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Gender Equality in Climate Change Adaptation: A Case of Cirebon, Indonesia

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Abstract

Climate change will greatly affect many aspects of Indonesia's economy, society, and environment. The vulnerability of individuals to climate change will depend on their adaptive capacity and manifestations of gender inequality can affect this capacity. It is generally acknowledged that women may be more vulnerable to climate change impact than men. Therefore, gender inequality becomes the critical issue on climate change adaptation. However, it is not yet mainstreamed into climate change adaptation program in Indonesian cities. With regard to such circumstance, this study assessed the gender dimensions in the context of climate change vulnerability, and how to mainstream gender-sensitive into climate change adaptation program at the local level with a case of Cirebon, Indonesia, in urban and rural areas. Mixed methods were employed for this study by combining quantitative and qualitative analysis through explanatory and comprehensive analysis. We examined the gender differences on socio-economic condition by using the socio-ecological model with various variables consisting of literacy and education, livelihood, access to and control over resources, health, mobility, female-headed household, and roles in decision-making. The results highlight that there are different gender's adaptive capacities between urban and rural areas to climate change, and gender mainstreaming in climate change adaptation in an urban area is easier to be implemented than in a rural area which influenced by the level of society and policymakers ability and awareness.

Keywords: climate change adaptation; gender equality; vulnerability

1. Introduction

Climate change is the greatest threat faced by humans because its impact jeopardizes global ecological safety, survival, and development of human society (He, 2015). Climate variability adds further pressure, such as farmland becomes faster drying, reduced water storage glaciers, the intensity of extreme climate events more frequently (such as drought or floods), and water shortages, as well as declining agricultural productivity (Hoff, 2011). Given the rapidly changing climate, however, the ability of people who live in the vulnerable area to respond effectively to the increasing incidence of shocks needs to be strengthened (Tambo, 2016). This is because resilient households are more likely to anticipate, resist, cope with and recover from climate change impacts (Fan, Pandya-Lorch, & Yosef, 2014).

Intergovernmental Panel on Climate Change (2001b) stated that climate change impacts vary by region, generation, age, class, income, occupation, and gender. The individual's vulnerability to climate change will depend on their adaptive capacity. Compared to men, women are becoming more vulnerable because they have more difficulties to access and control resources, command, and access paid labor, have the capacity and strategy for income diversification, have a role in the community and household decision-making (Denton, 2002; UNDP, 2009a). This condition shows that climate change tends to aggravate

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women's already precarious situation (Denton, 2002). Gender inequality, in fact, would be a new problem for women who have become the victims of climate change.

Gender equality has become a global issue in the face of environmental change including those caused by climate change impact. Many studies have been conducted on gender and climate change with results that show women are more sensitive to climate change impacts in certain conditions. Most women in developing countries live in poverty, have no ownership of land and resources, as well as have less control over production and income (Alston, 2014). Women are much more likely to work in informal employment which is directly or indirectly dependent on natural resources, for instance, energy sources, crops and water which climate change definitely affect the security of their livelihoods (Dankelman & Jansen, 2010). As a consequence, women earn less money than men and they also have diminished bargaining power and fewer resources to cope with climate change (Singh, Svensson, & Kalyanpur, 2010). Moreover, Chant (1997) argued that mostly female-headed household are living in poverty and this condition affects their differences of susceptibility from women with the male-headed household. The female-headed household has to endure family living costs while they have a problem of financial and assets limitations, on the other hand, women with male-headed household have less access to and control over resources or assets in the household (Van Aelst & Holvoet, 2016). Regarding access to the decision, the roles of women in decision-making are less than men since women are considered responsible for the household, children, the elderly and the disabled, and this role significantly influence their decision-making abilities (Singh et al., 2010). In addition, different levels of education and access to information between women and men may influence different responses to climate change adaptation (Jin, Wang, & Gao, 2015).

Incorporating gender issues into climate change vulnerability and adaptive capacity assessment are needed to understand the impacts of climate change on different genders because it needs to be taken into account in the formulation of climate change adaptation (Perez et al., 2015). The gender-specific differences in adaptive capacity must be fully acknowledged and considered paying special attention to the design and implementation of climate change adaptation program. Based on those reasons, this study aimed to assess the gender dimensions in the context of climate change vulnerability and how to mainstream gender-sensitive into climate change adaptation program at the local level. Specifically, this study would like to answer the following questions: Is there any difference of adaptive capacity between men and women in the face of climate change impacts, both in the rural and urban area? How do they share roles and responsibilities in response those impacts? How to create gender equality in climate change adaptation at the local level?

This study conducted in Cirebon Region, Indonesia that represents the coastal area in West Java Province. It is understood that Indonesia is an archipelagic country which is vulnerable to climate change impacts and it affects the increase in hydro-meteorological disasters, such as flood and drought. The impacts of climate change are likely to worsen many problems that coastal areas are already facing (Zikra & Lukijanto, 2015).

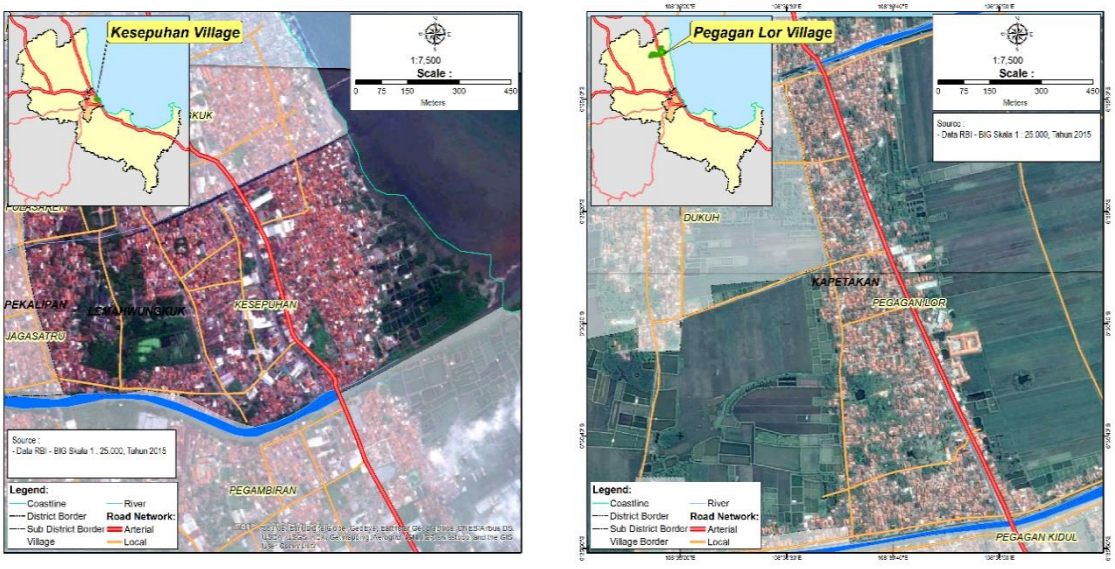

Figure 1. Study Area (left: Kesepuhan Village in Cirebon City; right: Pegagan Lor Village in Cirebon District)
(Source: Authors Analysis, 2016)

