Research Article

Capacities and Vulnerabilities Analysis (CVA) Toward Strengthening the Pug of Women Victims of Coastal Tidal Flooding in Semarang City

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Abstract.

Indonesia is a country with high complexity in facing the challenges of climate change. Indonesia's vulnerability to the negative impacts of climate change is predicted to experience rainfall intensity and temperature increases. This then causes the emergence of negative impacts, such as drought and flood risk, and also increases the risk of the emergence of other extreme events that can adversely affect human life, especially women who are in the context of vulnerable people. Climate change issues affecting vulnerable communities include those living in coastal areas, cities, and small islands. Coastal areas are vulnerable to climate change and the disasters it causes. Women victims of tidal flooding (coastal) have a high vulnerability that is detrimental. Strategies and policies are needed to address these issues. This study aims to analyze the vulnerability and capacity of women flood victims to produce strategies for strengthening gender mainstreaming of tidal floods in Semarang City. The capacities and vulnerabilities analysis (CVA) technique is used to reveal women's capacity or ability to deal with unfavorable circumstances or tidal flood emergencies. The assessment of capacities and weaknesses in the CVA technique includes three categories, namely, (1) physical aspects, (2) social aspects, and (3) motivational aspects.

Keywords: women tidal flooding, gender mainstreaming, CVA, coastal area

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1. Introduction

Indonesia has a vast sea. According to data from the Central Bureau of Statistics (2023), two-thirds of Indonesia's territory is ocean, so Indonesia has high potential for marine resources. Coastal areas have high biodiversity and provide important social, economic and ecological benefits. The richness of coastal areas causes population activities to be concentrated in these areas. Massive human activities contribute to climate change by causing changes in the Earth's atmosphere, which in turn increases the frequency and intensity of natural disasters, such as landslides, typhoons, floods and tidal surges, among others [1]. Excessive infrastructure development due to urbanisation significantly

increases vulnerability to erosion and tidal flooding. These conditions are further exacerbated by global climate change, which causes sea level rise and storm frequency [2] Tidal flooding occurs due to the rise in sea level influenced by tides and storm surges that inundate low-lying areas around the coast. The tidal floods are expected to be even greater due to the phenomenon of rising sea surface temperatures followed by the expansion of sea water masses and melting of ice sheets. This phenomenon is an important issue faced by island countries. The increase in SSL by 2100 is estimated to increase by 43 cm to 84 cm or about 0.4 cm to 1.5 cm per year. intergovernmental Panel on Climate Change [IPCC], 2019.

Various disasters that occur, including tidal floods, are the result of change. The impact of climate change is starting to be felt from several climate variation events. Climate variations that occur can have a major effect on the community, especially vulnerable groups. Vulnerable groups appear as groups of people who receive a high risk of an event because they are in a position that lacks the ability to prepare themselves in facing disaster risks [3]. Climate variations that hit vulnerable groups can then lead to disaster crises. Inadequate disaster crisis management could threaten food security and water needs by 2030. By 2030, the world's population is expected to cause a 50% greater increase in food demand than today, 45% more energy required and 30% more clean water required. Projections of undernourished people will continue to grow by more than 20 million people, 884 million people do not have access to clean water and no less than 2.6 billion people do not have basic sanitation [4]These various phenomena have resulted in women being defined as vulnerable groups who feel the various impacts of the disaster crisis due to climate change.

