

Gender sensitive education in watershed management to support environmental friendly city

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Abstract. This study is about gender-sensitive perspective in watershed management education program as one of capacity building for citizens in watershed management with community-based strategy to support environmental friendly cities and security for women from flood disasters. Involving women and increasing women's active participation in sustainable watershed management is essential in urban area. In global warming and climate change situations, city management should be integrated between social aspect and environmental planning. This study used mix method (concurrent embedded type, with quantitative as primary method) with research type is descriptive-explanatory. The result of this study is education strategies with gender approaches and affirmative action through emancipation approach and local knowledge from women's experiences can increase women's participation. Women's empowerment efforts need integrated intervention and collaboration from government, *NGO*, and other stakeholders to optimize women's role in watershed management for support environmental friendly city. The implication of this study is an educational strategy on watershed conservation with gender perspective to offer social engineering alternatives for decision makers to policy of sustainable watershed management in urban area related to flood mitigation efforts.

1. Introduction

The rivers in urban areas have a very strategic role for the local population. The river's role is not only a physical role for the ecosystem and social sustainability, but also a cultural role. It is important in planning environmentally friendly city planning to achieve water security and sustainable cities with watershed management. But the problems of environmental degradation of the city, the loss of riparian areas, and the river pollution caused complexity of situations in the city, especially to the face of climate change conditions. Flood disaster is one of the most common problems in urban areas when the capacity and carrying capacity of the city decreases caused by global warming [1]. This problem is also in DKI Jakarta and Tasikmalaya, Indonesia which is as research location in this paper. Both of the two cities there is frequent flooding, and the waste pollutes the river that passes through the city. The citizens in the city must be able to manage environmentally for mitigation action and adapt from the impacts of climate change and global warming, as well as the various environmental degradation problems that occur in urban areas. The impact of the floods in urban areas causes both financial and material losses



(both houses, cars, and others) to the community, even causing casualties, destroying economic and social infrastructure, such as reduced water supply, power outages, the damage of roads and rail train (as a means of transportation). Also, flooding causes the spread of diseases, such as diarrhea, typhoid, scabies, cholera and malaria. Effect of floods has decreased carrying capacity of cities for the community to obtain security, both environmental and healthy security. This condition will hamper the sustainability of the city [2]. One of the mitigation efforts to climate change effect is building the environmentally friendly city with an ecology of the city approach. In the concept of eco-city, there is related social and ecological context, where human and environmental interaction becomes the factor that needs with the ecological approach [3]. So the involvement of all elements of society fairly and equally in urban planning and urban management is very significant in the development of environmentally friendly cities.

Strengthening the capacity of citizens about social resilience efforts is to increase the knowledge of citizens for environmental management in the community. This ability will shape awareness, be able to adapt, and participate in environmental management. Effort to support the capacity of citizens in the implementation of sustainable development by focused the gender aspects, especially in watershed management. Gender norms in society, shaping the division of roles between men and women. This condition leads to differences in knowledge about conservation and awareness of the environment between them. It also makes inequality access for women to watershed and natural resources [4]. Citizens are agents in environmental management, there needs equality for participation between men and women, both in a decision-making for urban planning and watershed management, as well as access to involvement in environmental management. Women are supposed to have role in planning and decision making [5]. Women become water managers, both as collectors and users of water for their households. Thus, the role of women will be necessary in the conservation of sustainable watersheds and the achievement of community welfare. Like women in South Wollo, Ethiopia has a role in environmental protection and management, both in flood and water source management. Efforts to address the information access gap and vulnerability for women need to be continuously carried out by providing information on mitigation and coping mechanism from climate change effect, both through education and other information support [6]. Besides that, in one of study about women's environmental literacy Jakarta, women who become activists of pro-environmental activities have competency for solved environmental problems, and they can form a social network in the community to conduct environmental management activities [7].