Figure 1 shows the study area. The study area covers two administrative regions – Cirebon City and Cirebon District, with a focus on locations along the coastal area. The case of Cirebon City represents a flood-prone area since there are various urban settlements and another urban facility in the coastal area with locus of study is Kesepuhan village. On the contrary, the Cirebon District represents a drought-prone

area because there is a lot of agriculture land and farmers are threatened by climate change impacts with locus of study is Pegagan Lor village.

Kesepuhan is vulnerable to flooding due to its geomorphology. It is located in the downstream area of many rivers in Cirebon with the Kuningan District as the upstream area. The major problem of flooding in this area is due to the overflow of the river especially when heavy rain and high-intensity rainfall come at the same time. There are 252 households live in riverbank settlements and 866 households live in slum areas (BPS Kota Cirebon, 2015). Those areas are exposed to climate change impacts, and further, degrade the quality of the environment of the area.

Pegagan Lor is one of the largest contributors of agricultural commodities in Kapetakan sub-district, Cirebon District. Therefore, the long dry seasons will disrupt the rice planting season and force the farmers to think other options for their income during the seasons.

2. Gender Dimensions of Climate Change

Climate change is a serious challenge for humans, with vulnerable populations being most affected. The 2007 Human Development Report stated that climate change threatens human freedoms (UNDP, 2009a). Women are the most vulnerable group to climate change impacts, especially women who live in developing countries. They tend to have limited access to resources, mobility actions, and access to participate in decision-making process. Referring to the women's vulnerability to climate change, climate change impacts can magnify the gender inequality which refers to roles, responsibilities, and opportunities of women and men (Nelson, 2015).

Gender inequality is the main factor which takes a role to the increased vulnerability of women to climate change impacts. United Nations Development Programme (2010) stated that 'women are vulnerable not because of natural weakness (i.e. because of their sex) but rather due to socially and culturally constructed roles (i.e. because of their gender). Given extreme gender inequality, mostly in the developing world, climate change is likely to magnify existing patterns of gender disadvantage due to several factors, such as limited access to resources, dependence on natural resources, sexual division of labor, lack of education and access to information, limited mobility, and limited roles in decision-making (UNDP, 2010).

Women are usually less able than men in adapting climate change, and they represent the majority of low-income earners and commonly have a lower level of education than men (Lambrou & Piana, 2006). In rural areas, women have difficulty in accessing credit and agricultural extension services because their right to property and land are denied (Lambrou & Piana, 2006). Gender inequality also occurs in urban areas, where women commonly suffer disproportionately.

In several cases, women and men have similar levels of awareness about climate change. Nevertheless, the different gender roles in daily activities because women and men have a different feel and ways of climate change impacted (Nelson, 2015). For instance, women may be more concerned about the health impacts of clean water shortages or about the difficulty of finding affordable household fuel while men more concerned about the lack of employment caused by flooding or drought. Women and/or men may be impacted by higher workloads in agriculture.

In Indonesia, culture, history, and social constructions play an important role in shaping gender inequality (BAPPENAS, 2012). Gender stereotypes and traditional views of women's roles disadvantage women and make women difficult to equally participate in social, economic, and political life. Although most of Indonesia women are active in several aspects of public life, there is still a wide gap between women and men in terms of gross national income per capita, where women have less participation in the labor force than men (Sapiie, 2017). In the other words, the challenges of gender equality in Indonesia are discriminatory attitudes, which tend to prevent women from gaining economic rights, access to credit, wages and workplace benefits, property ownership and land inheritance, and livelihood opportunities (UN DESA, 2009).

Nevertheless, not all women are unable to respond climate change impacts. There are several examples which show that women's participation has been crucial to community survival. In Indonesia, women have shown themselves to be important and creative agents of change in the forestry sector and play important leadership roles. Women can prove to be 'the cushion' of local households and communities through their diversification of livelihood strategies in the informal sector (BAPPENAS, 2012). It shows that there are gender responses to climate change. Those responses are articulated through adaptation actions.

Adaptation is viewed as a secondary and long-term option if mitigation efforts are not adequate (UNDP, 2009b). There are various definitions of adaptation. Intergovernmental Panel on Climate Change (2001) defined adaptation as adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. The terms refer to changes in process, practices, and structures to moderate potential damages to or benefit from opportunities associated with climate change. This study attempted to combine that two definitions of adaptation and more examined the response actions by stakeholders on the adaptation strategies.

The decision-making process is an appropriate way to execute the adaptation strategies for climate change (UNDP, 2009b). There are several issues that have to be considered by the decision makers in facilitating adaptation strategies. Some of these issues emphasize the importance of considering gender equality in terms of adaptation. However, there are different ways to look at gender aspects which are related to policies, strategies, and projects. Both men and women have different bodies of knowledge (including traditional knowledge), skills, and experience which can contribute to their strategies. In addition, due to the difference of natural resources management between women and men, women usually get more

disadvantages from the change in or loss of natural resources associated with climate change (UNDP, 2009b).

3. Method

3.1 Research Method

This research employed mixed methods, combining both quantitative and qualitative analyses, using statistical data processing and explanatory and comprehensive analysis respectively. In the explanatory analysis, qualitative linkages were built between the issues and case study in Cirebon and their influences or impacts. This explanation was built based upon general academic understanding and empirical studies. This analysis showed the gender dimensions associated with the phenomena of climate change in Cirebon (leading to drought and flood), and the residents' role in carrying out adaptive activities. Secondly, a comprehensive analysis connected and compared the influences of adaptive capacity to climate change and the gender dimension. This comparison was based on several theoretical concepts of adaptive capacity and gender mainstreaming.