Underprivileged communities, especially women, are particularly affected, based on physical biological limitations to access and opportunities. Climate adaptation has caused the neutrality between men and women in the concept of gender to become a major concern. Capacity and contribution to adaptation assume that men can be strong agents of change and leaders in driving adaptation. Men and women have different needs in adaptation efforts [5] Gender construction conditions women and men to have access to resources and ways to turn these resources into achievements including adaptive strategies [6] Gender variability has significant value in flood disaster risk reduction, household development and family care activities. Women's activities focus heavily on flood risk management, but their value and role is not seen and appreciated by the environment [7] Empowering and investing in women is key to combating the effects of desertification and paving the way for poverty alleviation in

the world's developing countries. However, under the current climate change financing regime, women do not have sufficient access to funds intended to cover weather-related losses, nor do they have funds for adaptation and mitigation technology services [8]

The development of the times with the context of climate change has a direct impact on gender development. The implementation of Gender Mainstreaming (PUG) as a strategy to achieve Gender Equality and Equity (GEC) is carried out through policies and programmes by taking into account the aspirations, experiences, needs and problems of women and men in a series of processes from planning to evaluation of policies outlined in programmes in various development sectors. Formulation of various approaches to formulate policies that apply gender mainstreaming. Systematic and integrated efforts with reliable schemes from all parties are needed considering the massive impacts of climate change that tend to harm vulnerable people. The challenge in raising awareness of gender mainstreaming is socialisation and commitment from various parties. Women in certain areas as a vulnerable group become a strong magnet for PUG socialisation. This group needs further understanding of climate change, especially if it is related to gender issues as a direction for adaptation strategies and action programmes.

The issue of climate change affects vulnerable communities, including those living in coastal areas, cities and small islands. Climate change also affects people who depend on fishing, farming and people who make a living from natural resources. Coastal production activities, relocation to flood-prone areas, sea level rise and rapid shoreline erosion are vulnerability factors of coastal areas. Gender is a significant social factor that influences disaster preparedness [9]

Data on tidal flooding in Semarang City is of great concern due to its unique topography and land subsidence issues. Semarang City is located on a delta that is naturally a floodplain with nine major rivers flowing through the city. The north coast of Java, where Semarang City is located, is experiencing subsidence at an unprecedented rate, with more than 8,000 hectares (20,000 acres) of land on the north coast now under water [10] According to a study titled 'Subsidence in Coastal Cities Around the World Observed by InSAR' published in 2022, Semarang has the second highest subsidence rate after Tianjin, China, followed by Jakarta in third place. Land subsidence in Semarang exceeds sea level rise, with a line-of-sight (LOS) of 20-30 mm/year [11]

The coastal area of Semarang City is an area that is often hit by tidal floods. The area affected by tidal flooding will expand together when heavy rains occur [12] Many socioeconomic problems occur in the area. Households in coastal areas are more

vulnerable to various environmental, social and economic disturbances when viewed from an intersectionality perspective [13]. The coastal area of Semarang City requires a study of coastal flood disaster that correlates with gender. First, Karondia et al [14] stated that in the Coastal Vulnerability Index (CVI) algorithm, the calculation result was 45.644, which means that the coastal vulnerability of Semarang City is in a very high category. Second, Rusmadi et al [15] stated that women are more vulnerable when affected by climate change due to the time span of exposure, double burden and quantity of victims if disasters related to climate change occur.

Women victims of tidal floods have a high vulnerability that is detrimental. Fulfilling the rights of women flood victims is also an issue that has not been specifically studied by the Semarang City Government. This has implications for women's inequality in development. Strategies and policies are needed to address these issues. Gender mainstreaming (PUG) is one of the strategies needed by women victims of tidal floods in Semarang City. Weak gender analysis in PUG can reduce information about the different perspectives of women's and men's roles, needs and interests in the policy environment. This has a direct impact on the activities carried out in responding to tidal floods. Studies on gender analysis are still rare in Semarang City, although studies on adaptation strategies have often been conducted, such as in the research of Septian et al. [16] Nihayah [17] and Oktarian [18] Kemenpa [4] also stated that climate change adaptation is not gender neutral because women and men have different capacities and contributions to climate change adaptation. Based on this, this research aims to examine gender equality strategies, especially for women victims of tidal flooding in Semarang City. The scope of PUG implementation includes gender analysis. Gender analysis can be used to identify and understand the division of labour or roles between women and men and is essential to understanding the local community context [19]Women have rights and roles in every development. Women need equality in accessing their rights as victims of tidal floods. The accuracy of gender analysis in PUG can be a policy strategy for the Semarang City government to identify limitations and strengths, both in the structure of policies, programmes and activities so that goals can be achieved and measured in handling tidal floods.

