BUKTI KORESPONDENSI
ENVIRONMENT AND ECOLOGY RESEARCH, 11(2)

A Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

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A. **Judul Artikel:** "A Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation"

B. **Penulis:** Rr. M. I. Retno Susilorini, Iskhaq Iskandar, dan Budi Santosa

C. **Jurnal, Volume, No:** Environment and Ecology Research, 11(2)

D. Korespondensi untuk review manuskrip dilakukan melalui email Editor Jurnal dengan email author (susilorini@upstegal.ac.id)

E. Proses Review sampai Publikasi dijelaskan dengan kronologi sebagai berikut:

   a. Submitted: 20 Januari 2023
   b. Revised: 10 Februari 2023
   c. Accepted: 13 April 2023
   d. Published: 15 Mei 2023

F. Manuskrip direview oleh **Peer-Review dalam 1 Round** (Tahapan Review)

G. Bukti-bukti korespondensi disusun sebagai berikut:

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   2. Email Editor Journal EER_Review Round 1_Peer-Review Report; Cover Letter untuk Submission; Peer-Review Report (masukan, kritik, saran, koreksi); Manuskrip awal saat Submission ke Jurnal EER; Cover Letter; Response to Peer-Review Report (tanggapan dan penjelasan revisi dari author); Manuskrip yang sudah direvisi

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   4. Email Editor Jurnal - Acceptance Letter (ID_14092398); Letter of Acceptance untuk dipublikasikan di Jurnal; Manuskrip Final Accepted

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REVIEW ROUND 1

1. Email Editor Journal EER_Review Round 1_Peer-Review Report;
2. Manuskrip Awal;
3. Peer-Review Report;
4. Response to Peer-Review Report;
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Revision after Peer Review (ID:14092398)-Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

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Manuscript Information

Manuscript ID:	**14092398-sp**
Manuscript Title:	**Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation**

Evaluation Report

General Comments	• **In the introduction, web link should be added as a reference.** • **Not enough citation to support** • **The author needs to provide percentage (decadal) rural households headed by women.** • **Terms like Gender-Eco Friendly (gender specific) does not have a valid definition** • **There is a direct jump from methods to result and discussion – intermediate steps missing** • **Reference of similar case or study area is not evaluated** • **Geographical statistics missing (local or regional data)** • **Population data missing** • **Population background missing** • **The author should provide in-depth data regarding population, population by age and gender group, and flood occurrence.** • **A GIS-based master plan with urban designing features and principles could be provided.** • **Figure 2. The Stages to Create the Master Plan – should have more description. The author needs to provide hi-resolution image.** • **The author needs to provide decadal satellite images for coastal erosion.** • **The author needs to provide "number and intensity of flood in a year/ decade" chart?** • **Figure 7: source of the image should be provided.** • **Evaluation method for the data is not much spoken about**

Advantage & Disadvantage	**Advantages:** • **Selection of topic is good** • **Very generalize** • **Easy to understand the concept even by interdisciplinary stream** • **Quality of Content is clear** **Disadvantage:** • **Overall quality of paper is Moderate**
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Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

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Abstract. It is reported in the last decades that the northern coastal area of Java has been submerged by tidal flooding caused by climate change. Demak Regency is one of several cities that hardly suffered from the disaster, especially in Sriwulan Village, Sayung District. The phenomenon shows a threat to sustainable built environment caused by climate change impact. In tidal flooding-prone areas, the built environment must be both influenced and also makes influenced by its surroundings. Since the built environment has been disturbed by climate change, women can adapt and take the initiative during disaster events, including taking place of their jobless husbands as breadwinners during the Covid-19 pandemic. Every event of a disaster, including tidal flooding, will strongly impact women, which may become a gender inequality issue. A gender-responsive village master plan could become a crucial issue in village development, especially for the ones impacted by disasters. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment. The research was located in Sriwulan village, Sayung District, Demak Regency which was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The survey, observation, and in-depth interview reported a rapid increase in tidal flooding inundation and level in Sriwulan village. It was also found that women have a limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. In conclusion, women should be given the opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and fair knowledge. In the future, village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" which was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment. By the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village", the face of the Sinking Village of Sriwulan will change to a prospective Eco-Tourism Village of Sriwulan.

Keywords: sustainable, built environment, gender, eco-friendly, master plan, climate change, adaptation

INTRODUCTION

A study conducted by Kompas team (https://interaktif.kompas.id/baca/hilangnya-pesisir-kami-dari-sabang-sampai-merauke/) has published a very shocking analysis on the middle of August 2021 about the prediction of coastal area's sinking in Indonesia, from Sabang (eastern part of Indonesia) to Merauke (western part of Indonesia). It was reported that there are 119 cities and regencies in Indonesia were predicted submerged by tidal flooding.

Climate change has absolutely changed the world, that cause sea water depth increase, climate extreme, drought [1,2], and flooding and also tidal flooding, which happened periodically in the north Java coastal area. Several investigations, studies, and researches reported that in the last 3 decades the coastal area has been continuously submerged by tidal flooding (called 'rob' in Javanese language) caused by climate change. The coastal line along the Java Island has changed and reduced by several kilometres, included Demak Regency and especially Sayung District and Sriwulan village. The worst impact of sea erosion happened in Indonesia was found in Sriwulan village that has lost its area of 2.116,54 ha for 20 years and 5 km reduction of its coastal line since 1994 [3]. The abrasion rate of Sayung District was found as 82% and the accretion as 18% [4]. The impact of tidal flooding in Sriwulan village and the disaster risk reduction to cope with the problem also reported by authors [5,6] as well as several investigations that have been conducted in that area [7–13].

In tidal flooding-prone areas, the built environment must be both influenced and also makes influence to its surroundings. Basically, people create or modify the built environment which consists of buildings and living spaces. Wider than the definition, built environment includes the infrastructural elements such as waste management, transportation, and utility transmission systems that serve the building space [14]. However, it is a fact that built environments such as buildings and infrastructure contribute to global warming which is the main issue of climate change. There is no doubt that the built environment has a significant environmental footprint as RIBA reported [15] that the growth of buildings are very incredible since from the 255 billion m^2 of buildings in the world today which still increase around 5.5 billion m^2 every year will still exist in 2050. A good approach and solution to cope with the environmental footprint's built environment is to make better use of existing buildings that will reduce the demand for new construction, to minimize the negative environmental impact of new buildings, and make the best decisions which put the long-term health of the planet above near-term financial interests [15]. Hence, there is no doubt to evaluate the built environment in terms of sustainability that complies with the needs and requirements of future generations [14]. For instant, it is important to build zero carbon buildings and to reduce embodied carbon [16] as well as to implement built environment adaptation to climate change and to meet beyond the minimum criteria in regulation [17]. In adaptation urban planning, we need to enhance physical protection of urban assets from extreme weather as climate change impact. The authorities have to build protection against sea level rise and flooding i.e. seawalls and pumps and also ecological solutions i.e. wetlands and mangroves forests [18]. A sustainable built environment is not only about the buildings, but also about the infrastructure and environment. Speaking about the 'sinking village', Sriwulan village, a built environment will become a big portrait of sustainable living space which will not be sinking because they want to change their face to become a prospective eco-tourism village like others do especially after the Covid-19 pandemic [19].

Since the built environment has been disturbed by climate change, an adaptation of tidal flooding prone area should be implemented to reduce the hazard and to protect the vulnerable ones, the women and children. Every event of disaster will strongly impact women, which may become gender inequality issue. Since women facing unfair situation and also double burden during disaster events as it is happened in tidal flooding prone area, the presence of government is very important. The role of government and community to reduce the disaster and to implement policy in wise and 'smart' way is a necessity. There is no doubt that a responsive gender climate change adaptation is very crucial as well as the gender mainstreaming. United Nations Economic and Social Council (ECOSOC) on July 1997 emphasized that we should implement the gender mainstreaming as a process of assessing the implications for women and men planned actions, included legislation, policies, and programs that was also by the [20,21].

A gender responsive village master plan could become crucial issue in village development, especially to the ones impacted by disasters. The issuance of Law No. 6/2014 has shown that Indonesia's government want to strengthen village development by constructing the village authority that has responsibility to village development,

empowering village community development by their initiatives, rights origin, and village customs [22]. It should be noted that the Law No. 6/2014 Indonesia is very gender responsive that involve women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has obvious statement that village development activities must be determined based on gender justice. Therefore, a gender eco-friendly master plan for village development is very important as gender mainstreaming in coping with the climate change impact, especially in Sriwulan village. As the most vulnerable groups in the event of disaster, the women and children in the middle of tidal flooding disaster need a safer and more comfortable place to live.

The people in Sriwulan village who are now hopeless about their sinking village need a change and better future of their living space. We could promote an adaptation to the climate change for sustainable built environment in Sriwulan village by producing a gender eco-friendly master plan for the future of the village. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment.

METHOD OF RESEARCH

FIGURE 1. Satellite image of Sriwulan village in Sayung District, Demak Regency, on February, 2022 by Google Earth

The research was located in Sriwulan village, Sayung District, Demak Regency which was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The descriptive-qualitative method used to portray the existing situation of Sriwulan village that is submerged continuously by tidal flooding and to study the previous data of tidal flooding in Sayung District and Sriwulan village. There were questionnaires for survey to 25 respondents (women and men) and a in-depth interview to 3 (three) women's community representatives who live in Sriwulan village, Sayung District, Demak Regency.

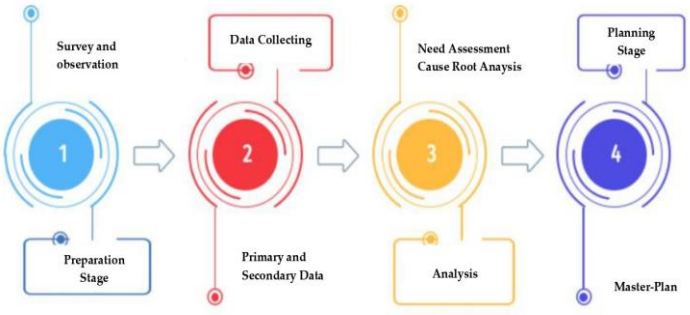

FIGURE 2. The Stages to Create the Master Plan

The master-plan was created by several stages as described by Figure 2. The data collecting aimed and analysis conducted by qualitative purposive and quantitative random sampling to the respondents mentioned above. There were 2 main issues delivered to the respondents in questionnaires and also in-depth interview: (1) women's knowledge and capacity of tidal flooding disaster risk reduction, and (2) women's groups participatory in tidal flooding disaster risk reduction.

RESULT AND DISCUSSION

Results of observation of the impact of tidal flooding disaster in Sriwulan village

The sinking of Sriwulan village is a long process of coastal erosion caused by climate change which had begun since 1925 [13,23]. It was reported by Ruswanto [23] that during the period of 1925-1964 the coastline of Demak Regency was reduced as 200 m and in the next 20 years later, in 1984, the coastline was also reduced as 200-300 m, about 12,5 m per year. The same report stated that in November 1955, the coastline of Demak Regency was reduced as 55 m. Another report [12] found that coastline of Sayung village change from 2003 to 2013 from 4.49 km to become 10.38 km.

FIGURE 3. Existing situation in Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

FIGURE 4. "Mr. Boat Man" of Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

During the last two decades, the depth of tidal flooding in Sriwulan village has become higher and higher. In 2008, the depth of tidal flooding reported as 0.25 m [3] while in 2017 authors have reported in that the depth of tidal flooding achieved 0. 5 m [6]. In 2020, [8] reported that the depth of tidal flooding in Sriwulan village has achieved 1 m while the present investigation of authors, in November 2021, it is found that the tidal flooding disaster in Sriwulan has become worse that the maximum tidal flooding depth has achieved 1.5 m as shown by Figure 3.

The field survey of this research has observed that the disaster of tidal flooding in Sriwulan village is the worst in the last 5 years that the depth of tidal flooding has been increasing in exponential trend. Obviously, Figure 3 explains the sinking Sriwulan village (houses, public facilities, road, etc.) that submerged by tidal flooding more than 6 (six) times a week with depth about 0.5-1.5 m. There is Mr. Nasikin 'Yatin', "Mr. Boat Man" (Figure 4) who lives in RT. 6/RW. 2, Sayung village,with his family in their house by floating with the boat inside the building. They built a simple wooden bridge to connect their tidal flooding submerged house with the road. It was also found that several Small and Medium Enterprises existed in Sriwulan Village which located in business zones in the village suffered by the tidal flooding.

Results of in-depth interview

The questionnaires delivered by Likert scale of five-point agreement (strongly agree, agree, strongly disagree, disagree, and undecided) as described by Table 1 while control score shown by Table 2.

Table 1. Parameter and score of questionnaires

PARAMETER	NUMBER OF QUESTION	QUESTION TYPE	NUMBER OF QUESTION WITH TYPE OF A OR B	SCORE*				
				SA	A	SD	D	U
1	17	A	16	5	4	3	2	1
		B	1	2	3	4	5	1
2	17	A	14	5	4	3	2	1
		B	3	2	3	4	5	1

***Note: SA=Strongly-Agree; A=Agree; SD=Strongly-Disagree; D=Disagree; U=Undecided**

Table 2. Control for scoring

CONTROL	SCORE
Highest Score / Good	91-125
Medium Score / Fair	65-90
Lowest Score / Bad	25-64

Figure 5 described the response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction. It has found that women's knowledge and capacity of tidal flooding disaster risk reduction 75.36% were good and 26.64% were fair. The second parameter response that is women's groups participatory in tidal flooding disaster risk reduction shown by Figure 6. In this parameter, the response consists of good, fair, and bad. It was found that 28.07% responses that were good, 62.69% were fair, and 9.24% bad.

