Determinants of women's participation in environmental protection and management in selected towns of north Wollo, Amhara Regional State, Ethiopia

Sisay Demeke Molla*

Abstract

Environmental challenges are inter-weaved which trigger multi-phase dilemmas. Tackling this intricacy requires integrating gender into environment management efforts because coordinated approach is needed in order to solve such problems. But there are determinants that affect this integration. This study intends to assess determinants of women's participation in environmental protection and management. A mixed approach with concurrent design was employed. The quantitative data were collected from 118 respondents and qualitative data were from purposefully selected participants. Statistical and thematic data analysis techniques were employed to analyze the quantitative and qualitative data, respectively. The study found out that women are indispensable in environmental administration. Accordingly, women's age groups (28-37 & 38-47) were positive factors; whereas, violence, technology, social services, production, consumption, resources and institutions were negative factors. It is possible to conclude that despite women are essential in environmental protection and management, they are obstructed by various factors. This has an impact on the environment. Therefore, governmental and non-governmental organizations should work cooperatively to enhance women's participation via training, awareness-rising, and by making social service available.

Key words: *determinants, environmental protection and management, women's participation*

**Lecturer, Department of Political Science and International Relations, Woldia University, E-mail: demekesisay9@gmail.com; Phone: +251928858849*

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Background

As Morelli (201) and Ghafoor (2013) argue, the concept of environment protection has evolved since it started to become a global issue in the early 1970s. At first, it was a kind of global recognition that the earth's ecosystems are in fact fragile, and that human beings have been contributing much to its deterioration. The social and economic welfare of human beings are closely allied to the environment. Any change in the socio-economic fields will have an impact on the environment and vice versa, whether positively or negatively, immediately or eventually. And in many cases, negative results are irreversible.

Goosen (2012) and Ghafoor (2013) noted that with instantaneous increases in global population, industrialization, technological advancement, and enhanced demands on natural resources, the earth is no longer able to sustain a healthy and balanced ecosystem. Accordingly, coordinated approaches are necessary for solving major environmental and sustainability problems. Therefore, among other things, gender should be integrated into the environment because gender norms influence the impact of people on the environment, and vice versa. Likewise, Goosen (2012) & Koohi, et al. (2014) outlined that a gender analysis of environmental administration is necessary; i.e., looking at gender aspects of the use of natural resources, consumption of services and experiences of environmental degradation.

Women and men should be agents in environmental management including equal participation in decision making and policy processes. Globally, women provide a livelihood for their families and simultaneously manage the environment via keeping waste emissions, preservation of biodiversity and forest management.

However, due to gender power relations, their knowledge is often disregarded, and they are not counted as agents of change (Ogra, 2012; UNEP, 2016; Morufu, et al., 2019). Besides, because of patriarchal patterns, absence of environmental education and decision-making power, women's roles in environmental sustainability initiatives are unnoticed and un-integrated. Thus, meeting resources to needs of current and future generations would be perplexed. Accordingly, it is worthwhile to study determinants of women's participation in environmental sustainability efforts in empirical settings. Hence, this study intends to assess determinants of women's participation in environment protection and management in the study population. The study further documents the types of roles women play in environmental sustainability efforts, and challenges and opportunities regarding their participation.

.Problem statement

According to UN (2016), environmental challenges are interlinked with several socio-economic issues. Better human well-being; i.e., poverty reduction, improved human health, energy access and economic growth are associated to ecological factors. Solutions for one problem can lead to unintended negative consequences. For example, increasing in food production depletes soil, water, biodiversity, and increase deforestation and desertification, eventually ascertain self-limiting. World Bank (2012) sketched that because of population growth, industrialization, energy technologies and urbanization; global dimension of environmental problems like climate change, biodiversity loss, energy crisis, pollution, and desertification would be happening haphazardly. Thus, to address these interacted environmental challenges, possible remedies (i.e. better uses of human resource) should be made. Analogously, Principle 23 of the Rio Declaration (1992) declared that the environment and natural resources of people under oppression, domination and occupation shall be protected. Thus, gender should be integrated into environmental sustainability efforts. Accordingly, women should be part of the solution since they are eco-friendly and indispensable in soil preservation, resource management, pollution fortification and environmental administration (World Bank, 2012; Manjunath, 2015).

There are different impending factors that restrict women from engaging in environmental conservation activities. These include gender-based violence, stereotypes, social service inaccessibility, gender roles, and lack of resources. These factors have been restricting women from taking part in environmental protection activities and have damaging effect on the environment (Ogra, 2012; SSNC, 2015; Marius & Maxim, 2017; SEI, 2018; WHO, 2019).