2. Methods

This study aims to analyse the capacity and vulnerability of women victims of tidal (coastal) flooding in Semarang City. The literature review method was chosen with data

sources obtained from publications including articles, institutional publications (national and international), and newspapers related to gender-based tidal flood victims and tidal flooding in Semarang City over the past 10 years (2014-2024). Semarang was chosen as the research locus because it exhibits a combination of sea level rise and land subsidence problems. The serious impact of flood victims including women as part of the coastal community of Semarang City is considered relevant to the problem of tidal flooding which has become an annual problem and causes losses to affected coastal communities. Based on this problem, several data sources are needed to support this statement. This requires a perspective that does not only highlight what happens in the form of programmes issued by the government, but also needs to know the conditions faced by the community, especially from a gender perspective.

Capacities and Vulnerabilities Analysis (CVA) is used to reveal the capacity or ability of the community (women) in dealing with unfavourable circumstances or emergencies, such as tidal flooding. The assessment of capacities and weaknesses in the CVA technique includes three categories, namely: The first relates to physical and material attributes, such as local geography and household living conditions; the second relates to social and organisational attributes that look at human relations and 'social structure'; the third relates to motivation and attitudes that relate to cultural and psychological factors. The advantages of CVA analysis include that it can be used flexibly (both before, during and after a crisis), encourages a combination of short- and long-term perspectives and seeks to maximise capacity and minimise vulnerability [19]

The data obtained was analysed using the CVA analysis matrix to determine the appropriate strategy in answering the problem. There are two steps of CVA analysis, namely determining capacity and vulnerability and identifying strategies to increase capacity and reduce vulnerability as a component of forming gender mainstreaming policies. Visual Paradigm software was used as a tool in analysing the data. Cause-and-effect relationships and a complete picture are obtained from the dimensions of capacity and vulnerability.

3. Results and Discussion

Semarang City has a varied regional composition. Topographically, Semarang City consists of lowland areas, hills and coastal areas, thus there are various conditions of protrusion and slope. According to Bappeda [20], the regional composition of Semarang City is 37.78% hilly areas and 65.22% coastal areas. It is not surprising that Semarang

City has considerable coastal potential, especially in the field of fisheries of marine products, buying and selling of marine products and cultivation of marine products. The coastal area of Semarang City is utilised by 287 fish traders and 430 fish processors in North Semarang District [21]. From an economic point of view, the coastal area of Semarang City has three reasons for development, namely providing easy and practical accessibility, being the most biologically productive area and having a beautiful panorama that can be used as a tourist attraction.

Semarang City has a population of 1,659,975 people. The size of the population is directly proportional to the size of the challenges that must be faced by the government and its people. These challenges range from urban development and management, urban integration readiness to social issues such as homelessness, crime, violence and other social issues. The negative impact of uneven development causes justice and welfare issues. Justice and welfare issues are also related to disaster management in Semarang City. Semarang City is known as a city with tidal flood disaster vulnerability. BNPB Semarang City recorded as many as 2,397 buildings submerged by tidal floods in Tanjung Mas in 2022. It was also recorded that ten areas around Tanjung Mas harbour were affected by tidal flooding, including two sub-districts and eight villages [22]

a. Rob Flood Occurrence in Semarang City

There have been 13 tidal floods in the last five years (2019-2023) (BPBD Semarang City, 2024). This data indicates that tidal floods are quite frequent, especially in coastal areas. According to information from the Semarang City Regional Disaster Management Agency (BPBD), there are 11 sub-districts affected by flooding out of a total of 16 sub-districts, while all sub-districts that directly border the Java Sea experience the tidal flood disaster [23] Figure 1. shows the mapping of the area where the tidal flood disaster occurred. The most severe tidal flood disaster hit the coastal area. The most severe tidal flood disaster hit the Tanjung Mas Harbour area, North Semarang District. Tidal floods cause material and non-material losses to the community. Ngaliyan Subdistrict was the area affected by the flood with the highest depth of 1.5 metres.