Analysis of gender dimensions in climate change adaptation used the socio-ecological model. McLeroy, Bibeau, Steckler, & Glanz (1988) argued that ecological models in the social sciences view behavior as being affected by and affecting the social environment. In this study, the socio-ecological model was used to identify the community's challenges and/or efforts to respond to climate change by recognizing the multiple factors that climate changes, directly or indirectly, influence human behavior, for both men and women. Specifically, it is used to analyze gender equality in the face of climate change impacts in the urban area, in this case, represented by Kesepuhan village, and in the rural area, represented by Pegagan Lor village.

Figure 2. Socio-Ecological Model
(Source: Modified from McLeroy et al.,1988)

McLeroy et al., (1988), stated five levels in the socio-ecological model from smallest to large scale, namely individual, interpersonal, organizational, community, and public policy. In this study, each level can be defined as follows:

a. Individual level: the first level of the socio-ecological model represents an individual who vulnerable to climate change. This level aimed to analyze changes in human behavior that affected by climate change. The individual factors to be identified such as knowledge and skills, the level of education and employment status (McLeroy et al., 1988).
b. Interpersonal level: the second level of the socio-ecological model comprises relationships, culture, and society with whom the individual interacts. This stage aimed to analyze the human response to climate change in the interpersonal level. It consists of formal and informal social networks and social support systems, including family, workgroup, and friendship networks (McLeroy et al., 1988).
c. Organizational level: the third level of the socio-ecological model is intended to facilitate individual and behavioral change that influenced by the organizational system and policies that include social institutions with organizational characteristics and formal (and informal) rules and regulations for operations (McLeroy et al., 1988). The availability of social organization could increase human capacity to respond climate change.
d. Community level: activities at this level are intended to facilitate individual behavior change by leveraging resources and participation of community-level institutions. This level aimed to analyze the relationships among organizations, institutions, and informational networks within defined boundaries (McLeroy et al., 1988). The relationship could give interventions for human changes to respond climate change.

e. Policy level: activities at this level are intended to interpret the existing local policies (McLeroy et al., 1988). In this study, local policy refers to regulations or policy-making actions which related to gender equality in urban development planning and climate change adaptation. Policy intervention is quite a strength to reduce climate change vulnerability, both at the city level and village level.

3.2 Variable

In this study, the gender analysis has used a variable of adaptive capacity that related with social-economic aspect and presented the disaggregated data for men and women. There are eight variables which describe the people's knowledge, capacity, and opportunity to cope with or adapt to climate change impacts (see Table 1).

Table 1. Variable of Gender Analysis

No.	Variable	Essential Value	Indicators
1.	Literacy	Literacy is a way to determine people's knowledge and livelihood.	Ability to read and write
2.	Education	The level of people's education represents their level of understanding to the risks of climate change and its impacts and also influences their livelihood as well as income.	Educational attainment
3.	Livelihood	The type of livelihood indicates people's economic condition that can contribute to adapt to climate change impacts. It also can determine vulnerable groups, especially those whose livelihood depends on climatic conditions.	a. Type of livelihood b. Average monthly income
4.	Access to and control over resources	People who can access resources indicate they have some assets to support their life which can increase their income or saving.	a. Type of asset b. Access to financial resources (credit) c. Access to information
5.	Health	The risk of disease outbreaks may increase due to climate changes that affect the dynamics of the vector, infectious agents, and human interaction. People who have a weak immune system have other underlying health conditions are very sensitive to disease outbreaks such as dengue fever, malaria, tuberculosis, and diarrhea. In addition, drinking water supply resources, sanitation, and waste management may also influence health conditions.	d. Type of disease e. Health insurance f. Access to water g. Access to sanitation h. Waste management
6.	Female-headed household	As the family heads, women have a great responsibility to family life as well as being preoccupied with domestic matters. They are also responsible for taking care of children and the elderly.	a. Livelihood of female-headed household b. Average monthly income of female-headed household
7.	Mobility	Climate change is a driver of human mobility that is indicated by migration as an adaptation strategy and planned relocation as an adaptation measure of the last resort (UNHCR, 2015). This study looked at displacement and migration issues based on empirical findings, and local policy for planned relocation.	a. Displacement b. Migration c. Planned relocation
8.	Roles in decision-making	People who always participate in decision-making process have a better awareness of the environment and of social relationships. They also have the potential to be involved in the planning process and program implementation of climate change adaptation.	a. Participation in social organisation b. Participation in community discussion

Source: Authors Analysis, 2016

3.3 Sampling and Data Collection

The simple random sampling was used to determine the number of respondents and it was divided for each case study area based on the percentage number of household in Kesepuhan and Pegagan Lor. Distribution of questionnaires aimed to elaborate the data and information to analyze gender dimensions in climate change vulnerability. There were 374 respondents, both were men and women in productive age (20 – 64 years old) as representative of the household. Table 2 shows the distribution of respondents.

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{5{,}806}{1 + (5{,}806)(0.05)^2} = 374$$

where n = Number of samples
N = Total population
e = Error tolerance

Table 2. Number of Respondents for Questionnaires

District/ City	Case Study Area	Number of Households	Percentage of Total Household	Respondents
Cirebon City	Kesepuhan village	3,679	63%	235
Cirebon District	Pegagan Lor village	2,127	37%	138
Total		5,806	100%	374

Source: Authors Analysis, 2016

4. Results

4.1 Gender Equality in Response to Climate Change Impacts at Local Level

Cuevas, Peterson, Morrison, & Robinson (2016) stated that climate change impacts include various aspects of human existence, such as social, economic, political, ecological, and environmental. Those impacts are unlikely to be gender neutral, as its effects will increase the risk of the most vulnerable and least empowered group in our society (Singh et al., 2010). This section elaborates gender inequality in facing climate-related hazard as well as describes the potential on how to create gender equality in climate change adaptation based on men and women experiences in response to climate change impacts at the local level.

4.1.1 Individual Level

At the individual level, we analyzed human behavior that influenced by or influence climate change. For this context, the focuses are on the identification of literacy, education, and livelihood as basic factors that represent the knowledge of individual and influence the attitudes, behavior, and skills at the further levels. Literacy is a way to determine people's knowledge and livelihood. Meanwhile, education is an aspect that represents the level of people's understanding to the risk of climate change and its impacts. The level of education influences people's livelihood as well as income. On the other hand, at a more complex level, livelihood tends to indicate people's economic condition which can contribute to adapt to climate change impacts. Besides, it also can determine vulnerable groups.