To address flood and environmental degradation, integration between urban planning and education will reduce the city's vulnerability to disaster. Then, the watershed management with gender-sensitive perspective becomes indispensable to increase women's participation and ability to manage watersheds. Women should be knowledgeable about the importance of conserving watershed, including riparian zones, and catchment areas to ensure clean water supply for household use. However, women are still marginalized, even women and children become the most victims in the event of environmental disaster [8]. To increase women's participation in environmental protection programs need to support the role of women in environmental management by using gender approaches in environmental management, such as implemented in Tofa, Kano State, Nigeria [9]. Based on the description above, the purpose of this study is to describe the participation of women has relationship with community empowerment by education of watershed management with the gender perspective. Although education should be given to women and men to form an awareness of the importance of equality and equal opportunity. But, in this study, evaluation only in the education program for women. The novelty in this study about the integration of women's local knowledge and women's empowerment activities with gender perspectives to support participation in watershed conservation to achieve sustainability of the city.

2. Theoretical Review

Urban planning requires a holistic approach with due regard to social aspects to achieve security and resilience of the city. The urban ecology approach with emphasis ecology for city will significant to watershed management in planning an eco-friendly cities, taking into account the needs of the

community for comfortable, equal and quality of life. The eco-city is the city designed with a good consideration of environmental impact and inhabited, with balance development with carrying capacity of the city, encourage community with citizen involvement, also promote social justice and equity [10]. Citizen participation is an important strategy to support the successful planning and development of environmentally friendly cities. Community-based strategies in urban management will encourage citizen involvement in environmental management and environmental security [11]. It shows between eco-city planning included in watershed management and citizen involvement by increased participation of women as an agent in built cities and in decision-making process. Watershed management as an adaptive, comprehensive process, integrated multi-resources management planning that seeks to balance healthy ecological, economic, and social-cultural conditions within a watershed [12]. In this study, watershed management in context to flood control and protecting water quality. Because of that, watershed management needs to manage in community-based strategy to involve the citizens in planning and decision making to achieve sustainability of watershed management.

Gender aspect becomes very important to be integrated in the community empowerment to manage the watershed. Efforts to empower communities by providing water management education with a gender perspective to increase women's participation are essential in the face of climate change [13]. The involvement of women's roles and watershed management to achieve the sustainability of the city is also in line with human right concept and the objectives of Sustainable Development Goals (SDGs), in the fifth point have objective of "achieving gender equality and empower all women and girls", also in the-6 point is to "ensure availability and sustainable management of water and sanitation for all", and in the-11 point have objective "make cities inclusive, safe, resilient and sustainable" [14]. The relationship between gender and the environment, particularly on the importance of gender mainstreaming in environmental protection policies already explored in eco-feminism, Women In Development (WID), Neo Malthusian theory, and Gender and Development (GAD). The women's knowledge very important in community and family health, as well as environment conservation, and the importance of equal gender relations for sustainable development [15]. Education for women as one of the ways for women's empowerment whereby people gain knowledge about watershed management and women can more confidence in ordinary life with access and control to natural resources [16].

Based on the literature review, this study tested the hypothesis about the effect of gender sensitive education on watershed management with women's participation. There are several hypotheses with H1 (there is a relationship between knowledge on watershed management (X1) with women's participation in watershed conservation (Y)), H2 (there is a relationship between local beliefs on the role of river (X2) with women's participation in watershed conservation (Y)), H3 (there is a relationship between women's capability on watershed management (X3) with women's participation in watershed conservation (Y)), H4 (there is a relationship between adaptation of watershed management technology (X4) with women's participation in watershed conservation (Y)), and H5 (there is a relationship between women's access to watersheds (X5) with women's participation in watershed conservation (Y)). Hypothesis testing to know the contribution of education and facilitation implementation that most give influence to the participation of women. Aspects of women's interaction with watershed resources and conservation in accordance with the implementation of the eco-city planning, also control flooding and environmental sanitation to achieve sustainability of the city.