The tidal flood disaster that hit some areas caused material and non-material losses to the community. The community is the social component that is most directly affected by tidal floods. This relates to the exposure or proximity of a person, system, property or other component that has the potential to experience losses due to flood disasters [24]. Population density is a parameter used to measure the level of exposure. This parameter is assumed to represent the proximity of people, economic activities, property and other

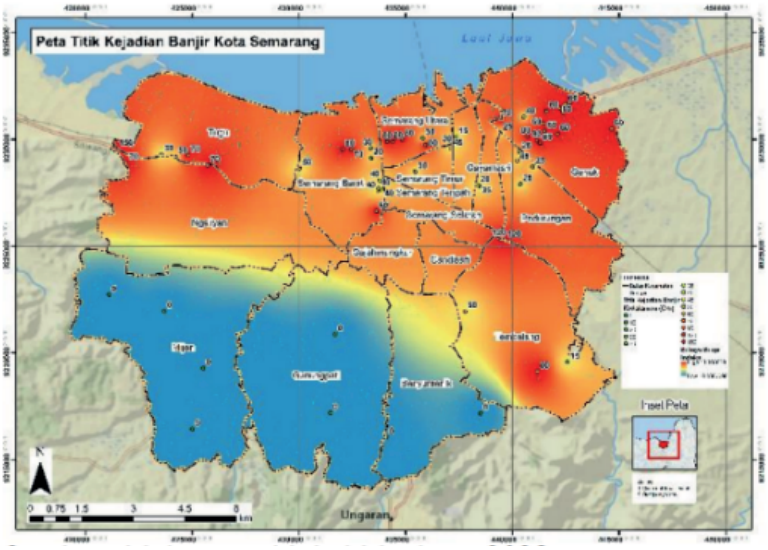

Figure 1: Tidal Flood Occurrence Points in Semarang City.

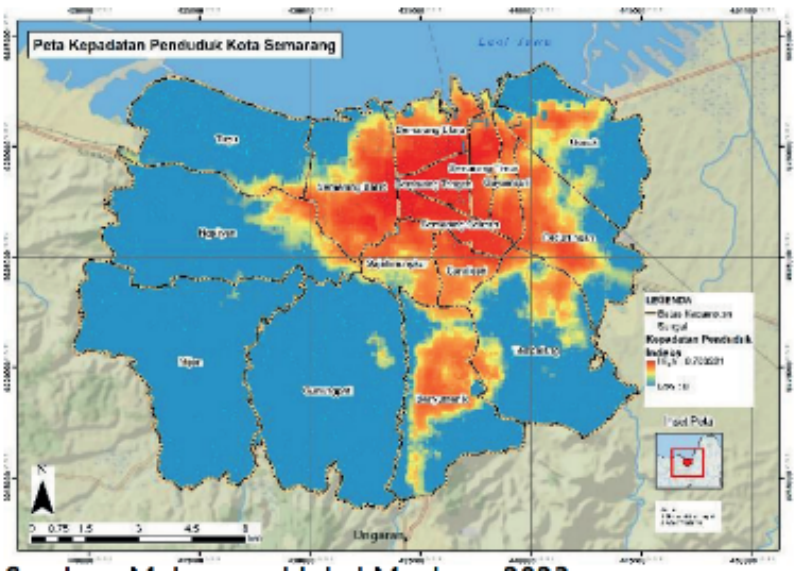

Figure 2: Population Density Map of Semarang City. *Source: Maulana, M. I., & Maulana, M. I. (2023).*

activities to the flood hazard zone. Figure 2. shows that the high population density index is located in North Semarang District, South Semarang District, Central Semarang District, West Semarang District, East Semarang District, Gajahmungkur District, Candisari District, Genuk District, Gayamsari District, Banyumanik District, Peterongan District, and Tembalang District.