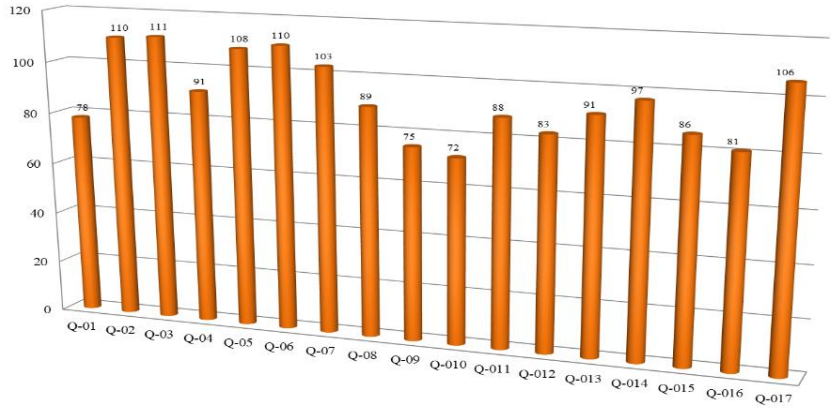

FIGURE 5. Response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction questionnaires

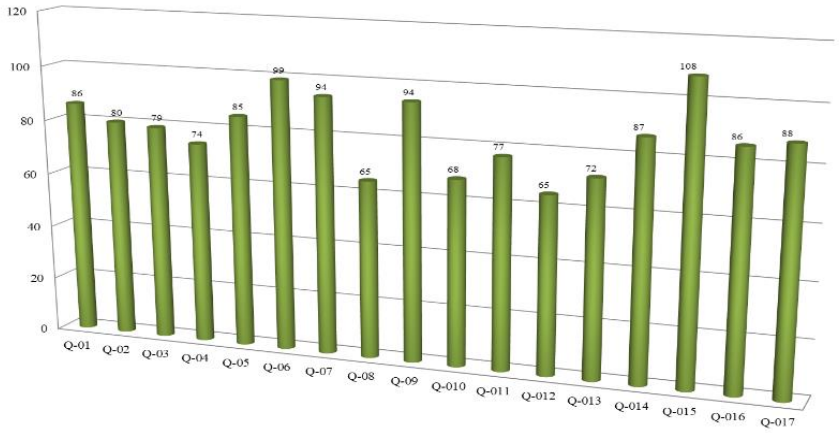

FIGURE 6. Response of parameter of women's groups participatory in tidal flooding disaster risk reduction

The fact came from the in-depth interview to the representatives of women's community that women are the most vulnerable group during the disaster event, the tidal flooding in Sriwulan village. They said that they have very limited access to clean water, food, and medicine during the event of tidal flooding. Women were the ones who only can stay at home which has condition submerged by the dirty water of tidal flooding which even come into the house.

However, women still have potential in promoting disaster risk reduction because women have a higher depth of sensitivity and concern for family members, the surrounding community [24]. In the case of Sriwulan village, women have ability to adapt and to take the initiative during the disaster events, including taken place their jobless husband as breadwinner during the Covid-19 pandemic. It was proven that women are stronger in protecting their children and family when the disaster happened, included tidal flooding in Sriwulan village. However, an important thing should be noted that women had difficulty to get access of information, training, and workshop about adaptation to climate change. There are no opportunities for women to get involved in village development planning which is very important to change the faith of their sinking village Sriwulan.

Discussion

The survey, observation, and in-depth interview had given comprehensive data to be analysed. Rapid increase of tidal flooding inundation and level in Sriwulan village as shown by Figure 2 and 3 may not getting so severe if only there is a coastal barrier that prevents the tidal flooding coming into the land. Since there is no coastal barrier infrastructure as prevention, then the mangrove cultivation can become the best option even though it takes years to grow the mangrove. Figure 1 has emphasized that the government of Semarang city has taken action in rehabilitating the mangrove plantation in coastal area, included Trimulyo village, in Genuk Disctrict, since 2004 until nowadays [25], but the Demak Regency government didn't take the same action. The mangrove cultivation in Trimulyo village is succeed to grow in about 30 ha along the beach in that village [26]. Unfortunately, as mentioned by most respondents in in-depth interview, the people in Sriwulan village doesn't conform to the prevention of their village from tidal flooding with mangrove cultivation. Therefore, it is necessary to grow mangrove forest with proper technique in the front of the village's coastal area and place the tidal flood detector (it can be operated manually or digitally). In master-plan, there are big area planned for mangrove forest. It also obvious that an alert zone with tidal flood detector is very important to be existed in the master-plan. The evacuation routes will be built properly with sufficient signs to guide people to reach assembly point in the event of disaster.

This research found that women have limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. It was also found that gender mainstreaming has not implemented yet in tidal flooding disaster risk reduction in Sriwulan village. Due to COVID-19 impact to economics, it was unfortunate that many householders have lost their job and substituted by women (their wives). In several program, it was found that village authority doesn't take special attention in gender mainstreaming in policy or regulation as well as development. Hence, it is important to encourage women, to give them opportunity and role as 'actor' in leading the community to cope the climate change impact for better future by increasing their capability and good knowledge. Hence, there should be a place for women and children to stay resilience and feel safe in Sriwulan village that can be implemented in the master plan as 'women and children care zone'. In the future, women also take an important role in domestic and also village economic increase by selling miscellaneous products in floating market near by the mangrove forest. They can also manage restaurants and shops and develop their business capability.

From the questionnaires and int-depth interview, the people in Sriwulan Village necessarily need their village life to be prolonged by the natural barrier of mangrove forest. They also wanted the government take action to work together to plant Mangrove and change the face of the village from a sinking village to become a prospective eco-tourism village. The people want the economics of the village is going to be supported to be wealthier by trade and commercial activity which be placed in a safe zone. The women have idea that their village have women's floating market, restaurants, and shops, to support their eco-tourism village.

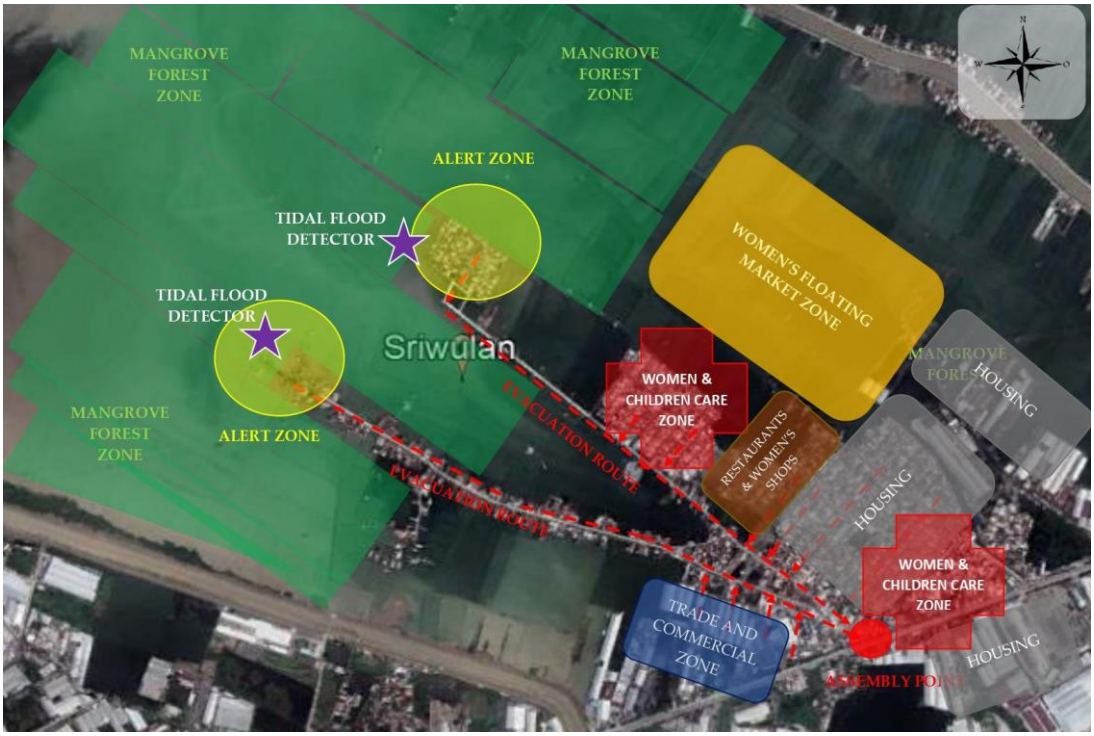

FIGURE 7. Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village

Hence, due to the need of the Sriwulan Village to change their village to be an eco-tourisme village, a comprehensive analysis conducted to the existing map of Sriwulan Village which finally create the **"Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village"** (Figure 7) by stages of planning described by Figure 2. Several zones were determined which created from the existing map of tidal flooding inundation, topographic and population secondary data from any sources and the comprehensive analysis of purposive sampling data of respondents by questionnaires and in-depth interview.

Several zones of the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" (Figure 7): (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shops zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor of Sriwulan village's sustainable built environment.

It should be noted that there is many critical thinking to create those zones mentioned above based on data and analysis. The mangrove zones are needed to begin now but it will take more than 10 (ten) years to get a 'real' mangrove forest as natural barrier which is going to support the eco-tourism village of Sriwulan. The alert zone with tidal flood detector is a major component of "Early Warning System" (EWS) of tidal flooding disaster risk reduction. There are 2 (two) tidal flood detectors placed in the water front which will firstly face the high tide and tidal flooding. In other disaster events, for instant in many events of tsunami disaster, EWS has been taken an important role to safe life and also give people enough time to evacuate [27–31]. Hence, we place also 2 (two) evacuation routes in the village to reach assembly points. Supporting the disaster risk reduction in the stage of emergency of the disaster event, it should be placed the women and children care zone to answer the need of safety, comfort place to take care of mother and her children, and also women who need shelter in the event of disaster. At the time out of the disaster event, several economics zones should be built to support gender responsive Master-Plan as the solution of change the face of Sriwulan village from the Sinking Village to become a gender responsive Eco-tourism Village. Since many women previously sold many products of seafood or other marine food products and

also vegetables, they will have a comfortable and safety place floating market that also serve culinary product in the restaurants as well as handy craft and other miscellaneous products in the shop in the women's floating market zone and also restaurant and women's shops zone. However, previous trade and commercial zone that there is public market, shops, mini market, etc. The zones of housing which were maintained located nearby the main road. It seems that the housing nearby the sea (water front area) will not survive in the near future. Hence it is wise to plan the housing far away from the entry of tidal flooding.

CONCLUSION

The research found that women have a limited role in tidal flooding disaster risk reduction and adaptation in Sriwulan village. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation to tidal flooding. Women should be given opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and good knowledge. In general, in the future, the village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment.

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ACKNOWLEDGMENT

The authors would like to acknowledge the Ministry of Education, Culture, Research and Technology, Republic of Indonesia which support these researches by Applied Research Grant, Contract No. 312/E4.l/AK.04.PT/2021, 66/LL6/PG/SP2H/JT/2021, and 00879/H.2/LPPM/VII/2021.

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Tegal, February 13, 2023.

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Dear Sir,

We would like to resubmit our manuscript entitled "**A Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation**" to "**Environment and Ecology Research**".

We appreciate and thank you for the constructive comments and advice of the Peer-Reviewers. In spite of the revision we made based on the Reviewer's comments, there are some discussions and opinions from our side which are explained in the file "Response to Peer-Review Report" which is attached to this letter.

We hope the manuscript will meet the "Environment and Ecology Research" criteria immediately and be published very soon.

Thank you very much. We would like to hear from you about our submission.

Sincerely,

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Manuscript Information

Manuscript ID:	**14092398-sp**
Manuscript Title:	**Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation**

Evaluation Report

General Comments	• **In the introduction, web link should be added as a reference.** • **Not enough citation to support** • **The author needs to provide percentage (decadal) rural households headed by women.** • **Terms like Gender-Eco Friendly (gender specific) does not have a valid definition** • **There is a direct jump from methods to result and discussion – intermediate steps missing** • **Reference of similar case or study area is not evaluated** • **Geographical statistics missing (local or regional data)** • **Population data missing** • **Population background missing** • **The author should provide in-depth data regarding population, population by age and gender group, and flood occurrence.** • **A GIS-based master plan with urban designing features and principles could be provided.** • **Figure 2. The Stages to Create the Master Plan – should have more description. The author needs to provide hi-resolution image.** • **The author needs to provide decadal satellite images for coastal erosion.** • **The author needs to provide "number and intensity of flood in a year/ decade" chart?** • **Figure 7: source of the image should be provided.** • **Evaluation method for the data is not much spoken about**
Advantage & Disadvantage	**Advantages:** • **Selection of topic is good** • **Very generalize** • **Easy to understand the concept even by interdisciplinary stream**

	• **Quality of Content is clear** **Disadvantage:** • **Overall quality of paper is Moderate**
How to improve	**1. More in-depth insight can be given to interesting parts like the following (It should be noted that the Law No. 6/2014 Indonesia is very gender responsive that involve women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has obvious statement that village development activities must be determined based on gender justice.)** **2. Can elaborate stated definitions about gender eco-friendly by other agencies** **3. Demographic, Geographic data about Sriwulan village is missing.** **4. The author can include more relevant case studies or research articles for literature study.**

Please rate the following: (1 = Excellent) (2 = Good) (3 = Fair) (4 = Poor)	
Originality:	2
Contribution to the Field:	**2**
Technical Quality:	**3**
Clarity of Presentation :	**2**
Depth of Research:	**3**

Recommendation

Kindly mark with a ■

☐ Accept As It Is	
☐ Requires Minor Revision	
■ Requires Major Revision	
☐ Reject	

Return Date:

RESPON TO EVALUATION REPORT SUBMITTED FEBRUARY 13, 2023

Manuscript ID: 14092398-sp

Manuscript Title: Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

A. RESPONSES TO COMMENTS

1. **In the introduction, a web link should be added as a reference.**

   Response:

   The web link has been added to the Reference.