The survey data in the study areas indicates that most of the population in study areas had a good literacy rate (more than 80 percent of the total respondents). Only a few people, mostly elderly, which were regarded as a vulnerable group, could not read and write. Furthermore, the majority of men (around 47 percent of respondents) in Kesepuhan graduated from senior high school and the majority of women (37 percent of female respondents) graduated from elementary school. The majority of the population in Pegagan Lor graduated from elementary school. Compared to Kesepuhan, the educational attainment of the population in Pegagan Lor was lower.

Regarding the livelihood, both study area has quite different livelihoods. The community education background and literacy influence types of work of the people in both areas. About 68 percent of working male and 83 percent of working female respondents work in Kesepuhan works in the informal sector. Meanwhile, the majority of people in Pegagan Lor are farmers, accounting for 48 percent of working male and 42 percent of working female respondents. Pegagan Lor's farmers are divided into two types: the owners and the laborers of agricultural land. The study found that there was different income rate between men and women. The average income for woman was less than a man, IDR 1,000,000, while the average income for man was IDR 2,500,000. Meanwhile, the average monthly living cost for each household is IDR 2,500,000.

The livelihood of farmers in Pegagan Lor is vulnerable to climate change impacts. In 2015, the farmers experienced only one harvesting period in March which was caused by the El Nino's drought. They were forced to search for alternative jobs in the informal sector to increase their income, and women also create alternative products to be sold on the market as income-generating activities.

In Kesepuhan, floods can threaten settlements located along the river and disrupt people's daily activities. Hence, they become more creative in preparing their home to minimize the impact of floods, for example, electronics and other valuable items are placed on the second floor or on the top of wardrobes. They also create small dikes or put sandbags in front of the door, and become aware of not throwing garbage in the river because it can cause floods.

In this study, people in Kesepuhan and Pegagan Lor have a different situation in the face of climate change impacts. Nevertheless, their response to the impacts was influenced by their skills and financial capability. Farmers in Pegagan Lor prefer to work in the informal sector because it does not require any special skills and higher education, whereas people who live along the river could not move to another area due to the higher cost to spend.

Limited knowledge of climate change risks, low level of literacy and limited access to climate information results in the vulnerable smallholder farmers to climate change impacts (Mattee, Mussa, Mwaseba, Mahonge, & Nsenga, 2014). Most of the vulnerable people both in Kesepuhan and Pegagan Lor have low levels of education and they may have a lack of knowledge on these issues. As a consequence, they may have less understanding of how to reduce the impacts of climate change so that they may need a different approach to increase their awareness of climate change impacts. Therefore, reducing climate change impacts through community development program on climate change (i.e. through workshops, community discussions, etc.) is believed could increase people's knowledge about climate change, especially on how to reduce climate change impacts, as well as to encourage people's awareness on environmental and climatic changes.

4.1.2 Interpersonal Level

The interpersonal level consists of formal and informal social networks and social support systems, including family, work for the group, and friendship networks (McLeroy et al., 1988). At this context, we focused on identifying several aspects: access to control and over resources, health condition, female-headed household status, and mobility.

1) Access to control and over resources

People who can access resources indicate they have some assets to support their life which can increase their income or saving. Several researchers concluded that women tend to have less access to and control over resources, such as land, financial services, agricultural resources, extension services and technologies that could help them to cope with existing vulnerabilities. Nevertheless, women in Cirebon area tend to have more access to and control over resources. Women have the power to control the family's assets, such as home, land, livestock, motor vehicles, gold, and savings. However, due to low-income condition, credit and financial services are not widely accessible in Kesepuhan and Pegagan Lor. Besides access to economic resources, access to information is also important in order to know the latest information on a local, national and global level about disaster events, including natural disasters and diseases outbreaks that need to be considered at times of extreme climate events.

Some people in Kesepuhan and Pegagan Lor know about the existence of global climate change, even though they do not fully understand the causes and effects. The sample survey found that men have better knowledge of climate change than women. People learn about climate change through different sources of information on climate change. In Kesepuhan, people know about these issues from television as well as from talking to people, while people in Pegagan Lor tend to understand from natural conditions, especially from the sea and weather observation. Understanding climate change may increase community awareness to be more resilient in responding to its impacts.

2) Health condition

Health condition becomes one of the important aspects of human's life which is exposed by the climate change impacts. People with poor health condition has less human capability to work and therefore can diminish their livelihood activities (Sangotegbe, Obayomi, & Oluwasusi, 2015). Analysis of health condition describes the disease and its treatment, access to clean, drinking water, and sanitation. The disease is an indirect impact of climate change. The risk of disease outbreaks may increase due to climate changes that affect the dynamics of the vector, infectious agents, and human interaction. Drinking water supply resources and sanitation may also influence health conditions.

Based on data from the survey in Kesepuhan and Pegagan Lor, we found that diarrhea is the main disease occurring in those areas and it affects most of the people. There is about 11 percent of men and 12 percent of women respondents in Kesepuhan have been affected. Diarrhoea is a common disease after flooding and droughts, caused by contaminated water from human and animal waste. The survey found that diarrhea generally occurs in densely populated areas. To address this issue, people clean the area and get access to the nearest health facilities. These efforts can be considered as their adaptive capacity to indirect climate change impacts. Adaptive capacity can be defined as a set of resources available to a system in order to reduce the negative impacts of climate change (Diouf & Gaye, 2015). In this context, the adaptive capacity will focus on reducing the threat of diseases caused by climate change impacts.

The study also found that most people in Kesepuhan and Pegagan Lor only have government insurance (i.e. BPJS) as the compulsory insurance provided by the government with only very limited persons have their own finance. Besides, people in both Kesepuhan and Pegagan Lor generally prefer to attend the community health center (*Puskesmas*).

The health condition cannot be separated from the human's lifestyle and their access to water. Cirebon is one of the districts in West Java Province where its clean water comes from several large rivers and distributed through pipelines coordinated by *Perusahaan Daerah Air Minum*/PDAM (the local state-owned water enterprise). In reality, there is a lack of accessibility to the pipelines due to the economic condition of people and the lack of PDAM supplies in the area. The clean water supply for domestic use in Kesepuhan and Pegagan Lor villages is through water pipes (personal property) and wells. There is about 73 percent of people in Kesepuhan get access to clean water through water pipes while 54 percent of people in Pegagan Lor still use wells to access clean water supply for domestic use. If there was a drought event in Pegagan Lor, people would have difficulty in obtaining clean water then they have to buy it from water sellers. In this situation, there is a rotating process between men and women in a family to supply clean water.