b. Government Efforts in Rob Flood Management in Semarang City

Tidal flooding in Semarang City causes various losses. Tidal floods that last for some time can paralyse community activities. Tidal floods also have an impact on sanitation

and clean water conditions. According to Indahsari & Hidayatulloh [25], this condition makes toilets and bathrooms unable to function properly because sanitation waste water cannot be disposed of. These conditions require communities affected by flooding to have physical preparedness and adaptation, such as implementing an adaptation plan for dwellings so that they are not affected by tidal flooding.

The Semarang city government has made various efforts to tackle tidal flooding. These include installing water pumps, improving drainage and channel control, and installing water pumps at various points. The Directorate General of Water Resources (Ditjen SDA) of the Ministry of Public Works and Public Housing (PUPR) has conducted a review of areas that play an important role in tackling tidal flooding events. The government has also made land acquisition efforts for the Jatibarang Reservoir and the construction of sea walls [26]

c. PUG Perspective on Rob Flood Disaster in Semarang City

The impact of natural disasters, including tidal floods, does not discriminate against gender. Women are doubly vulnerable in terms of the impact of natural disasters. According to Kantamaneni et al [27] women are more vulnerable when compared to men with higher mortality rates when coastal disasters occur. The level of vulnerability is also influenced by the region where rural coastal communities are lower when compared to urban coastal areas that have high vulnerability in the community, especially women.

Gender mainstreaming for tidal flood victims in Semarang City has become a priority in every disaster management. The Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia oversees and ensures the rights of vulnerable groups, including women. Victims require gender-specific handling and assistance. The National Disaster Management Agency (BNPB) has issued Regulation No. 14/2015 on Gender Mainstreaming in Disaster Management, which is also a priority in every disaster management.

d. Capacity and Vulnerability Analysis of Women Rob Flood Victims in Semarang City

The development of the times with the context of climate change has a direct impact on gender development. The implementation of Gender Mainstreaming (PUG) as a strategy to achieve Gender Equality and Equity (GEC) is carried out through policies and programmes that take into account the aspirations, experiences, needs and problems of women and men in a series of processes from planning to policy evaluation as outlined in programmes in various development sectors. Formulation of various approaches to formulate policies that apply gender mainstreaming. Systematic and integrated efforts

with reliable schemes from all parties are needed considering the massive impacts of climate change that tend to harm vulnerable people. The challenge in raising awareness of gender mainstreaming is socialisation and follow-up action. Women in certain areas as a vulnerable group become a strong magnet for PUG socialisation. This group needs further understanding of climate change, especially if it is related to gender issues as a direction for adaptation strategies and action programmes.

Table 1: Capacity and Vulnerability Matrix.

Category	Vulnerability	Capacity
Physical/Material Resources, skills, and what hazards exist?	1) Semarang City's Human Development Index (HDI) in 2022 by gender indicates that there is a gap where women are still lagging behind men in education, health, income/economy and other areas, with a HDI of 82.64 compared to men's HDI of 86.15 (Semarang City Gender Profile, 2023). 2) The Gender Development Index (GDI) value of 95.93 indicates that 4.07 is the gap in women's roles in various sectors of life. 3) The value of the Gender Empowerment Index (IDG), especially the role of women in parliament, is only 18.00%, a decrease from previous years, indicating that the role of women in politics and decision-making is decreasing. 4) Female per capita expenditure is lower at 14,908 than male at 17,115. This indicates that men's income for 2022 is better than that of women. In addition, this variable also illustrates that the higher the economic ability of women, the easier their access to health facilities and nutrition that can be consumed during pre- and post-pregnancy. 5) The number of unemployed women is higher at 779,391 than men at 736,806. 6) Dysfunction of sanitation, makeshift housing resulted in poor women being prevented from escaping during the tidal flood disaster (Siscawati, 2023).	1) Skilled in managing households/caring for disaster victims. 2) Women can take advantage of the potential around the environment, such as working as labourers processing fish or shrimp paste (Hidayatullah & Muktiali, 2021). 3) Women as family drivers extend their working hours and do anything to increase their income. They do additional work by trading in front of the house in the afternoon and become day labourers gluing envelopes and folders (Setiawan et al, 2023). 4) Strong resilience to face life's difficulties, especially women with single parent status. They perform all roles in the household (economic, socialisation, education, affective and all arrangements) which are carried out without a companion (Valentine & Susilowati in Sofyan & Bakhri, 2021).