As far as the researcher's knowledge is concerned, limited researches have been conducted wide-reaching on factors obstructing women from participating in environmental protection. For instance, Tiondi (2000) carried out a study on women's involvement in environmental management and development in Sub-Saharan Africa and Latin America. Bingeman (2001) assessed women's participation in forest management decisions in the Upper Kullu Valley. Sharma and Kaushik (2011) and Kumar (2016) conducted a research on the role of women in environmental conservation in India. Ogunjinmi et al. (2012) looked at scaling up women's roles in sustainability and conservation through wildlife farming. WB (2012) undertook a study on linking gender, environment, and poverty for sustainable development focusing on Ethiopia and Ghana. Wasike (2012) carried out a study on challenges facing women in accessing and controlling natural resources in Kenya. Similarly, Solomon, et al. (2014) reviewed women's participation in environmental protection and management focusing on lessons from Plateau State, Nigeria. Koohi, et al. (2014), Singh (2015), Manjunath (2015), Prebble (2015), UNEP (2016), Eminel (2018) and Morufu, et al. (2019) undertook studies addressing various aspects of women and environmental management.

However, most of the gender perspective environment analytical and operational works so far weren't conceptually inclusive. These studies focus on specific issues such as challenges facing women in accessing and controlling natural resources, and women's involvement in environmental protection and management. The aforementioned works neither emphasized determinants, challenges and opportunities of women's participation in environmental protection and management nor considered gender-based environmental needs and implications of the study. Furthermore, these studies have not comprehensively addressed women's full involvement in environmental protection and management. The present study fills these conceptual gaps addresses the study objectives via answering designed research questions. Accordingly, the study adopted concurrent research design with a mixed approach. To this end, both descriptive and inferential statistics were employed to address the quantitative objectives whereas thematic analysis for qualitative issues.

Objective of the study

General objective

The overall objective of this study was assess the factors affecting the participation of women in environment protection and management in the study population.

Specific objectives

- To identify the types of roles women play to environment protection and management, in general, and in the study area;
- To explore challenges and opportunities of women's roles to protect the environment; &
- To examine factors that determine women's role in achieving sustainable environment goals.

Review of related literature

Concepts on integrating women into environmental sustainability strategies

According to Rao (2012) and UNEP (2016), environmental sustainability involves making decisions and taking action that are in the interests of protecting the natural world with particular emphasis on preserving the capability of the environment to support human life. These days, environmental sustainability is a topical issue that receives plenty of attention from the media, different governmental departments, academicians, researchers and stakeholders. This is a result of the amount of research going into assessing the impacts that human activity can have on the environment. Although the long-term implications of this serious issue are not yet fully understood, it is generally agreed that the risk is high enough to merit an immediate response. To this effect, issues of environment and ecology entered the mainstream discourse only after the conference on environment and development at Stockholm in 1972. Thus, it is believed that protest movements against environmental destruction should be made via joint efforts of both men and women.

Eco-feminists argue that women as women have a special relationship with nature. Women's interaction with nature and their responses to environmental degradation must be analyzed and located within the material reality of gender (Rao, 2012). Women are victims of environmental degradation, but active agents in the regeneration and protection of the environment. Chukwu (2014) and Singh (2015) also noted that women around the world play distinct roles in protecting the environment. They participate in environmental protection significantly through agricultural activities, drainage management, waste disposal, flood

management and water resource management. Moser (1991), cited in Rao (2012), identified three roles for women; i.e., as managers or maintainers of the natural environment; rehabilitators of the natural environment in the sense of sustainable development, and as innovators in the use of appropriate technology in the creation of new environments. Thus, women should be integrated into the environment profoundly.

Gender and international environmental negotiations

As stated in WB (1991) and UN (1992), the first mention of women in the environmental treaties was in 1968 during the African Convention on the Conservation of Nature and Natural Resources held at Algiers. Despite the treaty was made to show the incorporation of women issues in the planning, design and implementation of environmental agenda; however, it was limited with regard to validating gender relations with the environment. As a result, in the 1980s, the relationship between women and the environment received considerable attention since the impact of the international environmental crisis on women was became an important subject of study. The parallel workshop of NGO's along with the first World Conference on Women in Nairobi (1985) was symbolic of the interlinked concerns of women, development, and environment. Both recognized and stressed women's concerns and their incorporation as an integral part of the policy planning.

Besides, Women's Action Agenda 21 as part of the 1992 UN Conference on Environment and Development reflected a cross sectoral approach including women's issues. The focus was on the strong links between women and environment. But it was the International Drinking Water Supply and Sanitation Decade and the UN Conference on Environment and Development that was hailed as promoting the role of women in natural resource management in a major way (UN, 2016). In connection with this, in order to realize women's participation in conservation and management of resources, governments should give equal access to education, make healthcare systems responsive, open employment and careers, and bring women into full participation in social, cultural, and public life.