2. **Not enough citations to support**

   Response:

   Several important citations have been added to give a clearer explanation and enhance the article.

3. The author needs to provide a percentage (decadal) of rural households headed by women.

   Response:

   Data on householders have been added on page 5, the second paragraph, line 4, as follows.

   "The householders reported 2,811 males and 657 females."

4. Terms like Gender-Eco Friendly (gender specific) do not have a valid definition

   Response:

   Gender-Eco-Friendly has a valid definition as it has been revised and explained on page 3, in the second paragraph as follows.

   "A gender-responsive village master plan could become a crucial issue in village development, especially for the ones impacted by disasters. The issuance of Law No. 6/2014 has shown that Indonesia's government wants to strengthen village development by constructing the village authority that has the responsibility for village development, empowering village community development through their initiatives, rights origin, and village customs [25]. It should be noted that Law No. 6/2014 Indonesia is very gender responsive that involves women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has the obvious statement that village development activities must be determined based on gender justice. Therefore, this research proposed the term "a gender eco-friendly" master plan for village development can be defined as an act of gender mainstreaming in coping with the climate change impact, especially in Sriwulan village. Obviously, the "gender-eco-friendly" master plan is conducted by an eco-friendly master plan with gender consideration to climate change adaptation."

5. There is a direct jump from methods to result and discussion – intermediate steps missing

   Response:

   The Method of Research Chapter has been revised and developed to build a bridge to reach the results and discussion part as described on pages 3-5.

6. Reference of a similar case or study area is not evaluated

   Response:

   A paragraph has been added on page 2 that explained about the disaster risk reduction to cope the tidal flooding issues in Sriwulan villages and Semarang city as follows.

   "Several studies of the impact of tidal flooding in Sriwulan village and the disaster risk reduction to cope with the problem were also reported by authors [6,7] as well as several investigations that have been conducted in that area [8-10,17-19]. Some good lessons come from the case of tidal flooding in Semarang that affected the northern coastal area of the city, including Tambak Lorok settlement [20], Panggung Lor Sub-District [7], and several Sub-Districts in Tugu District [21]. The case in Tambak Lorok settlement was to examine community vulnerability and to build adaptation for keeping the buildings and public facilities in safety, while the Panggung Lor Sub-District case was about increasing resiliency and adaptation by community-based disaster risk reduction. In Tugu District, resiliency has been grown by develop mangrove as natural barrier. However, the tidal flooding cause big damage to the mangrove forest that an urgent effort have to conduct to save the District from the hazard of tidal flooding."

7. Geographical statistics missing (local or regional data)

   Response:

   Geographical statistics has been added to page 4 on first paragraph, based on Statistic Government Agency data and publication, as follows.

   "The research was located in Sriwulan village, Sayung District, Demak Regency, Central Java Province in Indonesia. Demak Regency has area of 897,43 km^2 that consists of 14 Districts [26]. One of those Districs is Sayung District that has area of 78.80 km^2 and comprises of 20 villages, one of them is Sriwulan village. As shown by the Figure 1, Sriwulan village located next to the Java Sea, lay on 6^0 55' - 6^0 56' East Longitude and 110^0 27' - 110^0 29' North Latitude which. Sriwulan village has area of 4.02 km^2 with topography about 0-3 meters above the sea level that makes the village prone to tidal flooding [27]. It was reported Sriwulan village has 7 hamlets, 8 neighborhood communities of Rukun Warga (RW), and 76 neighborhood communities of Rukun Tetangga (RT) [28]. "

8. Population data missing

   Response:

   Data regarding population has been developed and added to page 5 and also Figure 2 and 3.

9. Population background missing

   Response:

   Data regarding population background has been added to page 5 and also Figure 2 and 3.

10. The author should provide in-depth data regarding population, population by age and gender group, and flood occurrence.

    Response:

    Data regarding population, population by age and gender group has been developed on page 5 and also Figure 2 and 3.

Data about flood occurrence has been existed on page 6-8, on Results and Discussion Chapter, and also on page 8 by Table 1, as follows.

"The sinking of Sriwulan village is a long process of coastal erosion caused by climate change which had begun since 1925 [14,29]. It was reported by Ruswanto [29] that during the period of 1925-1964 the coastline of Demak Regency was reduced as 200 m and in the next 20 years later, in 1984, the coastline was also reduced as 200-300 m, about 12,5 m per year. The same report stated that in November 1955, the coastline of Demak Regency was reduced as 55 m. Another report [13] found that coastline of Sayung village change from 2003 to 2013 from 4.49 km to become 10.38 km". (page 5, first paragraph on Results and Discussion Chapter)

"During the last two decades, the depth of tidal flooding in Sriwulan village has become higher and higher. In 2008, the depth of tidal flooding reported as 0.25 m [4] while in 2017 authors have reported in that the depth of tidal flooding achieved 0. 5 m [7]. In 2020, [9] reported that the depth of tidal flooding in Sriwulan village has achieved 1 m while the present investigation of authors, in November 2021, it is found that the tidal flooding disaster in Sriwulan has become worse that the maximum tidal flooding depth has achieved 1.5 m as shown by Figure 4."

11. A GIS-based master plan with urban designing features and principles could be provided.

Response:

The stages and principles of creating a Master Plan in this paper have been already explained in Figure 2. In this article, we don't use GIS. We use Google Earth Map as the basis for creating Master Plan.

12. Figure 2. The Stages to Create the Master Plan – should have more description. The author needs to provide a high-resolution image.

Response:

The explanation of stages to create master plan has been added to page 5, on the second paragraph as follows.

"The master-plan was created by several stages as described by Figure 2 that could be explained as follows.

1. **Preparation stage**. In this stage, a survey and observation were conducted to gain information, including need assessment, field observation, and Focus Group Discussion with the people and village authority of Sriwulan village.
2. **Data collecting.** The purpose of data collecting is to provide accurate information to be analyzed. Data collecting conducted by questionnaires and in-depth interview to the respondents. The data collecting conducted by qualitative purposive and quantitative random sampling to the respondents. There were 2 main issues delivered to the respondents in questionnaires and also in-depth interview: (1) women's knowledge and capacity of tidal flooding disaster risk reduction, and (2) women's groups participatory in tidal flooding disaster risk reduction.
3. **Analysis.** Comprehensive analysis has been conducted based on survey and observation results and data from questionnaires and in-depth interview. The analysis results will become a basis to create the master plan.
4. **Planning stage.** Zoning will be an initial step in planning stage prior to planning itself. A map of satellite image of Google Earth has been used as the basis of master plan. The determination of zoning implemented based on analysis results and data. There was also a placement of evacuation route and tidal flooding detector on the master plan. This stage is final stage which was produced a gender eco-friendly master plan for Sriwulan village for a sustainable built environment"

13. The author needs to provide decadal satellite images for coastal erosion.

Response:

The satellite images for coastal erosion during 2015-2022 has been added as Figure 8.

14. The author needs to provide a number and intensity of flood in a year/decade chart.

Response:

Depth and intensity of tidal flooding have been added by Table 1 (not chart, because the intensity reported as a range of tidal flooding intensity).

15. Figure 7: source of the image should be provided.

Response:

Source of the image has been written for Figure 9 caption, it is Master-Plan produced by the authors themselves, not others (previously it was Figure 7, but there are two new Figures addition, then it becomes Figure 9).

16. Evaluation method for the data is not much spoken about

Response:

The evaluation method was conducted as qualitative analysis of the questionnaires and in-depth interview results. However, revising and addition have been done to the Results and Discussion Chapter, on Results of questionnaires and in-depth interview Sub-Chapter on page 7-8 as follows.

"The fact came from the results of in-depth interview to the representatives of women's community that women are the most vulnerable group during the disaster event, the tidal flooding in Sriwulan village. They said that they have very limited access to clean water, food, and medicine during the event of tidal flooding. It is a fact that the women were the ones who only can stay at home which has condition submerged by the dirty water of tidal flooding which even come into the house. However, women still have potential in promoting disaster risk reduction because women have a higher depth of sensitivity and concern for family members, the surrounding community [30]. In the case of Sriwulan village, women have ability to adapt and to take the initiative during the disaster events, including taken place their jobless husband as breadwinner during the Covid-19 pandemic. It was proven that women are stronger in protecting their children and family when the disaster happened, included tidal flooding in Sriwulan village. An important thing should be noted that women had difficulty to get access of information, training, and workshop about adaptation to climate change. There are no opportunities for women to get involved in village development planning which is very important to change the faith of their sinking village Sriwulan. Hence, the result of the questionnaires analysis (Figure 6 and 7) was proven that the women participatory in tidal flooding disaster risk reduction was fair. Women still have limited access to contribute in decision making of many policies in the issues of tidal flooding disaster risk reduction as well as the future of their village."

B. RESPONSES TO HOW TO IMPROVE

1. More in-depth insight can be given to interesting parts like the following (It should be noted that the Law No. 6/2014 Indonesia is very gender responsive that involve women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has obvious statement that village development activities must be determined based on gender justice.)

   Response:

   The gender main-streaming policy in Indonesia has been developed and elaborated in the paragraphs in Introduction Chapter.

2. Can elaborate stated definitions about gender-eco-friendly by other agencies

   Response:

   The gender-eco-friendly definition and scope has been elaborated in terms of gender, women, and environment, by several Ministries and Agencies in Indonesia with Ministerial Regulations and other Regulations such as Ministry of Women Empowerment and Children Protection, Ministry of Environment and Forestry, Ministry of Finance, National Disaster Mitigation Agency, etc. This topic has been developed and added to Introduction Chapter.

3. Demographic, Geographic data about Sriwulan village is missing.

   Response:

   Demographic, Geographic data about Sriwulan village have been developed and added to Introduction Chapter.

4. The author can include more relevant case studies or research articles for literature study.

   Response:

   A paragraph has been added on page 2 that explained about the disaster risk reduction to cope the tidal flooding issues in Sriwulan villages and several areas in Semarang city.

Susilo Rini <susilorini@upstegal.ac.id>

Revision after Peer Review (ID:14092398)-Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

Susilo Rini <susilorini@upstegal.ac.id> Mon, Feb 13, 2023 at 9:44 PM
To: Edward Smith <hrpub.editor@gmail.com>, susilorini2903@gmail.com

Dear Mr. Edward Smith,
Hereby I send my revised paper, Cover Letter, Response to Peer-Review Report, and HRPUB Publication Agreement.
I apologize that my submission a little bit late from the due date I promise to you.
Thank you vey much.

Best regards,
Rr. M. I. Retno Susilorini
Pancasakti Tegal University
[Quoted text hidden]

4 attachments

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A Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

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Abstract. It is reported in the last decades that the northern coastal area of Java has been submerged by tidal flooding caused by climate change. Demak Regency is one of several cities that hardly suffered from the disaster, especially in Sriwulan Village, Sayung District. The phenomenon shows a threat to the sustainable built environment caused by climate change impact. In tidal flooding-prone areas, the built environment must be both influenced and also makes influenced by its surroundings. Since the built environment has been disturbed by climate change, women can adapt and take the initiative during disaster events, including taking place of their jobless husbands as breadwinners during the Covid-19 pandemic. Every event of disaster, including tidal flooding, will strongly impact women, which may become a gender inequality issue. A gender-responsive village master plan could become a crucial issue in village development, especially for the ones impacted by disasters. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment. The research was located in Sriwulan village, Sayung District, Demak Regency which was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The survey, observation, and in-depth interview reported a rapid increase in tidal flooding inundation and level in Sriwulan village. It was also found that women have a limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. In conclusion, women should be given the opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and fair knowledge. In the future, village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" which was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment. By the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village", the face of the Sinking Village of Sriwulan will change to a prospective Eco-Tourism Village of Sriwulan.

Keywords: sustainable, built environment, gender, eco-friendly, master plan, climate change, adaptation

INTRODUCTION

A study conducted by the Kompas team [1] published a very shocking analysis in the middle of August 2021 about the prediction of coastal area sinking in Indonesia, from Sabang (the eastern part of Indonesia) to Merauke (the western part of Indonesia). It was reported that there are 119 cities and regencies in Indonesia were predicted submerged by tidal flooding.

Climate change has changed the world, that causes seawater depth increase, climate extreme, drought [2,3], and flooding and also tidal flooding, which happened periodically in the north Java coastal area. Several investigations, studies, and research reported that in the last 3 decades, the coastal area has been continuously submerged by tidal flooding (called 'rob' in the Javanese language) caused by climate change. The coastal line along Java Island has changed and reduced by several kilometers including Demak Regency which is located in Central Java Province in Indonesia, especially in Sayung District and Sriwulan village. The worst impact of sea erosion happened in Indonesia was found in Sriwulan village which has lost its area of 2.116,54 ha for 20 years and a 5 km reduction of its coastal line since 1994 [4]. The abrasion rate of Sayung District was found as 82% and the accretion was 18% [5].