Table 1: Continued.

Category	Vulnerability	Capacity
Social/Organisation What are the relationships between people? What is their organisational structure?	1) Coastal women who only rely on additional work from the informal sector do not have legal guarantees and social security (Esariti et al, 2020). 2) Legal and physical infrastructure is not yet fully gender sensitive, especially in handling tidal floods (Setiadi et al, 2021). 3) The existence of patriarchal and closed cultural and religious behaviour conditions women to have high vulnerability to tidal floods. Women do not get the same understanding and knowledge as men about disasters because women are charged with household affairs (Siscawati, 2023).	1) Women are integrated in harmony groups, such as PKK groups, Muslimat groups, arisan groups and various other groups (Siscawati, 2023). These groups are used as a forum for sharing values, strengthening each other and exchanging information. 2) The Semarang City Government's commitment to empowering coastal women to cope with tidal floods is reflected in the programmes and activities of the Women's Skills Centre (csr.semarangkota.go.id, 2024).
Motivation/Attitude How does the community see its ability to make a difference?	1) Women's dependence on men (husbands, parents and siblings) minimises women's authority to make decisions for themselves (Siscawati, 2023). This can occur in conservative neighbourhoods and communities.	1) Women's willingness to participate in the disaster awareness movement. The Dasa Wisma movement is a manifestation of making women independent in the family, while protecting themselves and their families from disasters (Yulianto, 2021). 2) Women's perception is higher to prioritise family safety.
Conclucion	Coastal women have good resilience to deal with tidal floods. They can utilise multiple roles in fulfilling their needs. Coastal women in general also optimise social networks, such as the PKK to exchange information and strengthen each other. The role of the government in providing basic facilities and legal guarantees as well as bridging with external parties is needed in reducing existing vulnerabilities.	

Table 1 shows the results of the vulnerability and capacity matrix (CVA analysis) of women in Semarang City in facing tidal floods. Tidal floods have a serious impact on the community, especially women as vulnerable people. The results of the capacity analysis show that women have all the components, including; personal resilience, organic-social institutional networks, and support from the government in disaster management. Women cannot only rely on external forces, but must also be able to actualise themselves appropriately in the community during a tidal flood disaster. Women have an important role in tidal flood management, especially within the family. There are issues regarding policy infrastructure that is more responsive and gender sensitive. This needs to be a concern for the Semarang City government in maximising gender mainstreaming. Various sustainability strategies are needed in order to maximise the capacity and reduce the vulnerability of women tidal flood victims in Semarang City.

e. Implications of the Strategy to Strengthen Gender Mainstreaming (PUG) for Women Victims of Rob Floods in Semarang City

Gender mainstreaming (PUG) is a scheme that can be used by the Semarang City Government in order to build equality and justice for women victims of tidal floods. Women victims of tidal floods need their rights to be able to face and cope with tidal floods optimally. The government as a policy maker has an obligation and commitment to fulfil women's rights through policy. Friendly policies are needed, including a gender-sensitive budget. The analysis of the issue of women victims of tidal floods in Semarang City can be seen through the following visualisation.

3.1. Physical Aspect

Figure 3: Visualisation of Physical Aspect.

