improving the quality of the environment, such as participating in lowering the temperature of the environment, improving the quality of groundwater, and preserving the ecosystem in the area.
   - Carry out water and energy conservation efforts, through engineering, by making water reservoirs, biopory, infiltration wells, harvesting rainwater, processing water from ablution sites, utilizing rivers for micro-hydro, using solar panels for electrical energy.
   - Structural design and construction meet the standard of safety factors, taking into account safety in the event of a disaster, such as an earthquake, flood, landslide, cyclone, and so on according to the area of vulnerability.
   - Prioritizing the use of environmentally friendly local materials
   - Pay attention to thermal, visual, audial, ergonomic, and psychological comfort. Thermal comfort makes mosque users not hot/cold, visual comfort makes the eyes of the observer feel comfortable, audial comfort keeps mosques from disturbing noise,

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ergonomic comfort of mosques must be used by all people including people with special needs, psychological comfort makes people feel calm and close with its creator.
- Spatial planning and circulation meet technical standards and fiqh demands, through the clarity ofmale and female zones

5. Adaptive Mosque Design During Emergency Response (Utaberta et al., 2013) (Hadi & Hadiguna, 2016), are described as follows:
   - Information, volunteer, and logistics post. Accuracy of information is needed for emergency response actions. When a disaster occurs, residents will be preoccupied with the conditions of their respective homes and families, and volunteers will come from outside. Receiving and distributing logistics at the mosque with an agile task force and accurate data, will facilitate the distribution ontarget.
   - Medical service facilities, during an emergency response, mosques must have a special area for emergency first aid, with basic medical equipment and an ambulance.
   - Refugee shelter facilities, the open space in the mosque area can be used for temporary refugee shelters.
   - Sanitation facilities for refugees, to maintain the cleanliness and health of refugees, adequate sanitation facilities are needed.
   - Public kitchen facilities, in the emergency response phase, public kitchens are very much needed both for refugees and volunteers.
   - Trauma healing facilities, to support the trauma healing process, indoor and outdoor facilities are needed.
6. The Role of Mosques During Post-Disaster (Permana et al., 2011), (Wardyaningrum, 2014), is described as follows:
   - Metal rehabilitation/trauma healing. In addition to losing loved ones and property, disaster- affected victims usually leave the traumatic side, the process of mental rehabilitation or trauma healing is very helpful in accelerating the recovery process.
   - Community empowerment programs. After the disaster, many people lost their jobs, therefore empowerment programs are very much needed for the economic recovery of the community
   - Evaluation & capacity building. Mosques must be able to take lessons and lessons from every disaster that occurs to increase their capacity for disaster preparedness in the future.

4. CONCLUSIONS

From this study it can be concluded that the strategic role of planning and designing mosques as a center for saving people to reduce disaster risk can be carried out with the following description:

A. Mosque Preparation in the Pre-Disaster Stage
   - Program Planning (Non-Physical): Prepare mosque administrators with disaster-related programs(education/training). Collecting data and mapping congregations in the mosque environment with RT/RW. Prepare mosque communities as subjects in disaster management who are ready to collaborate with other related parties.
   - Infrastructure Planning (Physical): Selection of planners with professional experts. There is a sufficient budget and time for planning. There is research and definition of the scope of planning
   - Site Selection Planning: Not located in a disaster-prone area (expert recommendation). Safe fromthe impact of disasters around it. Has easy accessibility, including during emergency response. There are abundant sources of clean water throughout the year

DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165

(near rivers, lakes, etc.) There are alternative energy sources besides electricity (solar, wind, water, geothermal, etc.)

B. Adaptive Mosque Design in the Emergency Response Stage

At the emergency response stage, mosques must be designed to have readiness as information posts, volunteers and logistics, medical service facilities, refugee shelter facilities, refugee sanitation facilities, public kitchen facilities, and trauma healing facilities.

C. The Role of the Mosque in Post-Disaster

As a means of mental rehabilitation/trauma healing, organizing empowerment programs to restore the community's economy and evaluating and increasing the capacity of mosque resources in dealing with disasters

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DOI: https://doi.org/10.17509/ jodie.v1i1.35853
p- ISSN 2798-2246 e- ISSN 2798-2165