Several studies of the impact of tidal flooding in Sriwulan village and the disaster risk reduction to cope with the problem were also reported by authors [6,7] as well as several investigations that have been conducted in that area [8-10,17-19]. Some good lessons come from the case of tidal flooding in Semarang that affected the northern coastal area of the city, including Tambak Lorok settlement [20], Panggung Lor Sub-District [7], and several Sub-Districts in Tugu District [21]. The case in Tambak Lorok settlement was to examine community vulnerability and to build adaptation for keeping the buildings and public facilities in safety, while the Panggung Lor Sub-District case was about increasing resiliency and adaptation by community-based disaster risk reduction. In Tugu District, resiliency has been grown by develop mangrove as natural barrier. However, the tidal flooding cause big damage to the mangrove forest that an urgent effort have to conduct to save the District from the hazard of tidal flooding.

In tidal flooding-prone areas, the built environment must be both influenced and also makes influenced by its surroundings. People create or modify the built environment which consists of buildings and living spaces. Wider than the definition, the built environment includes the infrastructural elements such as waste management, transportation, and utility transmission systems that serve the building space [22]. However, it is a fact that built environments such as buildings and infrastructure contribute to global warming which is the main issue of climate change. There is no doubt that the built environment has a significant environmental footprint as the RIBA report [23] that the growth of buildings is very incredible since the 255 billion m^2 of buildings in the world today which increases to around 5.5 billion m^2 every year will still exist in 2050. A good approach and solution to cope with the environmental footprint built environment are to make better use of existing buildings that will reduce the demand for new construction, minimize the negative environmental impact of new buildings, and make the best decisions which put the long-term health of the planet above near-term financthe ial interests [23]. Hence, there is no doubt to evaluate the built environment in terms of sustainability that complies with the needs and requirements of future generations [22]. For an instant, it is important to build zero-carbon buildings and to reduce embodied carbon [24] as well as to implement built environment adaptation to climate change and to meet beyond the minimum criteria in regulation [25]. In adaptation urban planning, we need to enhance the physical protection of urban assets from extreme weather as climate change impact. The authorities have to build protection against sea level rise and flooding i.e. seawalls and pumps and also ecological solutions i.e. wetlands and mangroves forests [26]. A sustainable built environment is not only about the buildings, but also about the infrastructure and environment. Speaking about the 'sinking village', Sriwulan village, a built environment will become a big portrait of sustainable living space which will not be sinking because they want to change their face to become a prospective eco-tourism village like others do especially after the Covid-19 pandemic [27]. Therefore, an eco-tourism village of Sriwulan is an eco-friendly built environment that is designed to have little or no damaging effect on the environment by a responsive gender adaptation to climate change.

The built environment has been disturbed by climate change; hence, an adaptation of tidal flooding prone area should be implemented to reduce the hazard and to protect the vulnerable ones, the women and children. Every event of disaster will strongly impact women, which may become gender inequality issue. Climate change give deep

impact to vulnerable groups in society i.e. women, children, elderly people, disable people, indigenous people, and local communities, and also people in coastal area, urban and rural areas [28,29]. To anticipate the impact of climate change, it is necessary to implement climate change adaptation. However, adaptation to climate change disaster is not neutral to gender, since women and men have different capacity and contribution in adaptation as well as their different needs. In one side, climate change disaster makes women discrimination and gender inequality become worse, but in another side, the situation will be harder because of the limited role of women as decision maker in climate change issues [29]. Since women facing unfair situation and also double burden during disaster events as it is happened in tidal flooding prone area, the presence of government is very important.

The role of government and community to reduce the disaster and to implement policy in wise and 'smart' way is a necessity. There is no doubt that a responsive gender climate change adaptation is very crucial as well as the gender mainstreaming. United Nations Economic and Social Council (ECOSOC) on July 1997 emphasized that we should implement the gender mainstreaming as a process of assessing the implications for women and men planned actions, included legislation, policies, and programs that was also by the [30,31].

The gender-eco-friendly principal has been elaborated in terms of gender, women, and environment, by several Ministries and Agencies in Indonesia with Ministerial Regulations and other Regulations such as Ministry of Women Empowerment and Children Protection, Ministry of Environment and Forestry, Ministry of Finance, National Disaster Mitigation Agency, etc [28,29,32]. A gender-responsive village master plan could become a crucial issue in village development, especially for the ones suffered by disasters. The issuance of Law No. 6/2014 has shown that Indonesia's government wants to strengthen village development by constructing the village authority that has the responsibility for village development, empowering village community development through their initiatives, rights origin, and village customs [33]. It should be noted that Law No. 6/2014 Indonesia is very gender responsive that involves women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has the obvious statement that village development activities must be determined based on gender justice. Instead of the responsive gender law and regulation about village development, the Presidential Instruction Number 9 of 2000 assigned all the Ministers, Heads of Non-Ministerial Institutions, Governors and Regents/Mayors to involve and to implement the gender mainstreaming in order to carry out planning, implementation, monitoring and evaluation of national development policies and programs with a gender perspective in accordance with the field of duties and functions, as well as their respective powers [32]. Therefore, this research proposed the term "a gender eco-friendly" master plan for village development that can be defined as an act of gender mainstreaming in coping with the climate change impact, especially in Sriwulan village. Obviously, the "gender-eco-friendly" master plan is conducted by an eco-friendly master plan with gender consideration to climate change adaptation.

The people in Sriwulan village who are now hopeless about their sinking village need a change and better future of their living space. We could promote an adaptation to the climate change for a sustainable built environment in Sriwulan village by producing a gender eco-friendly master plan for the future of the village. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment. The gender-eco-friendly master plan of Sriwulan village become a great hope to the most vulnerable groups in the event of disaster, the women and children, that in the middle of tidal flooding disaster they will have a safer and more comfortable place to live.

METHOD OF RESEARCH

Research Sites

FIGURE 1. Satellite image of Sriwulan village in Sayung District, Demak Regency, Central Java Province, Indonesia, on February 2022 by Google Earth

The research was located in Sriwulan village, Sayung District, Demak Regency, Central Java Province in Indonesia. Demak Regency has area of 897,43 km^2 that consists of 14 Districts [34]. One of those Districs is Sayung District that has area of 78.80 km^2 and comprises of 20 villages, one of them is Sriwulan village. As shown by the Figure 1, Sriwulan village located next to the Java Sea, lay on 6^0 55' - 6^0 56' East Longitude and 110^0 27' - 110^0 29' North Latitude which. Sriwulan village has area of 4.02 km^2 with topography about 0-3 meters above the sea level that makes the village prone to tidal flooding [35]. It was reported Sriwulan village has 7 hamlets, 8 neighbourhood communities of Rukun Warga (RW), and 76 neighbourhood communities of Rukun Tetangga (RT) [36].

Demographic of Sriwulan village is reported by the Central Java information system through the website of https://sidesa.jatengprov.go.id/pemkab/kependudukandes/33.21.04.2011 which based on the integrated data of Demographic Administration Information System in 2020 as follows. Population of Sriwulan in 2020 is 10,430 that consists of 5,202 males and 5,228 females. The householders reported as 2,811 males and 657 females. Educational background and the livelihood of Sriwulan village inhabitant described by Figure 2 and 3.

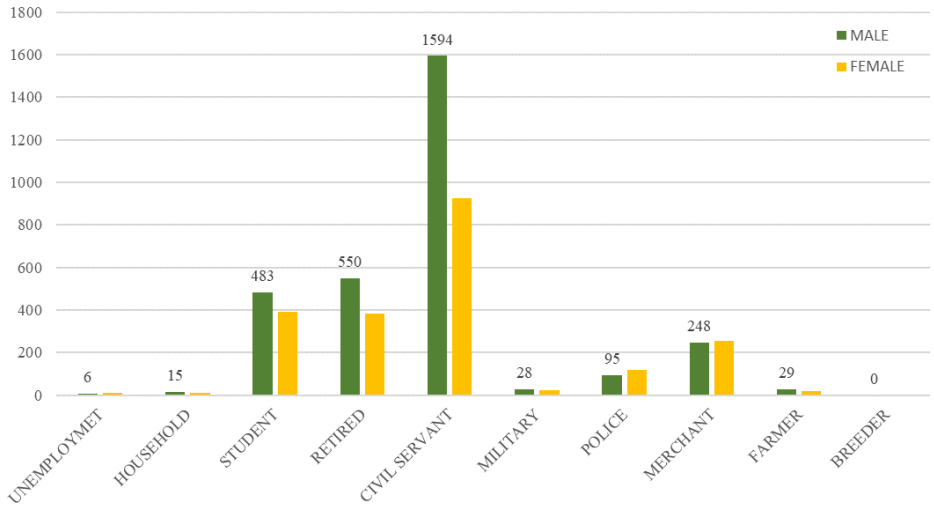

FIGURE 2. Educational background of Sriwulan village inhabitants

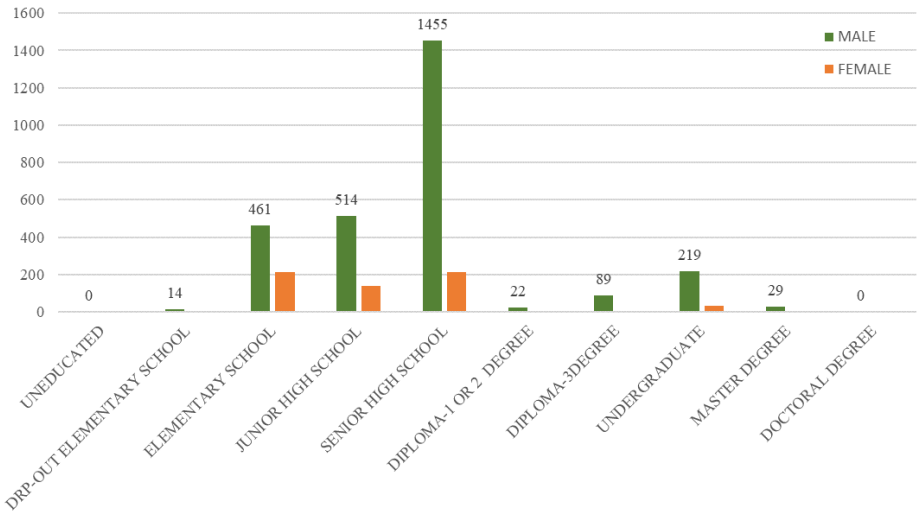

FIGURE 3. Livelihood of Sriwulan village inhabitants

Methods

The research was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The descriptive-qualitative method used to portray the existing situation of Sriwulan village that is submerged continuously by tidal flooding and to study the previous data of tidal flooding in Sayung District and Sriwulan village. There were questionnaires for survey to 25 respondents (women and men) and an in-depth interview to 3 (three) women's community representatives who live in Sriwulan village, Sayung District, Demak Regency.

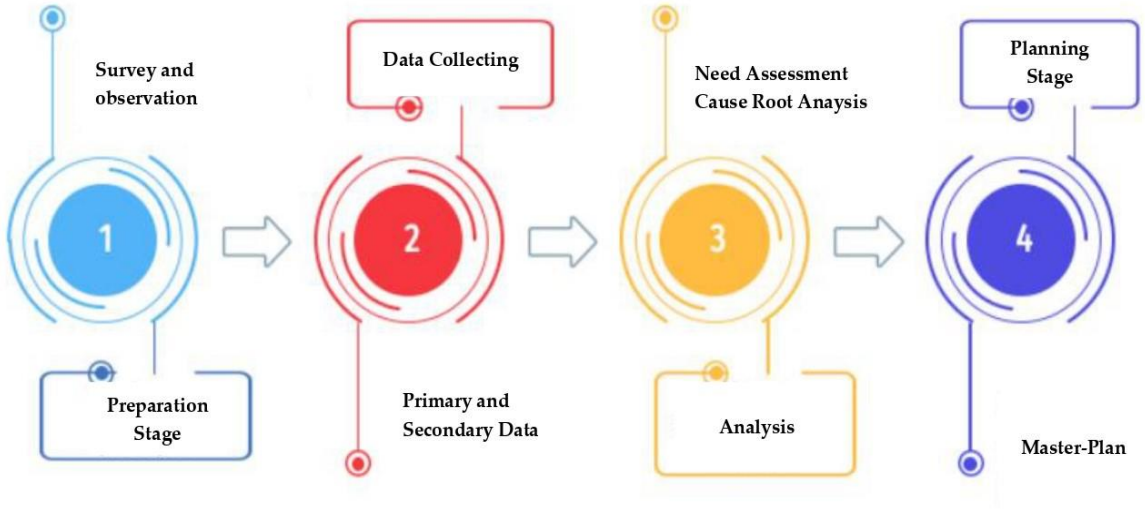

FIGURE 2. The Stages to Create the Master Plan

The master-plan was created by several stages as described by Figure 2 that could be explained as follows.