3. Methodology

This study used mix method (with concurrent-embedded type, the quantitative method as primary method). The type of this research is descriptive-explanatory, by testing hypothesis to explain the prediction of the relationship of gender sensitive education variables to the participation of women in managing the watershed (as the hypothesis has been written in the theoretical review), also analyzing of qualitative data to describe the test results based on field conditions. The process of collecting data in stages, with the initial stage of conducting the survey, then continued in-depth interviews and observations to get the context of the experience of informants who manage the watershed. Determination of research sites in DKI Jakarta and Tasikmalaya based on the assumption that the two

cities represent the urban areas with often flood problems, besides that they have a uniqueness of hydrology's in the watershed areas. The number of research samples for quantitative method is 120 respondents in two cities, there are 60 respondents in DKI Jakarta and 60 respondents in Tasikmalaya, Indonesia. It used cluster sampling technique to get samples. In gathering data with the qualitative method, sample criteria are women who actively participate in watershed conservation in urban areas. The sampling technique with snowball techniques to obtain four informants, which is two participants from DKI Jakarta and two participants from Tasikmalaya. Determination of the number of informants based on the assumptions related to the experience of informants doing environmental care activities that have been done more than ten years and actively motivated citizens to environmental activities in the community.

For analysis data (with the quantitative analysis technique) from the questionnaire by using descriptive statistical analysis and through hypothesis testing using Pearson correlation and multivariate regression analysis. In this study, a validity test was conducted using factor analysis, with results from *KMO and Barlett's Test* on *Kaiser-Meyer-Olkin Measure of sampling Adequacy* is 0.672, with significance value is 0.00 indicating the data are valid. Then, reliability test result with Alpha Cronbach analysis got the alpha result is 0.673 indicating that data are reliable, so that can be continued for multivariate regression analysis. Then, for the qualitative method, analyzing of the data of in-depth interview using thematic analysis to find pattern or theme on information of the transcript of the interview. Analysis is performed through process of coding data and complex indicator (from participant's statement in the verbatim transcript), then made the relation between indicators, defining, and naming themes, then generated descriptive of themes to integral elements with a form of conceptual scheme/diagram. This result is gained inductively from field data, also deductively from previous theory and another research result [17].

4. Results and discussions

Based on hypothesis testing, it is known that the results from Pearson correlation test to measure of correlation between independent variables (X1, X2, X3, X4 and X5) with dependent variable (Y) shows, in value of correlation between X1 variable (knowledge on watershed management) and Y variable (women's participation in watershed conservation) is 0.416, value of correlation between X2 variable (local beliefs on the role of river) with Y is 0.184, value of correlation between X3 variable (women's capability on watershed management) with Y is 0.473, value of correlation between X4 variable (adaptation of watershed management technology) with Y is 0.347, and value of correlation between X5 variable (women's access to watersheds) with Y is 0.412. The relationship between the X1, X3, and X5 with variable Y is moderate, while the strength of the relationship between X4 and Y is weak, and the strength of relations between X2 and Y variables is very weak. Then, the result of multivariate regression analysis, value of predictor X1, X2, X3 shows R value is 0.584 and have value of R square equal to 0.341 that is indicate X1, X2, X3, X4 and X5 donated 34.1% influenced Y, and 65.9% the rest (from 100% -34.1% = 65.9%) by other factors. The *ANOVA* test also shows the F value is 5.6, with the significance level of 0.000. It indicates that there is affect X1, X2, X3, X4 and X5 to Y. Although from the mathematical formulation shows only H3 (hypothesis number 3) that can be accepted with indicating X3 have relation on Y (proved that the X3 variable had an effect on Y), as a result of mathematical equations: $Y = 0.633 + 0.298X3$, with significance value is $0.040 < 0.05$, this indicates H3 is accepted. Meanwhile, result from H1, H2, H4, and H5 are not accepted (not proven), because they have significance value more than 0.05.