Women as victims of tidal floods need real formal efforts from the Semarang City Government. Friendly policies and gender-sensitive budgeting need to be reinforced by the government. Through gender-responsive budgeting, women flood victims can

actualise their needs and fulfil their rights. The following needs to be considered regarding budget allocation:

1. Optimising the role of women regarding decision-making in the political sphere. This is intended to explore the problems and needs of women flood victims. Concrete efforts can be made when women have the space and capacity to take part in the decision-making process.
2. Provision and sustainable management of basic facilities. Women flood victims need basic facilities, such as proper sanitation and shelter. The provision and management of basic facilities requires commitment from the government, including various related agencies.
3. Women's empowerment policies must be realised immediately. Policies for women flood victims are aimed at improving women's ability to manage household-scale businesses, small and large industries. This aims to open up productive and independent employment opportunities. Empowerment policies can increase access and control over resources and benefits ranging from welfare to power control (Nugroho, 2008).

3.2. Social Aspect

Women victims of tidal floods have social capital that can be used as a common strength in dealing with disasters. Relationships that exist between individuals and social groups can minimise the impact of tidal flooding. Maintaining these relationships requires attention, given that this happens organically in the community. The following are strategic steps for social aspects:

1. Define and reconstruct institutional values that cause injustice in gender relations to become friendly and gender sensitive. This effort is intended to improve the function and role of women's organisations at the local level as a forum for empowering women to be actively involved in development programs in the surrounding area.

2. Regulations that provide legal and social guarantees for women victims of tidal floods. Women victims of disasters need responsive policies, especially after the disaster. The recovery efforts need to be studied more deeply by the government as the maker and implementer of gender-responsive policies. Intervention steps are needed for government policies contained in the law so that everything becomes responsive and gender sensitive.