1. **Preparation stage**. In this stage, a survey and observation were conducted to gain information, including need assessment, field observation, and Focus Group Discussion with the people and village authority of Sriwulan village.
2. **Data collecting.** The purpose of data collecting is to provide accurate information to be analyzed. Data collecting conducted by questionnaires and in-depth interview to the respondents. The data collecting conducted by qualitative purposive and quantitative random sampling to the respondents. There were 2 main issues delivered to the respondents in questionnaires and also in-depth interview: (1) women's knowledge and capacity of tidal flooding disaster risk reduction, and (2) women's groups participatory in tidal flooding disaster risk reduction.
3. **Analysis.** Comprehensive analysis has been conducted based on survey and observation results and data from questionnaires and in-depth interview. The analysis results will become a basis to create the master plan.
4. **Planning stage.** Zoning will be an initial step in planning stage prior to planning itself. A map of satellite image of Google Earth has been used as the basis of master plan. The determination of zoning implemented based on analysis results and data. There was also a placement of evacuation route and tidal flooding detector on the master plan. This stage is final stage which was produced a gender eco-friendly master plan for Sriwulan village for a sustainable built environment

RESULT AND DISCUSSION

Results of observation of the impact of tidal flooding disaster in Sriwulan village

The sinking of Sriwulan village is a long process of coastal erosion caused by climate change which had begun since 1925 [17,37]. It was reported by Ruswanto [37] that during the period of 1925-1964 the coastline of Demak Regency was reduced as 200 m and in the next 20 years later, in 1984, the coastline was also reduced as 200-300 m, about 12,5 m per year. The same report stated that in November 1955, the coastline of Demak Regency was reduced as 55 m. Another report [16] found that coastline of Sayung village change from 2003 to 2013 from 4.49 km to become 10.38 km.

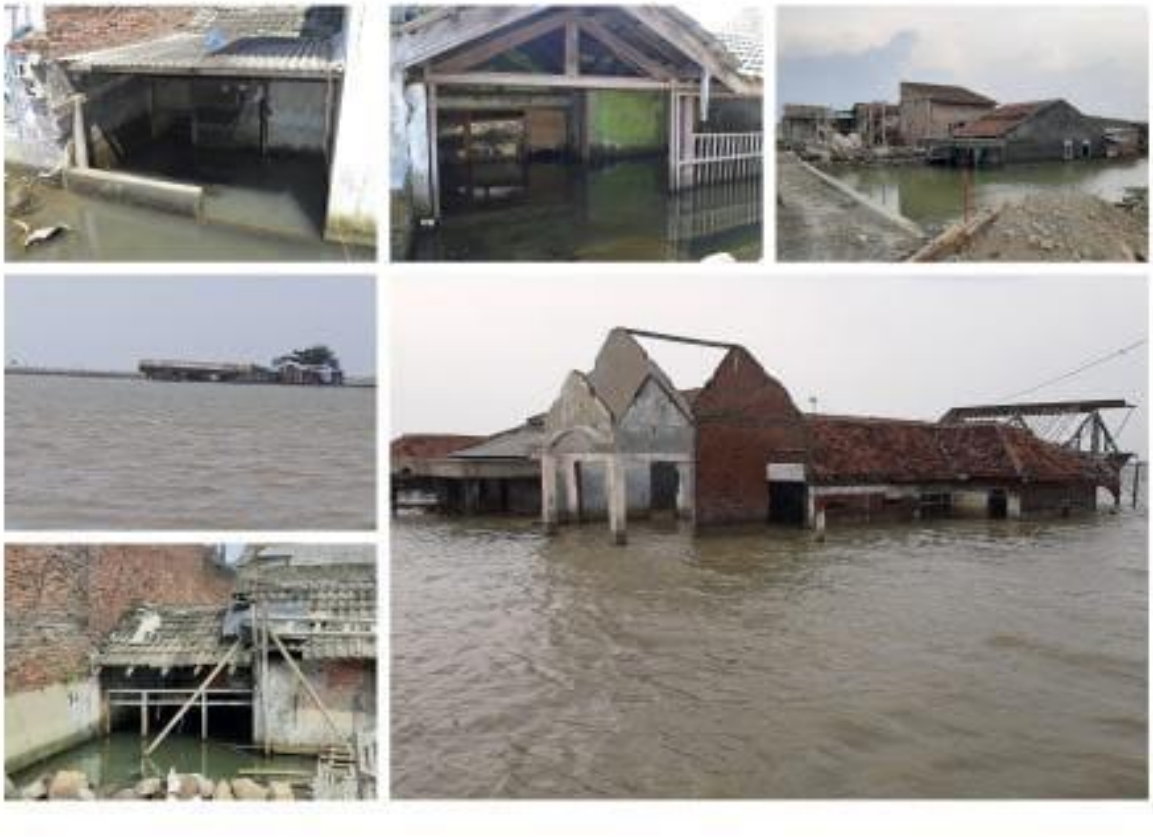

FIGURE 4. Existing situation in Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

FIGURE 5. "Mr. Boat Man" of Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

During the last two decades, the depth of tidal flooding in Sriwulan village has become higher and higher. Tidal flooding's intensity and depth were reported in several years during 2008-2022 [4] as described by Table 1. In 2008, the depth of tidal flooding reported as 0.25 m [4,7,12] while in 2017 authors have reported in that the depth of tidal

flooding achieved 0. 5 m [7]. In 2020, [12] reported that the depth of tidal flooding in Sriwulan village has achieved 1 m while the present investigation of authors, in November 2021, it is found that the tidal flooding disaster in Sriwulan has become worse that the maximum tidal flooding depth has achieved 1.5 m as shown by Figure 4.

TABLE 1. Tidal flooding's intensity and depth in Sriwulan village (2008-2022)

	2008	2017	2020	2021	2022
Intensity (per year)	2	2 to 3	5	> 6	> 6
Depth (max)	0.25	0.5	1	1.25	1.5

The field survey of this research has observed that the disaster of tidal flooding in Sriwulan village is the worst in the last 5 years that the depth of tidal flooding has been increasing in exponential trend. Obviously, Figure 5 explains the sinking Sriwulan village (houses, public facilities, road, etc.) submerged by tidal flooding more than 6 (six) times a week with depths of about 0.5-1.5 m. Mr. Nasikin 'Yatin', "Mr. Boat Man" (Figure 5), lives in RT. 6/RW. 2, Sayung village, with his family in their house with a floating boat inside the building. They built a simple wooden bridge to connect their tidal flooding submerged house with the road. It was also found that several Small and Medium Enterprises existed in Sriwulan Village which is located in business zones in the village that suffered from tidal flooding.

Results of questionnaires and in-depth interview

The questionnaires were delivered by a Likert scale of five-point agreement (strongly agree, agree, strongly disagree, disagree, and undecided) as described in Table 2 while the control score sinwn by Table 3.

TABLE 2. Parameter and score of questionnaires

PARAMETER	NUMBER OF QUESTION	QUESTION TYPE	NUMBER OF QUESTION WITH TYPE OF A OR B	SCORE*				
				SA	A	SD	D	U
1	17	A	16	5	4	3	2	1
		B	1	2	3	4	5	1
2	17	A	14	5	4	3	2	1
		B	3	2	3	4	5	1

***Note: SA=Strongly-Agree; A=Agree; SD=Strongly-Disagree; D=Disagree; U=Undecided**

TABLE 2. Control for scoring

CONTROL	SCORE
Highest Score / Good	91-125
Medium Score / Fair	65-90
Lowest Score / Bad	25-64

Figure 6 described the response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction. It has found that women's knowledge and capacity of tidal flooding disaster risk reduction 75.36% were good and 26.64% were fair. The second parameter response is women's groups participatory in tidal flooding disaster risk reduction shown in Figure 7. In this parameter, the response consists of good, fair, and bad. It was found that 28.07% responses were good, 62.69% were fair, and 9.24% were bad.

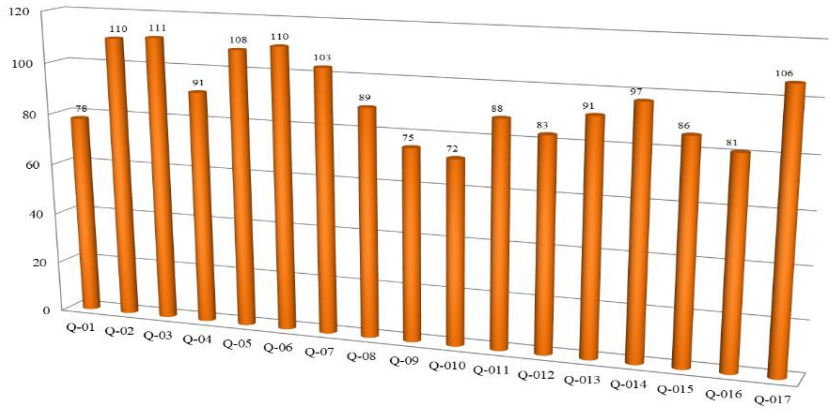

FIGURE 6. Response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction questionnaires

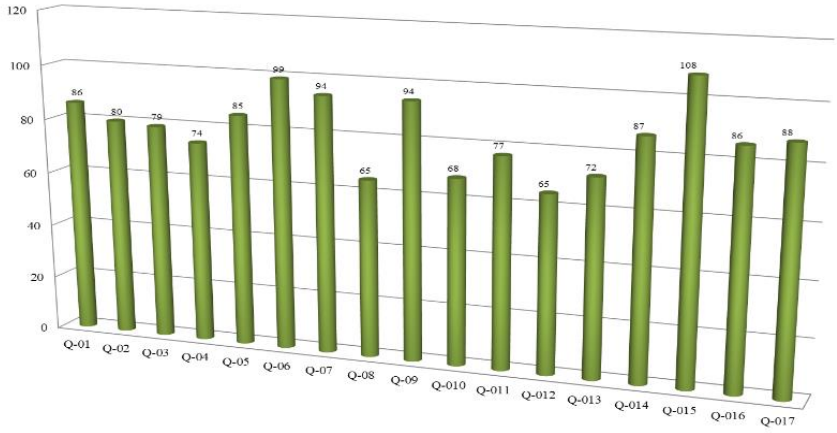

FIGURE 7. Response of parameter of women's groups participatory in tidal flooding disaster risk reduction

The fact came from the results of in-depth interviews with the representatives of women's community that women are the most vulnerable group during the disaster event, the tidal flooding in Sriwulan village. They said that they have very limited access to clean water, food, and medicine during the event of tidal flooding. It is a fact that the women were the ones who only can stay at home which has condition submerged by the dirty water of tidal flooding which even come into the house. However, women still have potential in promoting disaster risk reduction because women have a higher depth of sensitivity and concern for family members, the surrounding community [38]. In the case of Sriwulan village, women have ability to adapt and to take the initiative during the disaster events, including taken place their jobless husband as breadwinner during the Covid-19 pandemic. It was proven that women are stronger in protecting their children and family when the disaster happened, included tidal flooding in Sriwulan village. An important thing should be noted that women had difficulty to get access of information, training, and workshop about adaptation to climate change. There are no opportunities for women to get involved in village development planning which is very important to change the faith of their sinking village Sriwulan. Hence, the result of the questionnaires analysis (Figure 6 and 7) was proven that the women participatory in tidal flooding disaster risk reduction was fair. Women still have limited access to contribute in decision making of many policies in the issues of tidal flooding disaster risk reduction as well as the future of their village.

Discussion

The survey, observation, and in-depth interview had given comprehensive data to be analysed. Rapid increase of tidal flooding inundation and level in Sriwulan village as shown by Figure 2 and 3 may not getting so severe if only there is a coastal barrier that prevents the tidal flooding coming into the land. Since there is no coastal barrier infrastructure as prevention, then the mangrove cultivation can become the best option even though it takes years to grow the mangrove. Figure 1 has emphasized that the government of Semarang city has taken action in rehabilitating the mangrove plantation in coastal area, included Trimulyo village, in Genuk Disctrict, since 2004 until nowadays [39], but the Demak Regency government didn't take the same action. The mangrove cultivation in Trimulyo village is succeed to grow in about 30 ha along the beach in that village [40]. An observation of the coastline of Sriwulan village in about seven years (2015-2022) also conducted in this research by satellite image map by Google Earth that described by Figure 8. The areas with red border in 2015 have been exposed lightly to abrasion, but in 2017, some parts of the area have already sunk and finally in 2022 wider area have been exposed to abrasion and get to sink.

FIGURE 8. Satellite image map by Google Earth of the coastal area of Sriwulan village from 2015-2022 taken by authors

Unfortunately, as mentioned by most respondents in in-depth interview, the people in Sriwulan village doesn't conform to the prevention of their village from tidal flooding with mangrove cultivation. Therefore, it is necessary to grow mangrove forest with proper technique in the front of the village's coastal area and place the tidal flood detector (it can be operated manually or digitally). In master-plan, there are big area planned for mangrove forest. It also obvious that an alert zone with tidal flood detector is very important to be existed in the master-plan. The evacuation routes will be built properly with sufficient signs to guide people to reach assembly point in the event of disaster.

This research found that women have limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. It was also found that gender mainstreaming has not implemented yet in tidal flooding disaster risk reduction in Sriwulan village. Due to COVID-19 impact to economics, it was unfortunate that many householders have lost their job and substituted by women (their wives). In several program, it was found that village authority doesn't take special attention in gender mainstreaming in policy or regulation as well as development. Hence, it is important to encourage women, to give them opportunity and role as 'actor' in leading the community to cope the climate change impact for better future by increasing their capability and good knowledge. Hence, there should be a place for women and children to stay resilience and feel safe in Sriwulan village that can be implemented in the master plan as 'women and children care zone'. In the future, women also take an important role in domestic and also village economic increase by selling miscellaneous products in floating market near by the mangrove forest. They can also manage restaurants and shops and develop their business capability.