Regarding drinking water, the supply of drinking water in Kesepuhan and Pegagan Lor villages is dominated by bottled and piped water. Most of the people in Kesepuhan access drinking water through PDAM piped water (77 percent) and communal piped water (11 percent) while people in Pegagan Lor prefer to use personal piped water (45 percent) and bottled water (33 percent) for drinking water. Based on this condition, it can be seen that people in Kesepuhan and Pegagan Lor despite their limited access to clean water from the government service, they realize the importance of clean water for their health and this awareness can minimize the level of impact of diseases.

Access to sanitation also has an important role in influencing the health condition. According to the survey data, most of the people in Kesepuhan and Pegagan Lor have a different level of access to toilets and septic tanks. The respondent at Kesepuhan has better access (74 percent), compared to the respondents at Pegagan Lor which only about 54 percent while the rests use communal toilets. In addition, there are about 83 percent people in Kesepuhan and 62 percent in Pegagan Lor who use septic tanks.

According to the previous explanation, the health condition of people in Kesepuhan and Pegagan Lor is affected indirectly by the fluctuating weather changes that cause flooding and drought in several areas. The impact of these diseases on human health varies depending on the adaptive capacities of the individuals. Access to clean drinking water and sanitation are essential for climate change adaptation. People's ability to access the clean water and sanitation can indirectly demonstrate their ability to maintain their health. Thus, water resource management, either manage by households or local institution, must adapt with a change of water supply and demand due to the climate change impacts.

3) Female-headed household status

Female-headed households are ones where women are responsible for the family's needs because they do not have a husband or a father, and all members of the family are women or children. As the head of the family, women have a great responsibility for their family as well as being preoccupied with domestic matters. They are also responsible for caring the children, elderly and disabled people. Female-headed households may have a lower adaptive capacity due to the existing underlying burdens and in certain situations a lower household income.

Based on survey data, there is about 18 percent of women in Kesepuhan and 16 percent of women in Pegagan Lor are the household heads. The survey found that most of the females who are household heads in both Kesepuhan and Pegagan Lor work in the informal sector with uncertain income. The average rate of maximum monthly income for the female-headed household is IDR 1,000,000. In general, people who have dependents are less adaptive to climate change impacts. It is because the dependents reduce their capacity to focus on climate change adaptive capacity.

4) Mobility

Climate change is a driver of human mobility that is indicated by migration as an adaptation strategy and planned relocation as an adaptation measure of the last resort (UNHCR, 2015). Climate change impacts usually lead disruption of ecological and environmental services and loss of livelihoods, so it stimulates human mobility (Nagabhatla, Sobhan Kumar Sahu, Wen, & Lee, 2014). There are three main concepts of human mobility related to climate change (UNHCR, 2015): displacement, migration, and planned relocation. The survey data found that both males and females in Kesepuhan and Pegagan Lor prefer to stay in their homes when climate-related disasters occur. It shows that people in both Kesepuhan and Pegagan Lor have their own ways of dealing with floods and drought.

Most of the people in Kesepuhan and Pegagan Lor carry out their main livelihood activities in their hometown, indicating that the threat and impact of disasters caused by climate change are not high enough for them to mobilize as part of their adaptation actions.

Based on these findings, the mobilization process related to climate change impacts in Kesepuhan and Pegagan Lor still focuses on temporary mobility. Neither people nor local governments have set up a mobilization plan, because it is assumed that climate change impacts can be overcome. Nevertheless, in the future, the more concrete action may need to be taken in the event that severity of climate change impacts in Kesepuhan and Pegagan Lor worsens.

4.1.3 Organizational Level

Organization at the local level has important roles to assist vulnerable people in the face of climate change impact. It can provide the information related environment as well as climate change issues and increase community awareness to preserve the environment through socialization or regular community meetings, and warn everyone if any disaster occurs that they can prepare to deal with the impacts. Furthermore, each organization has adaptive behaviors based on routines, such as regulations, procedures, and strategies which potentially become a basic capacity to respond to climatic extremes (e.g. floods and droughts) (Leszczynska, 2012).

There are several social organizations in Kesepuhan and Pegagan Lor, such as *Pembinaan Kesejahteraan Keluarga/*PKK (the Family Welfare Movement), *Karang Taruna* (the Youth Organization), *Dharma Wanita* (the Women's Association of Civil Servants), *Forum Kesadaran Diri* (the Self-Awareness Forum), *Kelompok Wanita Tani* (the Women's Agricultural Group), and also *Majelis Ta'lim* (Religious Group). Community participation in each organization determines their roles in decision-making. According to the survey data, 49 percent of men and 32 percent of women in Kesepuhan actively participate in community discussions, and 42 percent of men and 25 percent of women in Pegagan Lor. It indicates that the roles of men in decision-making are still higher than women.

In Kesepuhan, the certain social organizations often conduct socialization to explain and discuss flood disaster and early warning system. This activity is very helpful to increase community's knowledge and develop their awareness. Someone warns from the mosques whenever near overflows, hence people who live along the river evacuate with their family to the shelters. Moreover, the Self-Awareness Forum in this village also contributes to raising awareness through regular discussion with specific issues and potential to change behavior to become more concerned about the environment, health, and disaster preparedness.

In Pegagan Lor, as the agriculture sector is the main livelihood so that the Farmers Group and Women's Agricultural Group are the crucial organizations. They often discuss agricultural development, including the problems when drought occurs and how to increase their income through other economic activities such as selling various snacks with the basic ingredients of fish and vegetables.

Based on those experiences, it is possible to create a working group of climate change in each village with men and women who are active in social organizations as the members. Technical assistance is needed to increase their knowledge regarding gender and climate change, and how to create gender equality in facing climate change impacts. Some of them can become agents of change for climate change adaptation and they can assist everyone to get involved in the process of climate change adaptation.

4.1.4 Community Level

Social capital ties have been recognized as an important component in addressing the adverse effects of climate change (Adger, 2001). Addressing climate change impact requires multi-stakeholder roles among others through adaptation to climate change due to differences adaptive capacity, whether individuals, groups, and local governments. Therefore, the quality of relationships among organizations in the areas plays important roles to adapt to climate change impact.