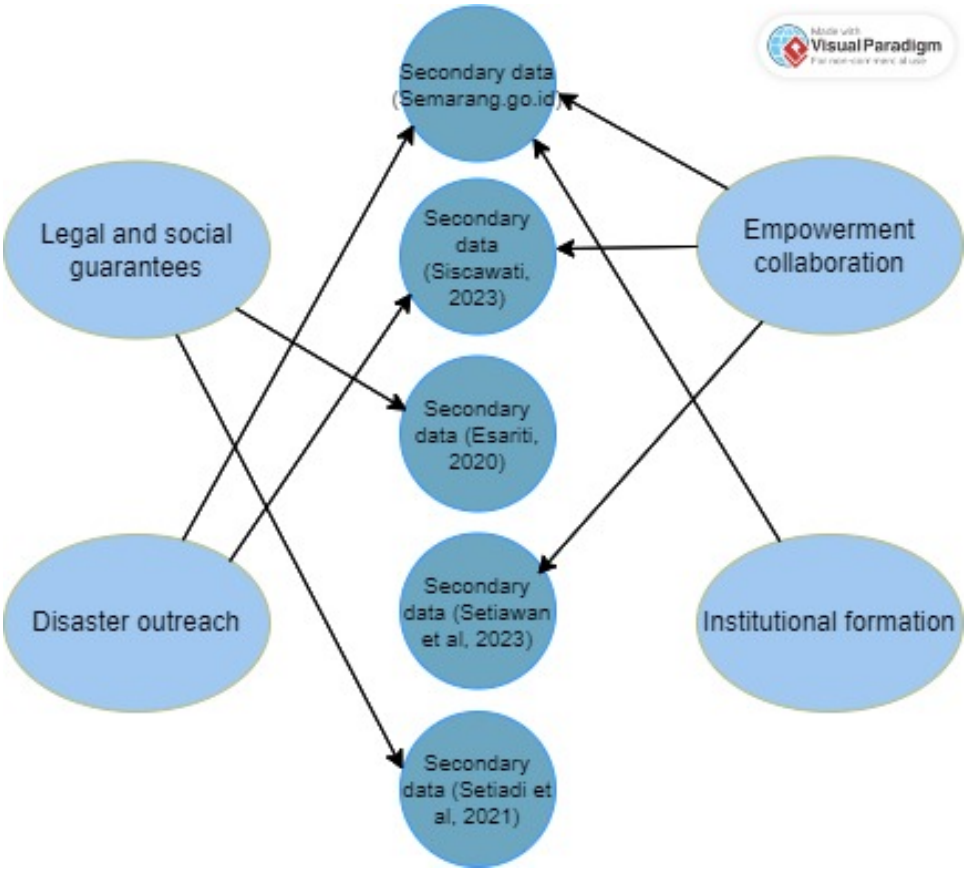

Figure 4: Visualisation of Social Aspect.

3.3. Motivation Aspect

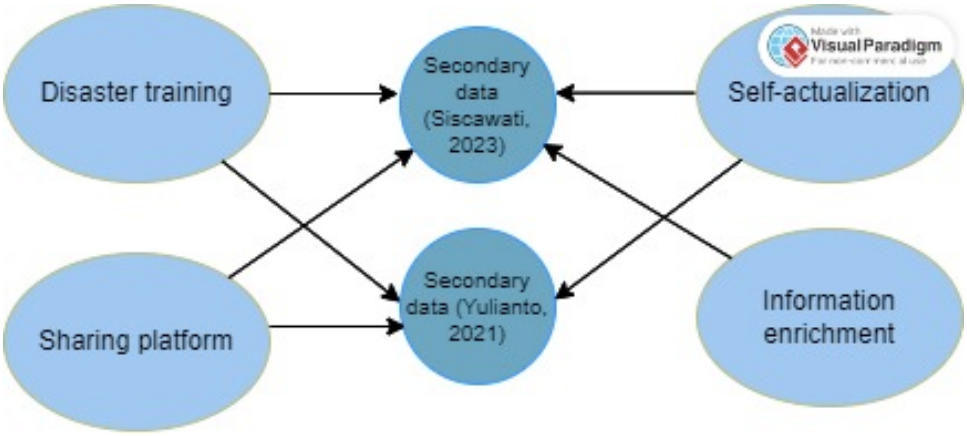

Figure 5: Visualisation of Motivation Aspect.

Capacity building and training can be utilised by women victims of tidal flooding. Capacity building and training are intended to highlight gender priorities and foster equality in tidal flood prone areas. Women's participation is critical and can lead to significant benefits. The following are strategies for motivational aspects:

1. Disaster-aware behaviour can be realised through women's active participation. This active participation requires adequate skills and knowledge. Women can independently or together learn and apply knowledge about disaster mitigation.

2. The government can form a network (caucus) with the private sector and social groups that have concerns and fields of work related to women to become the main forum for women to actualise themselves. An advanced form of the network can be in the form of training and debriefing for women victims of tidal floods. Training can be tailored to the needs and is expected to be sustainable.

4. Conclusion

Tidal floods often occur during the rainy season and coastal areas are the most severely affected areas of the disaster. Tidal floods cause losses to the community, especially women. Women are vulnerable to the impact of tidal floods. Gender differences between men and women that should not be a problem become a problem when they cause injustice. Gender injustice can manifest in the form of subordination, marginalisation and stereotyping of women flood victims. The injustice of women's rights along with their vulnerability to tidal floods requires optimising the capacities of women. The Capacities Vulnerabilities Analysis (CVA) technique was used to prepare a strategy scheme from the capacity and vulnerability conditions of women flood victims. The results of the strategy are divided into three aspects. First, the strategy from the physical aspect is related to the policy of empowering tidal flood women, including the expansion of women's capacity and involvement in decision-making and management of basic facilities (sanitation and shelter) in facing tidal floods. Second, strategies from the social aspect are related to the reconstruction of institutional values to realise gender equality and intervene in government policies to be responsive and gender-sensitive. Third, strategies from the motivational aspect are related to developing women's active participation and forming a network to provide provisions for women flood victims. Development is strengthening and adding capacity by suppressing and reducing vulnerability.

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