From the questionnaires and int-depth interview analysis, the people in Sriwulan Village necessarily need their village future to be prolonged by the natural barrier of mangrove forest to struggle with the tidal flooding disaster. They also wanted the government take action to work together to plant Mangrove and change the face of the village from a sinking village to become a prospective eco-tourism village. The people want the economics of the village is going to be supported to be wealthier by trade and commercial activity which be placed in a safe zone. The women

have idea that their village have women's floating market, restaurants, and shops, to support their eco-tourism village.

Hence, due to the need of the Sriwulan Village to change their village to be an eco-tourisme village, a comprehensive analysis conducted to the existing map of Sriwulan Village which finally create the **"Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village"** (Figure 8) by stages of planning described by Figure 2. Several zones were determined and plotted to the basis map which is a satellite image map of Google Earth. Several zones of the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" (Figure 7): (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shops zone; (7) trade and commercial zone; and (8) housing. After plotting the zones, the Master Plan completed by adding the evacuation route and the placement of tidal flooding detectors made by the authors. Data and analysis of tidal flooding inundation, topographic and population secondary data from any sources and the comprehensive analysis of purposive sampling data of respondents by questionnaires and in-depth interview were contributed significantly in Master Plan creation. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor of Sriwulan village's sustainable built environment.

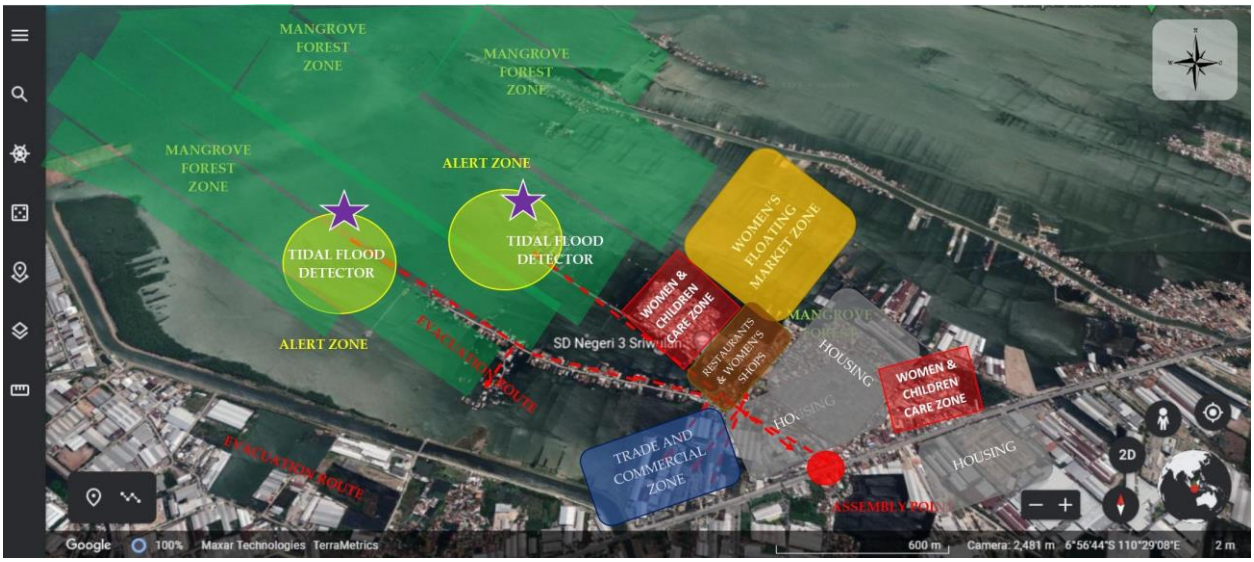

FIGURE 8. The Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village that was created by authors that using Google Earth Map as a basis map

It should be noted that there is many critical thinking to create those zones mentioned above based on data and analysis. The mangrove zones are needed to begin now but it will take more than 10 (ten) years to get a 'real' mangrove forest as natural barrier which is going to support the eco-tourism village of Sriwulan. The alert zone with tidal flood detector is a major component of "Early Warning System" (EWS) of tidal flooding disaster risk reduction. There are 2 (two) tidal flood detectors placed in the water front which will firstly face the high tide and tidal flooding. In other disaster events, for instant in many events of tsunami disaster, EWS has been taken an important role to safe life and also give people enough time to evacuate [41–45]. Hence, we place also 2 (two) evacuation routes in the village to reach assembly points. Supporting the disaster risk reduction in the stage of emergency of the disaster event, it should be placed the women and children care zone to answer the need of safety, comfort place to take care of mother and her children, and also women who need shelter in the event of disaster. At the time out of the disaster event, several economics zones should be built to support gender responsive Master-Plan as the solution of change the face of Sriwulan village from the Sinking Village to become a gender responsive Eco-tourism Village. Since many women previously sold many products of seafood or other marine food products and

also vegetables, they will have a comfortable and safety place floating market that also serve culinary product in the restaurants as well as handy craft and other miscellaneous products in the shop in the women's floating market zone and also restaurant and women's shops zone. However, previous trade and commercial zone that there is public market, shops, mini market, etc. The zones of housing which were maintained located nearby the main road. It seems that the housing nearby the sea (water front area) will not survive in the near future. Hence it is wise to plan the housing far away from the entry of tidal flooding.

CONCLUSION

The research found that women have a limited role in tidal flooding disaster risk reduction and adaptation in Sriwulan village. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation to tidal flooding. Women should be given opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and good knowledge. In general, in the future, the village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment.
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ACKNOWLEDGMENT

The authors would like to acknowledge the Ministry of Education, Culture, Research and Technology, Republic of Indonesia which support this research by Applied Research Grant, Contract No. 312/E4.l/AK.04.PT/2021, 66/LL6/PG/SP2H/JT/2021, and 00879/H.2/LPPM/VII/2021.

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BUKTI KORESPONDENSI
ACCEPTANCE DAN PUBLISHED ONLINE

1. Email Acceptance dari Editor Jurnal
2. Sertifikat Acceptance untuk dipublikasikan di Jurnal
3. Manuskrip Final yang sudah diterima

Susilo Rini <susilorini@upstegal.ac.id>

Acceptance Letter (ID:14092398)

Edward Smith <hrpub.editor@gmail.com> Fri, Apr 14, 2023 at 4:37 PM
To: Susilo Rini <susilorini@upstegal.ac.id>
Cc: Afiqoh Akmalia Fahmi <aaf550@ums.ac.id>

Dear Rr. M. I. Retno Susilorini,

Thank you for your interest in publishing your work in HRPUB.
We're pleased to inform you that your paper entitled "Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation" has been accepted for publication. Herewith attached is the Acceptance Letter.
Once we receive the Article Processing Charges , your paper is scheduled to be published.

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Date: 04/13/2023

Environment and Ecology Research
ISSN: 2331-625X (Print) ISSN: 2331-6268 (Online)

Acceptance Letter

Dear Rr. M. I. Retno Susilorini,

Congratulations! As a result of the reviews and revisions, we are pleased to inform you that your following paper has been accepted for publication.

Paper Title: Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

Paper ID: 14092398

Contributor (s): Rr. M. I. Retno Susilorini, Iskhaq Iskandar, Budi Santosa

It is scheduled for publication on Environment and Ecology Research, Vol 11 , No 2 .

Should you have any questions, please feel free to let us know by quoting your **Paper ID** in any future inquiries.

Best wishes,

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A Toward Sustainable Built Environment: A Gender-Eco Friendly Master Plan of a Sinking Village for Climate Change Adaptation

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Abstract. It is reported in the last decades that the northern coastal area of Java has been submerged by tidal flooding caused by climate change. Demak Regency is one of several cities that hardly suffered from the disaster, especially in Sriwulan Village, Sayung District. The phenomenon shows a threat to the sustainable built environment caused by climate change impact. In tidal flooding-prone areas, the built environment must be both influenced and also makes influenced by its surroundings. Since the built environment has been disturbed by climate change, women can adapt and take the initiative during disaster events, including taking place of their jobless husbands as breadwinners during the Covid-19 pandemic. Every event of disaster, including tidal flooding, will strongly impact women, which may become a gender inequality issue. A gender-responsive village master plan could become a crucial issue in village development, especially for the ones impacted by disasters. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment. The research was located in Sriwulan village, Sayung District, Demak Regency which was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The survey, observation, and in-depth interview reported a rapid increase in tidal flooding inundation and level in Sriwulan village. It was also found that women have a limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. In conclusion, women should be given the opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and fair knowledge. In the future, village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" which was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment. By the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village", the face of the Sinking Village of Sriwulan will change to a prospective Eco-Tourism Village of Sriwulan.

Keywords: sustainable, built environment, gender, eco-friendly, master plan, climate change, adaptation

INTRODUCTION

A study conducted by the Kompas team [1] published a very shocking analysis in the middle of August 2021 about the prediction of coastal area sinking in Indonesia, from Sabang (the eastern part of Indonesia) to Merauke (the western part of Indonesia). It was reported that there are 119 cities and regencies in Indonesia were predicted submerged by tidal flooding.

Climate change has changed the world, that causes seawater depth increase, climate extreme, drought [2,3], and flooding and also tidal flooding, which happened periodically in the north Java coastal area. Several investigations, studies, and research reported that in the last 3 decades, the coastal area has been continuously submerged by tidal flooding (called 'rob' in the Javanese language) caused by climate change. The coastal line along Java Island has changed and reduced by several kilometers including Demak Regency which is located in Central Java Province in Indonesia, especially in Sayung District and Sriwulan village. The worst impact of sea erosion happened in Indonesia was found in Sriwulan village which has lost its area of 2.116,54 ha for 20 years and a 5 km reduction of its coastal line since 1994 [4]. The abrasion rate of Sayung District was found as 82% and the accretion was 18% [5].

Several studies of the impact of tidal flooding in Sriwulan village and the disaster risk reduction to cope with the problem were also reported by authors [6,7] as well as several investigations that have been conducted in that area [8-10,17-19]. Some good lessons come from the case of tidal flooding in Semarang that affected the northern coastal area of the city, including Tambak Lorok settlement [20], Panggung Lor Sub-District [7], and several Sub-Districts in Tugu District [21]. The case in Tambak Lorok settlement was to examine community vulnerability and to build adaptation for keeping the buildings and public facilities in safety, while the Panggung Lor Sub-District case was about increasing resiliency and adaptation by community-based disaster risk reduction. In Tugu District, resiliency has been grown by develop mangrove as natural barrier. However, the tidal flooding cause big damage to the mangrove forest that an urgent effort have to conduct to save the District from the hazard of tidal flooding.

In tidal flooding-prone areas, the built environment must be both influenced and also makes influenced by its surroundings. People create or modify the built environment which consists of buildings and living spaces. Wider than the definition, the built environment includes the infrastructural elements such as waste management, transportation, and utility transmission systems that serve the building space [22]. However, it is a fact that built environments such as buildings and infrastructure contribute to global warming which is the main issue of climate change. There is no doubt that the built environment has a significant environmental footprint as the RIBA report [23] that the growth of buildings is very incredible since the 255 billion m^2 of buildings in the world today which increases to around 5.5 billion m^2 every year will still exist in 2050. A good approach and solution to cope with the environmental footprint built environment are to make better use of existing buildings that will reduce the demand for new construction, minimize the negative environmental impact of new buildings, and make the best decisions which put the long-term health of the planet above near-term financthe ial interests [23]. Hence, there is no doubt to evaluate the built environment in terms of sustainability that complies with the needs and requirements of future generations [22]. For an instant, it is important to build zero-carbon buildings and to reduce embodied carbon [24] as well as to implement built environment adaptation to climate change and to meet beyond the minimum criteria in regulation [25]. In adaptation urban planning, we need to enhance the physical protection of urban assets from extreme weather as climate change impact. The authorities have to build protection against sea level rise and flooding i.e. seawalls and pumps and also ecological solutions i.e. wetlands and mangroves forests [26]. A sustainable built environment is not only about the buildings, but also about the infrastructure and environment. Speaking about the 'sinking village', Sriwulan village, a built environment will become a big portrait of sustainable living space which will not be sinking because they want to change their face to become a prospective eco-tourism village like others do especially after the Covid-19 pandemic [27]. Therefore, an eco-tourism village of Sriwulan is an eco-friendly built environment that is designed to have little or no damaging effect on the environment by a responsive gender adaptation to climate change.

The built environment has been disturbed by climate change; hence, an adaptation of tidal flooding prone area should be implemented to reduce the hazard and to protect the vulnerable ones, the women and children. Every event of disaster will strongly impact women, which may become gender inequality issue. Climate change give deep

impact to vulnerable groups in society i.e. women, children, elderly people, disable people, indigenous people, and local communities, and also people in coastal area, urban and rural areas [28,29]. To anticipate the impact of climate change, it is necessary to implement climate change adaptation. However, adaptation to climate change disaster is not neutral to gender, since women and men have different capacity and contribution in adaptation as well as their different needs. In one side, climate change disaster makes women discrimination and gender inequality become worse, but in another side, the situation will be harder because of the limited role of women as decision maker in climate change issues [29]. Since women facing unfair situation and also double burden during disaster events as it is happened in tidal flooding prone area, the presence of government is very important.

The role of government and community to reduce the disaster and to implement policy in wise and 'smart' way is a necessity. There is no doubt that a responsive gender climate change adaptation is very crucial as well as the gender mainstreaming. United Nations Economic and Social Council (ECOSOC) on July 1997 emphasized that we should implement the gender mainstreaming as a process of assessing the implications for women and men planned actions, included legislation, policies, and programs that was also by the [30,31].