In Kesepuhan, there are several garbage banks formed by inter-organizational cooperation. It could influence behavioral change of community on waste management and also to introduce that waste is one of the emitter as well as cause of flooding. At the city level, since 2014 the local government of Cirebon City has joined the Asian Cities Climate Change Resilience Network (ACCCRN) Program to address climate change impacts. Through this program, Cirebon city has a multi-stakeholder working group on climate change that represents local government, non-government organization, university, the private sector, and experts. This working group will assist the community in the vulnerable area to adapt to the impacts of climate change. In addition, the Self-Awareness Forum, Youth Organization, and other organizations in Kesepuhan have the potential to cooperate with the working group in order to strengthen the adaptive capacity of the community to deal with climate change impacts.

There are initiatives from various organizations to supply drinking water when drought events occur in Pegagan Lor. These initiatives give lessons learned to the society in order to help each other to respond drought as the impact of climate change. It becomes a good chance to build a network of social and the organizations. Meanwhile, some organizations also have worked with the village institution which very concerned to farmer's circumstance as a vulnerable group. They jointly organized socialization on farming to increase farmers' knowledge and skills about environmental issues that may affect agricultural land so they know how to anticipate problems.

The involvement of society in cooperation between organizations or in their programs is an initial step to create networks, then it can be followed by a planning process for climate change adaptation. The strong cooperation between society and organizations can encourage community resilience to face climate change impacts.

4.1.5 Policy Level

Policymakers should ensure that gender equality is mainstreamed into climate change adaptation by allowing women and men to build their capacities, reduce their vulnerability, and diversify their sources of income (Denton, 2002). Policy analysis for mainstreaming gender in climate change adaptation can be a contribution to the policy-making process. Policy development and advocacy are able to be used to promote gender equality in climate change adaptation, and also mitigation.

The local government of Cirebon City already has a City Resilience Strategy to deal with climate change supported by ACCCRN Program. There are two pilot projects for an action plan of climate adaptation, namely rainwater harvesting and greywater management which could increase community awareness regarding the importance of saving water. Moreover, the flood problems also become a focus addressed by local policy and program. This hazard encourages the local government of Cirebon City to spread information about self-awareness to keep the environment clean in order to prevent floods. Although floods threaten human settlements, yet there are not any policies recommend to relocate them. The local planning documents only include disaster evacuation routes to temporary shelters (i.e. open public spaces).

Meanwhile, the local government of Cirebon District has programs in the agriculture sector, such as farmer's welfare improvement, enhancement of agriculture production and marketing. It is believed that the program will increase farmers' knowledge and skills. However, those programs cannot solve farmers' problems, especially when drought occurs. Furthermore, the local policy for food security in this region has not been effective during droughts and it requires food supplies from other regions.

Specifically, the local governments of Cirebon City and District still need assistance to mainstreaming gender in climate change adaptation. Combination of gender analysis and vulnerability assessment may help them in understanding the importance of gender equality in climate change adaptation. This assessment should be conducted by related experts so that the results could influence policymakers to consider gender equality in climate change adaptation.

4.2 Integration of Gender Dimensions in Climate Change Adaptation Program

Policy, program, and project planning cycles provide an opportunity for mainstreaming gender into climate change adaptation using general planning process. It can be done by local government or other stakeholders who have awareness and willing to assist the community in the vulnerable village. The collaboration of multi-stakeholders is very important in the formulation of climate change adaptation to reduce climate risks based on the crucial problem affected by climate change. Therefore, this activity should be carried out with the participatory approach in order to know the kind of adaptation needed by the community.

There are potential organizations which require assistance to cope with climate change impacts at the community level, namely Self-awareness Forum in Kesepuhan, and Farmers Group in Pegagan Lor. These groups can also be a pioneer and become a working group in the formulation process of climate change adaptation program. The members of the working group should be equal between men and women, and they can be representative of Village Officer, community leaders, and society who live in those villages.

In general, there are four systematic stages in the planning cycles: (1) identification; (2) designing/ planning; (3) implementation; and (4) monitoring and evaluation. Mainstreaming gender in climate change adaptation program can be implemented through gender vulnerability and adaptive capacity consideration in each stage of project management or planning cycles (World Health Organization, 2012). Table 3 elaborates the details of gender mainstreaming in the stages of climate change adaptation program.

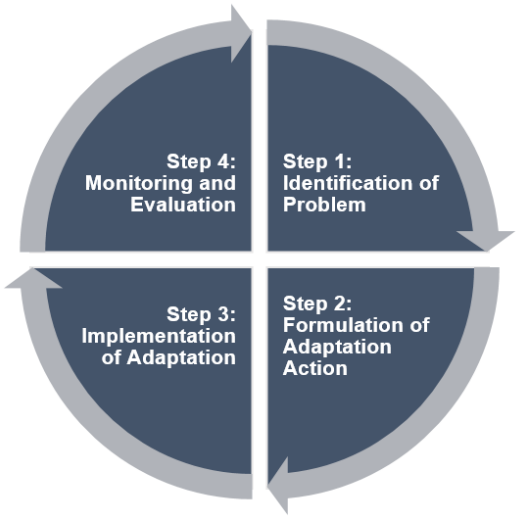

Figure 3. Stages of Climate Change Adaptation Program in Planning Cycles
(Source: Authors Analysis, 2016; Modified from WHO, 2012)

Table 3: Gender Mainstreaming in the Stages of Climate Change Adaptation Program at the Local Level