The results showed that women's capability variables included skills and understanding to manage the watershed by preserving riparian and sanitation areas. Women in DKI Jakarta and Tasikmalaya who participated in watershed management, only 70% of women involved in watershed management when in their community had event of an activity watershed management program who organized by the government and *NGO*. At the time of planning activities, women were still not involved. At the study sites, more women were involved in practical watershed management activities. Watershed management opportunities using technology and access to facilities are still provided to men. The problem of

inequality is still experienced by informants in the ease of access and involvement in watershed management activities. Conditions that still hamper the role of women are due to value in the society that limits women to be active in activities outside the home without the consent of the family. Even in the planning of watershed management activities, local government and *NGO* still prefer the involvement of male citizens. So the watershed management activities conducted by women often through social activities, as activities in local social organizations for women in their community. As for the form of activities is cleaning the river, greening around the river, prevent sand mining and tree felling in riparian areas. Thus, from the existence of educational programs, the women get many benefit, both the knowledge of managing the watershed according to the typology of the river, riparian area, and coping strategies of the flood disaster. Ease of access to watershed management gained by women has strengthened social networking among women in their communities.

Gender approaches and affirmative action in education to increase women's participation through emancipation approach for women and explore for local knowledge. Education with a gender perspective uses an emancipation-participatory strategy can open access for citizens to involved in determining need for knowledge of watershed management. Problems of inequality in women still occur in the community. The orientation of community empowerment with gender approach in realizing sustainable river conservation has improved women's ability in watershed management. Watershed management that is integrated with the involvement of the citizens will support the development of the environmentally-friendly city as well as efforts to address the problem of flooding in urban areas. That's conditions very support sustainability of city and SDG's objectives. Thus, gender-sensitive education programs should implement affirmative action with collaboration between government and *NGO*. That can be with co-management approach with a community-based approach.

Gender-sensitive education is basically to provide justice and equality to all citizens in the city, so in its application even though it focuses on women, but it should to community empowerment in the implementation, supervision, and protection of water resources with increased knowledge and skills to manage river and biodiversity for watershed conservation. Also, involving citizens in water resources management planning, with access for women to attend meetings in watershed management planning, and socialization of development, utilization, maintenance of facilities and infrastructure of natural resources, also equipment as a means for sanitation, gardening, cleaning the river from trash in the watershed area, and implementation of 3R principles in waste management.

The ecological approach also needs to be linked to local cultural conditions to implement gender-sensitive education. Women's local knowledge contributes to the watershed management. One of the examples, residents in community still hold the cultural value in the utilization of the river, where on the location of the river Citanduy there is still a belief in the existence of supernatural powers, it called *pamali* (the term is in Sundanese language) and the basic culture of "taboo" to cut down certain trees that exist in riparian rivers or damage plants. This value can support watershed management. The women who actively manage the watershed have an orientation towards the well-being of their families, including a healthy environment for their children and grandchildren in the future. The experience of women engaged in solve environmental concerns and actively participating in watershed management is supported by activities in local women's organizations.

Women able to engage citizens in their communities. It increased community participation in riparian management and sustainable community-based watershed management. The independence's community in watershed management to achieve sustainability should be considered important element in the integrated watershed management plan for sustainability of city.

5. Conclusion

Education for watershed management with gender sensitive perspective very significant to empowering citizens to create environmental security with watershed conservation. Equality is one of aspect to be achieved in built environmental friendly city planning. Education, access to watershed management, and explore women's leadership important to mobilizing women in their communities. Watershed management with gender perspective will foster the independence of society with the improvement of

ability in managing their environment and achieve prosperity through the formation of social resiliency. The contribution of this study as a strategy for women's empowerment with gender sensitive education and recommendations for policies in watershed management with the community-based approach, also offer social engineering alternatives to achieve sustainable watershed management in urban area and flood mitigation action.

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