The gender-eco-friendly principal has been elaborated in terms of gender, women, and environment, by several Ministries and Agencies in Indonesia with Ministerial Regulations and other Regulations such as Ministry of Women Empowerment and Children Protection, Ministry of Environment and Forestry, Ministry of Finance, National Disaster Mitigation Agency, etc [28,29,32]. A gender-responsive village master plan could become a crucial issue in village development, especially for the ones suffered by disasters. The issuance of Law No. 6/2014 has shown that Indonesia's government wants to strengthen village development by constructing the village authority that has the responsibility for village development, empowering village community development through their initiatives, rights origin, and village customs [33]. It should be noted that Law No. 6/2014 Indonesia is very gender responsive that involves women's participation in village development as mandatory. Specifically, in village development terms, another regulation of Government Regulation (PP) No. 43 of 2014 on Village Article 121 paragraph (2) has the obvious statement that village development activities must be determined based on gender justice. Instead of the responsive gender law and regulation about village development, the Presidential Instruction Number 9 of 2000 assigned all the Ministers, Heads of Non-Ministerial Institutions, Governors and Regents/Mayors to involve and to implement the gender mainstreaming in order to carry out planning, implementation, monitoring and evaluation of national development policies and programs with a gender perspective in accordance with the field of duties and functions, as well as their respective powers [32]. Therefore, this research proposed the term "a gender eco-friendly" master plan for village development that can be defined as an act of gender mainstreaming in coping with the climate change impact, especially in Sriwulan village. Obviously, the "gender-eco-friendly" master plan is conducted by an eco-friendly master plan with gender consideration to climate change adaptation.

The people in Sriwulan village who are now hopeless about their sinking village need a change and better future of their living space. We could promote an adaptation to the climate change for a sustainable built environment in Sriwulan village by producing a gender eco-friendly master plan for the future of the village. Hence, this research wants to create a gender eco-friendly master plan for Sriwulan village for a sustainable built environment. The gender-eco-friendly master plan of Sriwulan village become a great hope to the most vulnerable groups in the event of disaster, the women and children, that in the middle of tidal flooding disaster they will have a safer and more comfortable place to live.

METHOD OF RESEARCH

Research Sites

FIGURE 1. Satellite image of Sriwulan village in Sayung District, Demak Regency, Central Java Province, Indonesia, on February 2022 by Google Earth

The research was located in Sriwulan village, Sayung District, Demak Regency, Central Java Province in Indonesia. Demak Regency has area of 897,43 km^2 that consists of 14 Districts [34]. One of those Districs is Sayung District that has area of 78.80 km^2 and comprises of 20 villages, one of them is Sriwulan village. As shown by the Figure 1, Sriwulan village located next to the Java Sea, lay on 6^0 55' - 6^0 56' East Longitude and 110^0 27' - 110^0 29' North Latitude which. Sriwulan village has area of 4.02 km^2 with topography about 0-3 meters above the sea level that makes the village prone to tidal flooding [35]. It was reported Sriwulan village has 7 hamlets, 8 neighbourhood communities of Rukun Warga (RW), and 76 neighbourhood communities of Rukun Tetangga (RT) [36].

Demographic of Sriwulan village is reported by the Central Java information system through the website of https://sidesa.jatengprov.go.id/pemkab/kependudukandes/33.21.04.2011 which based on the integrated data of Demographic Administration Information System in 2020 as follows. Population of Sriwulan in 2020 is 10,430 that consists of 5,202 males and 5,228 females. The householders reported as 2,811 males and 657 females. Educational background and the livelihood of Sriwulan village inhabitant described by Figure 2 and 3.

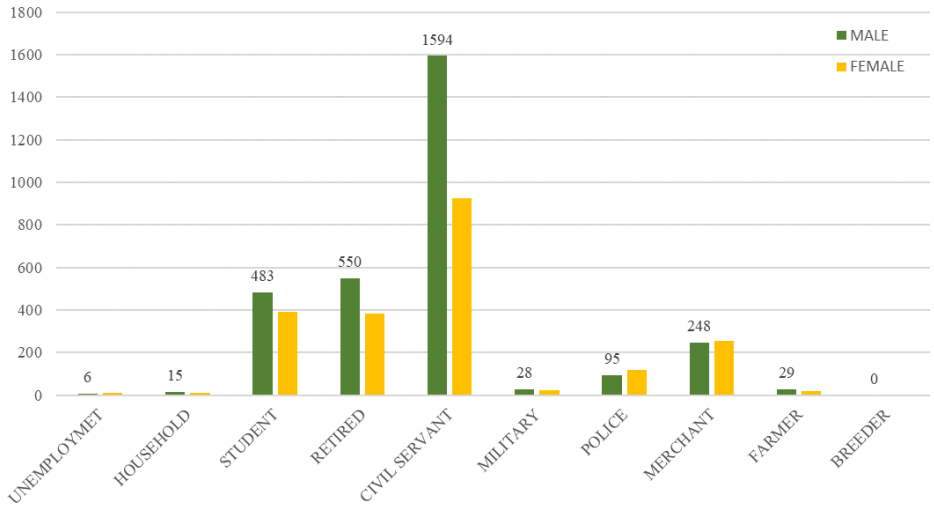

FIGURE 2. Educational background of Sriwulan village inhabitants

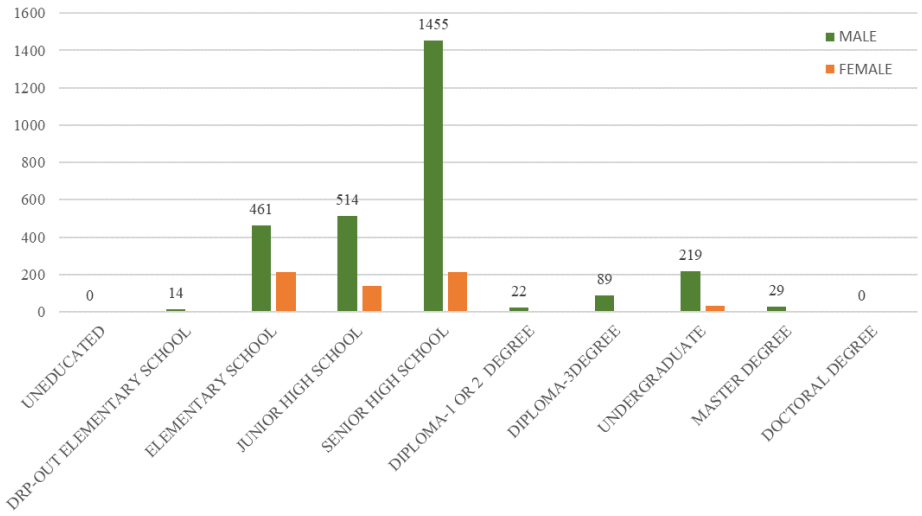

FIGURE 3. Livelihood of Sriwulan village inhabitants

Methods

The research was conducted by descriptive-qualitative method to produce a gender eco-friendly Sriwulan village's master plan. The descriptive-qualitative method used to portray the existing situation of Sriwulan village that is submerged continuously by tidal flooding and to study the previous data of tidal flooding in Sayung District and Sriwulan village. There were questionnaires for survey to 25 respondents (women and men) and an in-depth interview to 3 (three) women's community representatives who live in Sriwulan village, Sayung District, Demak Regency.

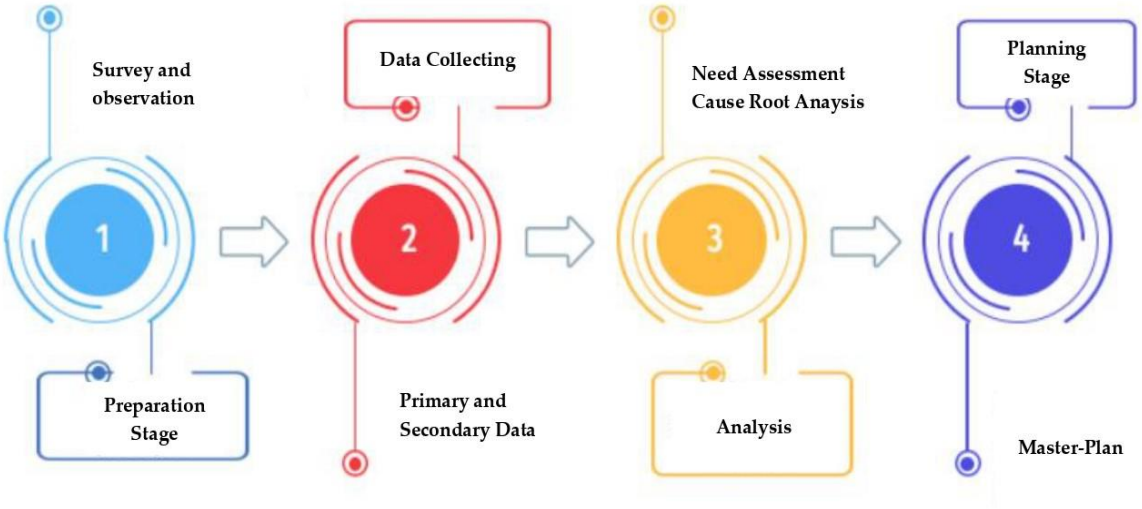

FIGURE 2. The Stages to Create the Master Plan

The master-plan was created by several stages as described by Figure 2 that could be explained as follows.

1. **Preparation stage**. In this stage, a survey and observation were conducted to gain information, including need assessment, field observation, and Focus Group Discussion with the people and village authority of Sriwulan village.
2. **Data collecting.** The purpose of data collecting is to provide accurate information to be analyzed. Data collecting conducted by questionnaires and in-depth interview to the respondents. The data collecting conducted by qualitative purposive and quantitative random sampling to the respondents. There were 2 main issues delivered to the respondents in questionnaires and also in-depth interview: (1) women's knowledge and capacity of tidal flooding disaster risk reduction, and (2) women's groups participatory in tidal flooding disaster risk reduction.
3. **Analysis.** Comprehensive analysis has been conducted based on survey and observation results and data from questionnaires and in-depth interview. The analysis results will become a basis to create the master plan.
4. **Planning stage.** Zoning will be an initial step in planning stage prior to planning itself. A map of satellite image of Google Earth has been used as the basis of master plan. The determination of zoning implemented based on analysis results and data. There was also a placement of evacuation route and tidal flooding detector on the master plan. This stage is final stage which was produced a gender eco-friendly master plan for Sriwulan village for a sustainable built environment

RESULT AND DISCUSSION

Results of observation of the impact of tidal flooding disaster in Sriwulan village

The sinking of Sriwulan village is a long process of coastal erosion caused by climate change which had begun since 1925 [17,37]. It was reported by Ruswanto [37] that during the period of 1925-1964 the coastline of Demak Regency was reduced as 200 m and in the next 20 years later, in 1984, the coastline was also reduced as 200-300 m, about 12,5 m per year. The same report stated that in November 1955, the coastline of Demak Regency was reduced as 55 m. Another report [16] found that coastline of Sayung village change from 2003 to 2013 from 4.49 km to become 10.38 km.

FIGURE 4. Existing situation in Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

FIGURE 5. "Mr. Boat Man" of Sriwulan village, Sayung District, Demak Regency, November 5, 2021 (photograph ©Susilorini, et. al., 2021)

During the last two decades, the depth of tidal flooding in Sriwulan village has become higher and higher. Tidal flooding's intensity and depth were reported in several years during 2008-2022 [4] as described by Table 1. In 2008, the depth of tidal flooding reported as 0.25 m [4,7,12] while in 2017 authors have reported in that the depth of tidal

flooding achieved 0. 5 m [7]. In 2020, [12] reported that the depth of tidal flooding in Sriwulan village has achieved 1 m while the present investigation of authors, in November 2021, it is found that the tidal flooding disaster in Sriwulan has become worse that the maximum tidal flooding depth has achieved 1.5 m as shown by Figure 4.

TABLE 1. Tidal flooding's intensity and depth in Sriwulan village (2008-2022)

	2008	**2017**	**2020**	**2021**	**2022**
Intensity (per year)	2	2 to 3	5	> 6	> 6
Depth (max)	0.25	0.5	1	1.25	1.5

The field survey of this research has observed that the disaster of tidal flooding in Sriwulan village is the worst in the last 5 years that the depth of tidal flooding has been increasing in exponential trend. Obviously, Figure 5 explains the sinking Sriwulan village (houses, public facilities, road, etc.) submerged by tidal flooding more than 6 (six) times a week with depths of about 0.5-1.5 m. Mr. Nasikin 'Yatin', "Mr. Boat Man" (Figure 5), lives in RT. 6/RW. 2, Sayung village, with his family in their house with a floating boat inside the building. They built a simple wooden bridge to connect their tidal flooding submerged house with the road. It was also found that several Small and Medium Enterprises existed in Sriwulan Village which is located in business zones in the village that suffered from tidal flooding.

Results of questionnaires and in-depth interview

The questionnaires were delivered by a Likert scale of five-point agreement (strongly agree, agree, strongly disagree, disagree, and undecided) as described in Table 2 while the control score sinwn by Table 3.