Stage		Gender Mainstreaming in Climate Change Adaptation Program	
1.	Identification of Problems	1.a	Conduct gender analysis in climate change vulnerability and determine the critical issues or problem which affected by climate change.
		1.b	Identify the historical disaster event that influenced by climate change in the period of 10 to 30 years ago until now.
		1.c	Produce the season calendar which divided into two types that are in the normal climate and extreme climate based on information from the community.
		1.d	Conduct a discussion with a working group of climate change and other society, both men, and women, at the village level to obtain the critical issues.
		1.e	Identify the number of vulnerable groups based on their age, education, livelihood, health, access to and control over resources, and others with included both men and women, and explore those problems.
		1.f	Use the sex-disaggregated data to provide inequality gender information.
		1.g	Identify the program at the village level which related to gender and/or climate change adaptation to know community experiences and what the outcome or impact of that program.
		1.h	Identify community best experiences to response climate change impact, it can be done by them or supported by other stakeholders, this is to understand their capacity in the face of climate change impact.
2.	Formulation of Adaptation Action	2.a	Conduct a discussion with a working group of climate change and other society, both men, and women, at the village level in the formulation process of adaptation action.
		2.b	Formulate the goal and objective of the adaptation program with gender consideration, and involve the men and women in determining and defining the goal and objective.
		2.c	Determine the adaptation option based on the critical issues and ensure it should in accordance with men and women needs and they receive the same advantages.
		2.d	Ensure that the team has an established mechanism for reporting and sharing information on gender equality.
		2.e	Ensure ongoing development of the program's gender mainstreaming strategy.
		2.f	Ensure that budget allocation is available to address gender inequality in climate change adaptation.
		2.g	Identify the gender-sensitive indicators that will be used to monitoring and evaluation of the adaptation implementation.
3.	Implementation of Adaptation	3.a	Conduct the capacity building and raising awareness activities (e.g. training) regarding climate change adaptation to a working group of climate change and other society at the village level.

Stage		Gender Mainstreaming in Climate Change Adaptation Program
	3.b	Consider constraints women or men may face in accessing selected sites of program delivery. Choose sites that are accessible to all – even if this means multiple program delivery sites.
	3.c	Consider times where both women and men are available to access the sites of program delivery.
	3.d	Implement the selected adaption action with included women and men participation.
	3.e	Ensure that the allocated budget is used to reduce gender inequality in climate change adaptation.
	3.f	Ensure that implementing partners are committed to gender equality.
4. Monitoring and Evaluation	4.a	Use the gender-sensitive indicators to measure the gender equality in climate change adaptation.
	4.b	Ensure that sex-disaggregated data are collected and reported when conducting integrated environment, climate change, and gender equality.
	4.c	Identify the impacts of adaptation action to men and women whether it's effective to reduce their vulnerability or it needs other intervention.
	4.d	Assess the challenges and lessons learned of adaptation implementation in order to realize gender equality in climate change adaptation.

Source: Authors Analysis, 2016; modified from WHO, 2012

5. Conclusion

There is no strictly difference between men and women's adaptive capacity in facing and responding the climate change impacts in the study area. The obvious difference occurs between people who live in rural and urban area. In general, men and women in urban area, Kesepuhan, have better individual capacity than people in rural area, Pegagan Lor. The differences are indicated by the different level of literacy and education. People in Kesepuhan have a higher literacy and education level than people in Pegagan Lor. A similar situation also found in the case of livelihoods, access, and control over resources, female-headed households, and roles in decision-making.

From the findings, gender inequality has shifted. Women in Kesepuhan and Pegagan Lor have begun to take a crucial role in facing the impacts of climate change, such as flood and drought. The roles that require physical strength is still be dominated by men, because the stigma of male position as a leader still survive, including in the study areas which are part of developing countries. The gender inequality shift begins to occur because of the pressures of economic conditions that indirectly encourage women to take an equivalent role to men, such as in controlling over resources.

Kesepuhan and Pegagan Lor have the potential to achieve gender equality. Besides the gender inequality shifting process, there is also a community network at the organizational and community level. In the networks, men and women can discuss about the impacts of climate change, e.g. flood and drought, and their responds to face it. This potential can be further developed by mainstreaming climate change adaptation strategies on the networks. Moreover, the strategies on the networks can be integrated or scaled up into the policy formulation process at the local level. However, this effort should be implemented periodically and continuously together between communities, local governments, and facilitators.

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References

Adger, W. N. (2001). *Social capital and climate change*. Norwich. Retrieved from https://www.researchgate.net/publication/228386024_Social_capital_and_climate_change

Alston, M. (2014). Gender mainstreaming and climate change. *Women's Studies International Forum*, *47*(PB), 287–294. doi:10.1016/j.wsif.2013.01.016.

Badan Perencanaan dan Pembangunan Nasional (BAPPENAS). (2012). *Policy Paper on Gender Mainstreaming in Climate Change Adaptation*. Jakarta. Retrieved from https://www.bappenas.go.id/files/1813/5763/0712/policy-papergmccalaunching-cetak20130320120610375 60.pdf.

Badan Pusat Statistik Kota Cirebon (BPS Kota Cirebon). (2015). *Lemahwungkuk Dalam Angka 2015*. Cirebon: Badan Pusat Statistik Kota Cirebon. Retrieved from https://cirebonkota.bps.go.id/index.php/publikasi/88.

Chant, S. (1997). Women-headed households: Poorest of the poor? perspectives from Costa Rica and the Philippines. *IDS Bullettin*, *28*(3), 26–48. doi:10.1111/j.1759-5436.1997.mp28003003.x.

Cuevas, S. C., Peterson, A., Morrison, T., & Robinson, C. (2016). Methodology for examining the challenges in mainstreaming climate change adaptation. *International Journal of Climate Change Strategies and Management*, *8*(3), 418–439. doi:10.1108/IJCCSM-07-2015-0091.

Dankelman, I. E. M., & Jansen, W. H. M. (2010). Gender, environment, and climate change: Understanding

the linkages. In I. E. M. Dankelman (Ed.), *Gender and Climate Change: An Introduction* (pp. 21–54). London: Earthscan.

Denton, F. (2002). Climate change vulnerability, impacts, and adaptation: Why does gender matter? *Gender & Development*, *10*(2), 10–20. doi:10.1080/13552070215903.

Diouf, A., & Gaye, A. T. (2015). A methodological framework for building an index for vulnerability assessment in rainfed agriculture. In W. L. Filho (Ed.), *Handbook of Climate Change Adaptation* (pp. 3–15). Berlin: Springer. doi:10.1007/978-3-642-38670-1_42.

Fan, S., Pandya-Lorch, R., & Yosef, S. (2014). *Resilience for Food and Nutrition Security*. Washington DC. doi:10.2499/9780896296787.

He, J. K. (2015). China's INDC and non-fossil energy development. *Advances in Climate Change Research*, *6*(3–4), 210–215. doi:10.1016/j.accre.2015.11.007.

Hoff, H. (2011). Understanding the nexus. Background paper for the Bonn2011 Nexus Conference: In *Background Paper for the Bonn 2011 Conference: The Water, Energy and Food Security Nexus, Stockholm Environment Institute (SEI), Stockholm, Sweden.* (pp. 1–52). Stockholm: Stockholm Environment Institute (SEI). Retrieved from http://wef-conference.gwsp.org/fileadmin/documents_news/understanding_the_nexus.pdf.