TABLE 2. Parameter and score of questionnaires

PARAMETER	**NUMBER OF QUESTION**	**QUESTION TYPE**	**NUMBER OF QUESTION WITH TYPE OF A OR B**	**SCORE***				
				SA	**A**	**SD**	**D**	**U**
1	17	A	16	5	4	3	2	1
		B	1	2	3	4	5	1
2	17	A	14	5	4	3	2	1
		B	3	2	3	4	5	1

***Note: SA=Strongly-Agree; A=Agree; SD=Strongly-Disagree; D=Disagree; U=Undecided**

TABLE 2. Control for scoring

CONTROL	**SCORE**
Highest Score / Good	91-125
Medium Score / Fair	65-90
Lowest Score / Bad	25-64

Figure 6 described the response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction. It has found that women's knowledge and capacity of tidal flooding disaster risk reduction 75.36% were good and 26.64% were fair. The second parameter response is women's groups participatory in tidal flooding disaster risk reduction shown in Figure 7. In this parameter, the response consists of good, fair, and bad. It was found that 28.07% responses were good, 62.69% were fair, and 9.24% were bad.

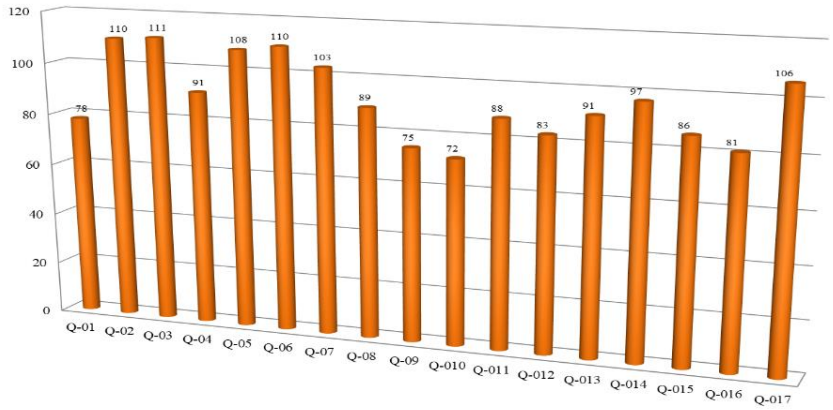

FIGURE 6. Response of first parameter of women's knowledge and capacity of tidal flooding disaster risk reduction questionnaires

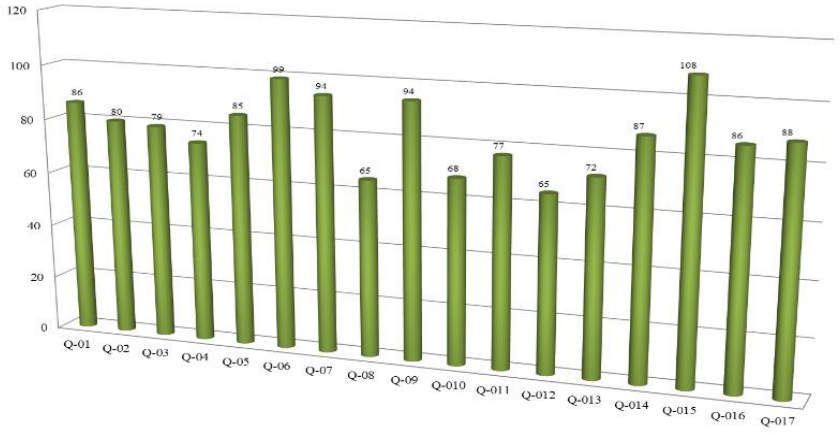

FIGURE 7. Response of parameter of women's groups participatory in tidal flooding disaster risk reduction

The fact came from the results of in-depth interviews with the representatives of women's community that women are the most vulnerable group during the disaster event, the tidal flooding in Sriwulan village. They said that they have very limited access to clean water, food, and medicine during the event of tidal flooding. It is a fact that the women were the ones who only can stay at home which has condition submerged by the dirty water of tidal flooding which even come into the house. However, women still have potential in promoting disaster risk reduction because women have a higher depth of sensitivity and concern for family members, the surrounding community [38]. In the case of Sriwulan village, women have ability to adapt and to take the initiative during the disaster events, including taken place their jobless husband as breadwinner during the Covid-19 pandemic. It was proven that women are stronger in protecting their children and family when the disaster happened, included tidal flooding in Sriwulan village. An important thing should be noted that women had difficulty to get access of information, training, and workshop about adaptation to climate change. There are no opportunities for women to get involved in village development planning which is very important to change the faith of their sinking village Sriwulan. Hence, the result of the questionnaires analysis (Figure 6 and 7) was proven that the women participatory in tidal flooding disaster risk reduction was fair. Women still have limited access to contribute in decision making of many policies in the issues of tidal flooding disaster risk reduction as well as the future of their village.

Discussion

The survey, observation, and in-depth interview had given comprehensive data to be analysed. Rapid increase of tidal flooding inundation and level in Sriwulan village as shown by Figure 2 and 3 may not getting so severe if only there is a coastal barrier that prevents the tidal flooding coming into the land. Since there is no coastal barrier infrastructure as prevention, then the mangrove cultivation can become the best option even though it takes years to grow the mangrove. Figure 1 has emphasized that the government of Semarang city has taken action in rehabilitating the mangrove plantation in coastal area, included Trimulyo village, in Genuk Disctrict, since 2004 until nowadays [39], but the Demak Regency government didn't take the same action. The mangrove cultivation in Trimulyo village is succeed to grow in about 30 ha along the beach in that village [40]. An observation of the coastline of Sriwulan village in about seven years (2015-2022) also conducted in this research by satellite image map by Google Earth that described by Figure 8. The areas with red border in 2015 have been exposed lightly to abrasion, but in 2017, some parts of the area have already sunk and finally in 2022 wider area have been exposed to abrasion and get to sink.

FIGURE 8. Satellite image map by Google Earth of the coastal area of Sriwulan village from 2015-2022 taken by authors

Unfortunately, as mentioned by most respondents in in-depth interview, the people in Sriwulan village doesn't conform to the prevention of their village from tidal flooding with mangrove cultivation. Therefore, it is necessary to grow mangrove forest with proper technique in the front of the village's coastal area and place the tidal flood detector (it can be operated manually or digitally). In master-plan, there are big area planned for mangrove forest. It also obvious that an alert zone with tidal flood detector is very important to be existed in the master-plan. The evacuation routes will be built properly with sufficient signs to guide people to reach assembly point in the event of disaster.

This research found that women have limited role in tidal flooding disaster risk reduction and adaptation. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation. It was also found that gender mainstreaming has not implemented yet in tidal flooding disaster risk reduction in Sriwulan village. Due to COVID-19 impact to economics, it was unfortunate that many householders have lost their job and substituted by women (their wives). In several program, it was found that village authority doesn't take special attention in gender mainstreaming in policy or regulation as well as development. Hence, it is important to encourage women, to give them opportunity and role as 'actor' in leading the community to cope the climate change impact for better future by increasing their capability and good knowledge. Hence, there should be a place for women and children to stay resilience and feel safe in Sriwulan village that can be implemented in the master plan as 'women and children care zone'. In the future, women also take an important role in domestic and also village economic increase by selling miscellaneous products in floating market near by the mangrove forest. They can also manage restaurants and shops and develop their business capability.

From the questionnaires and int-depth interview analysis, the people in Sriwulan Village necessarily need their village future to be prolonged by the natural barrier of mangrove forest to struggle with the tidal flooding disaster. They also wanted the government take action to work together to plant Mangrove and change the face of the village from a sinking village to become a prospective eco-tourism village. The people want the economics of the village is going to be supported to be wealthier by trade and commercial activity which be placed in a safe zone. The women

have idea that their village have women's floating market, restaurants, and shops, to support their eco-tourism village.

Hence, due to the need of the Sriwulan Village to change their village to be an eco-tourisme village, a comprehensive analysis conducted to the existing map of Sriwulan Village which finally create the **"Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village"** (Figure 8) by stages of planning described by Figure 2. Several zones were determined and plotted to the basis map which is a satellite image map of Google Earth. Several zones of the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" (Figure 7): (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shops zone; (7) trade and commercial zone; and (8) housing. After plotting the zones, the Master Plan completed by adding the evacuation route and the placement of tidal flooding detectors made by the authors. Data and analysis of tidal flooding inundation, topographic and population secondary data from any sources and the comprehensive analysis of purposive sampling data of respondents by questionnaires and in-depth interview were contributed significantly in Master Plan creation. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor of Sriwulan village's sustainable built environment.

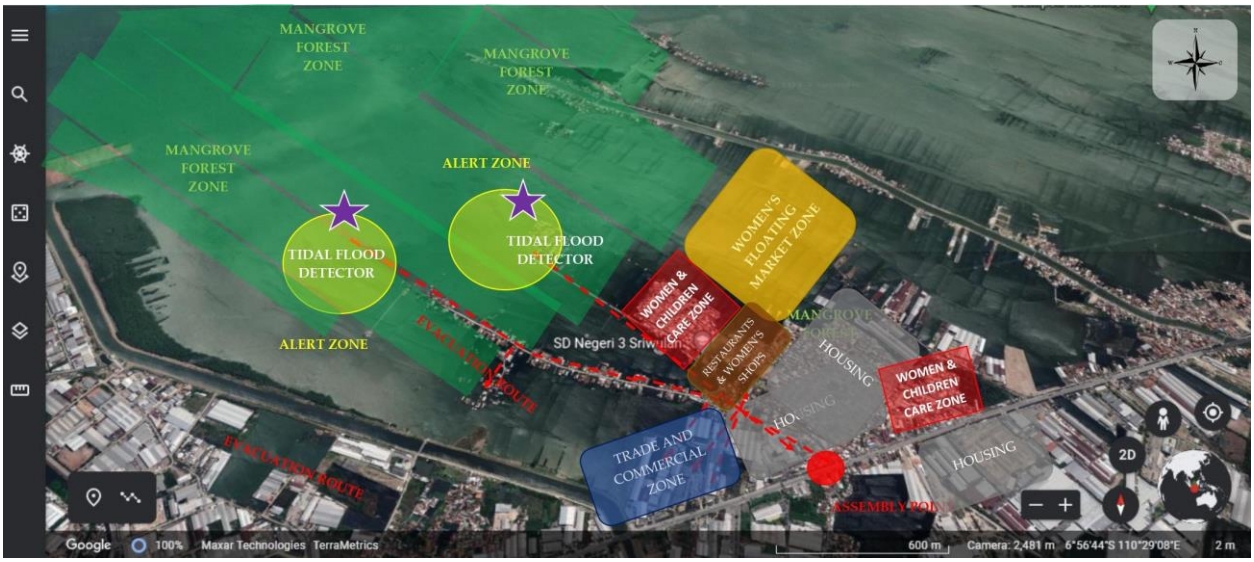

FIGURE 8. The Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village that was created by authors that using Google Earth Map as a basis map

It should be noted that there is many critical thinking to create those zones mentioned above based on data and analysis. The mangrove zones are needed to begin now but it will take more than 10 (ten) years to get a 'real' mangrove forest as natural barrier which is going to support the eco-tourism village of Sriwulan. The alert zone with tidal flood detector is a major component of "Early Warning System" (EWS) of tidal flooding disaster risk reduction. There are 2 (two) tidal flood detectors placed in the water front which will firstly face the high tide and tidal flooding. In other disaster events, for instant in many events of tsunami disaster, EWS has been taken an important role to safe life and also give people enough time to evacuate [41–45]. Hence, we place also 2 (two) evacuation routes in the village to reach assembly points. Supporting the disaster risk reduction in the stage of emergency of the disaster event, it should be placed the women and children care zone to answer the need of safety, comfort place to take care of mother and her children, and also women who need shelter in the event of disaster. At the time out of the disaster event, several economics zones should be built to support gender responsive Master-Plan as the solution of change the face of Sriwulan village from the Sinking Village to become a gender responsive Eco-tourism Village. Since many women previously sold many products of seafood or other marine food products and

also vegetables, they will have a comfortable and safety place floating market that also serve culinary product in the restaurants as well as handy craft and other miscellaneous products in the shop in the women's floating market zone and also restaurant and women's shops zone. However, previous trade and commercial zone that there is public market, shops, mini market, etc. The zones of housing which were maintained located nearby the main road. It seems that the housing nearby the sea (water front area) will not survive in the near future. Hence it is wise to plan the housing far away from the entry of tidal flooding.

CONCLUSION

The research found that women have a limited role in tidal flooding disaster risk reduction and adaptation in Sriwulan village. There is insufficient information, training, and workshop about climate change, disaster risk reduction, and adaptation to tidal flooding. Women should be given opportunity as an actor in leading the community to cope with the climate change impact for a better future by increasing their capability and good knowledge. In general, in the future, the village life will be prolonged by the "Gender Eco-Friendly Master Plan for Sustainable Built Environment of Sriwulan Village" was created by placing several zones such as: (1) the mangrove zones; (2) alert zone with tidal flood detectors; (3) evacuation routes with assembly point; (4) women and children care zone; (5) women's floating market zone; (6) restaurant and women's shop's zone; (7) trade and commercial zone; and (8) housing. The master plan is expected to give a better future to Sriwulan village, especially to adapt to tidal flooding and put the women as an actor in Sriwulan village's sustainable built environment.
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ACKNOWLEDGMENT

The authors would like to acknowledge the Ministry of Education, Culture, Research and Technology, Republic of Indonesia which support this research by Applied Research Grant, Contract No. 312/E4.l/AK.04.PT/2021, 66/LL6/PG/SP2H/JT/2021, and 00879/H.2/LPPM/VII/2021.

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