Intergovernmental Panel on Climate Change (IPCC). (2001a). *. Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom, and New York, NY, USA. Retrieved from http://www.ipcc.ch/.

Intergovernmental Panel on Climate Change (IPCC). (2001b). *Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Integovernmental Panel on Climate Change*. (R. T. Watson & the Core Writing Team, Eds.). Cambridge, United Kingdom, and New York, NY, USA: Cambridge University Press. Retrieved from ess.uci.edu/researchgrp/prather/files/2001IPCC_SyR-Watson.pdf.

Jin, J., Wang, X., & Gao, Y. (2015). Gender differences in farmers responses to climate change adaptation in Yongqiao District, China. *Science of the Total Environment*, *538*, 942–948. doi:10.1016/j.scitotenv.2015.07.027.

Lambrou, Y., & Piana, G. (2006). *Gender: The Missing Component of the Response to Climate Change*. *Food and Agriculture Organization of the United Nations*. Rome. Retrieved from http://www.fao.org/docrep/010/i0170e/i0170e00.htm.

Leszczynska, A. (2012). Adaptation to climate change as a process of organizational learning. In *Knowledge and Learning: Global Empowerment; Proceedings of the Management, Knowledge and Learning International Conference 2012* (pp. 499–508). doi:10.1007/978-3-319-09360-4_9.

Mattee, A. Z., Mussa, K. R., Mwaseba, D. L., Mahonge, C. P., & Nsenga, J. V. (2014). Factors in smallholder farmers vurnerability to climate change impacts in the Uluguru Mountains, Morogoro, Tanzania. In R. et al Lal (Ed.), *Sustainable Intensification to Advance Food Security and Enhance Climate Resilience in Africa*. London: Springer. doi:10.1007/978-3-319-09360-4_9.

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351–377. doi:10.1177/109019818801500401.

Nagabhatla, N., Sobhan Kumar Sahu, A. G., Wen, L., & Lee, W. (2014). Understanding impacts of climate variation in varied socio-ecological domains: A prerequisite for climate change adaptation and management. In L. W. Filho (Ed.), *Handbook of Climate Change Adaptation*. Berlin: Springer. doi:10.1007/978-3-642-40455-9_64-1.

Nelson, G. (2015). *Gender Responsive National Communications Toolkit*. New York: United Nations Development Programme. Retrieved from www.un-gsp.org/.../undp_gender_responsive_national_communications_toolkit.pdf.

Perez, C., Jones, E. M., Kristjanson, P., Cramer, L., Thornton, P. K., Förch, W., & Barahona, C. (2015). How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change*, *34*, 95–107. doi:10.1016/j.gloenvcha.2015.06.003.

Sangotegbe, N., Obayomi, J., & Oluwasusi, J. (2015). Adaptation to climate change effects among rural women in Savannah and Forest Zones of Oyo State, Nigeria. In L. W. Filho (Ed.), *Handbook of Climate Change Adaptation*. Berlin: Springer. doi:10.1007/978-3-642-38670-1_32.

Sapiie, M. A. (2017). Indonesia still struggles to close gender equality gap: UNDP. *The Jakarta Post*. Retrieved from http://www.thejakartapost.com/news/2017/03/22/indonesia-still-struggles-to-close-gender-equality-gap-undp.html.

Singh, A., Svensson, J., & Kalyanpur, A. (2010). The state of sex-disaggregated data for assessing the impact of climate change. *Procedia Environmental Sciences*, *1*(1), 395–404. doi:10.1016/j.proenv.2010.09.027.

Tambo, J. A. (2016). Adaptation and resilience to climate change and variability in north-east Ghana. *International Journal of Disaster Risk Reduction*, *17*, 85–94. doi:10.1016/j.ijdrr.2016.04.005.

United Nation Department of Economic and Social Affairs (UN DESA). (2009). *2009 World Survey on the Role of Women in Development: Women's Control over Economic Resources and Access to Financial Resources, including Microfinance*. *October*. New York: United Nation. Retrieved from http://www.un.org/womenwatch/daw/public/WorldSurvey2009.pdf.

United Nations Development Programme (UNDP). (2009a). *Gender and Climate Change : Impact and Adaptation*. *UNDP Asia-Pacific Gender Community of Practice Annual Learning Workshop*. Negombo, Sri Lanka. Retrieved from http://www.asia-pacific.undp.org/content/rbap/en/home/library/gender-

equality/gender-n-climate-change.html.

United Nations Development Programme (UNDP). (2009b). *Resource Guide on Gender and Climate Change*. (L. W. Garmer, Ed.), *United Nations Development Programme*. Mexico: United Nations Development Programme. Retrieved from http://www.undp.org/content/undp/en/home/librarypage/womens-empowerment/resource-guide-on-gender-and-climate-change.html.

United Nations Development Programme (UNDP). (2010). *Gender, Climate Change and Community-Based Adaptation: A Guidebook for Designing and Implementing Gender-Sensitive Community-Based Adaptation Programmes and Projects*. (L. W. Garmer, Ed.). New York: United Nations Development Programme. Retrieved from http://www.undp.org/content/undp/en/home/librarypage/environment-energy/climate_change/gender/gender-climate-change-and-community-based-adaptation-guidebook-.html.

United Nations High Commissioner for Refugees (UNHCR). (2015). *UNHCR Age, Gender and Diversity*. *Accountability Report 2015UNHCR. (2015). UNHCR Age, Gender and Diversity. Accountability Report 2015. Geneva. Retrieved from www.unhcr.org/5769092c7.pdf*. Geneva. Retrieved from www.unhcr.org/5769092c7.pdf.

Van Aelst, K., & Holvoet, N. (2016). Intersections of gender and marital status in accessing climate change adaptation: Evidence from Rural Tanzania. *World Development*, *79*(March 2016), 40–50. doi:10.1016/j.worlddev.2015.11.003.

World Health Organization (WHO). (2012). *Mainstreaming gender in health adaptation to climate change programmes: User's guide*. Geneva. Retrieved from http://www.who.int/globalchange/publications/Mainstreaming_Gender_Climate.pdf?ua=1.

Zikra, M., & Lukijanto. (2015). Climate change impacts on Indonesian Coastal Areas. *Procedia Earth and Planetary Science*, *14*, 57–63. doi:10.1016/j.proeps.2015.07.085.