According to UN (2016), in 1998, the World Conservation Union framed a gender policy statement that recognized the need to consciously enlist women's concerns for sustainable use, management, and conservation of natural resources. Gender equality and equity were felt to be fundamental to human rights and social justice issues and a foundation paving the way for sustainable development. Understanding the linkages between gender relationships and the environment became a major theme for advocacy and shifting paradigm. It concluded that only with a gender perspective in place can a complete picture of human relationships and ecosystems be built up. For that reason, many countries in the world including Ethiopia are built policy documents, legislative instruments, and international initiatives to develop a gender-sensitive environmental strategy in order to implement the agreements.

Theoretical contexts

Bingeman (2001) noted that gender relation perspective regards current social roles as established and maintained through power and authority, and therefore intrinsically contested and dynamic. A gender perspective is pertinent because issues of access, use, and resource management are linked to prescribed gender roles. As reviewed by Bingeman (2001), as part of a gender analysis, a feminist environmentalist perspective, or a gender and development framework, Jackson (1993); Agarwal (1992); Locke (1999) rejected the concept of women and men as unitary categories (undifferentiated by class, age, ethnicity, region, and wider political economy/ecology factors). This idea is also valid to the present discussion of women's roles in forest management. Furthermore, women are not a homogeneous group; assuming homogeneity can mask women's exploitation by other women on the basis of marital status, seniority, caste, and social-economic standing, while also underestimating the challenges inherent in the creation of a common identity as women. As Wasike (2012), eco-feminists believe that there is a relationship between women, human rights, and the exploitation of nature. They argue that male domination is harmful to both women and the environment. Men desire to control women and the environment in order to have complete power. An attempt to control women and the environment leads to the destruction of the environment.

The literature on gender and environment is largely grouped into two main strands; i.e., a liberal attempt to incorporate gender aspect into developmental policy and practice; and relational perspectives that lay emphasis on binary power relations between women and men. In both literatures, the main assumption is that men and women experience the environment differently. Since men and women have different roles, responsibilities, and knowledge with regards to the environment, they have different interests in natural resource management (Eminel, 2018). In terms of environmental and resource management issues, attention to policy implications and institutions for different groups of women may be very important. Bingeman (2001) emphasized that the material realities of men's and women's environmental dependence have to be recognized and issues of gender that influence participation in environmental management need to be identified.

Determinants of women's participation in environmental conservation

According to Bannerjee (1991), women workers with a science and technology background are key resources in today's knowledge-based economies. In view of that, there is a rising demand for science and technology workers, and job growth in this era is being driven by increases in female employment. Greater female participation in computer science, engineering and technology-oriented jobs would spur innovation that helps to safeguard the environment in all countries. But technology gender gap is visible; i.e., lesser involvement of young girls in science and technology can be observed as early as the secondary school level. Thus, women remain vastly underrepresented in science and technology studies and in the overall technical work forces. Consequently, they might not update themselves with regards to environmental management. Hence, technology is a variable that adversely affect women's contribution in environmental administration.

Besides, educating men and women is vital to economic growth and sustainable development. Raising the literacy rates of women is one of the most effective investments for increasing female productivity. Reducing gender inequality gaps in education is essential to reducing poverty, accelerating economic development and environmental sustainability. But most women are not in a position to get access to education and information. So, this is one of the factors that affect women's direct participation in ecological administration (Bannerjee, 1991; Catalyst, 2007).

The government should provide healthcare financing, health system reforms, education, and policies and programmes via considering gender dimensions. Prevention and treatment should be planned on the basis of gender. Despite health problems affects both men's and women's environmental effectiveness in all cases, women are more prone than men to self-declared ill-health that reduced their work capacity (WEN, 2007; WHO, 2019). This source further described that these physical and mental health

problems may be due to lack of job security as well as discriminatory workplaces in all countries.

Catalyst (2007) identified another variable that affect women's participation in environmental management. Accordingly, although women make-up half of the world's population and despite their achievement of equal citizenship status to men, they remain vastly under-represented in governance forums. In most countries, there is a clear absence of women involved in decision-making processes at local, regional and national levels. This source further sketched that the governance gender gap can be found in countries regardless of their economic status, religion or institutions. Factors contributing to the lack of female participation in decision-making processes include their low wage work participation and time poverty in relation to men as well as stereotypical attitudes towards the societal roles of women and men. This also encourages women's low self-team and undesirably affects their indoor and outdoor partaking.

Furthermore, a study in the United Kingdom shows that women's decisions regarding consumption of food, clothes, shelter, medicines, household goods, and education are decided by men's preference and this determines the well-being of families and has related ecological impacts. Women are more productive, but they are less likely to consume the outcomes. To mean that production and consumption are elements that determined women's environmental support (WEN, 2007).

Eco-feminist literature portrays the historical exploitation and domination of women and nature as going hand in hand, and both are seen as victims of development. Within the patriarchal conceptual framework, all those attributes associated with masculinity are given higher status or prestige than those associated with femininity, resulting in hierarchical dualisms (Warren, 1987). All eco-feminists are of the view that it is the logic of domination, in association with value-hierarchical thinking and value-dualisms that sustains and justifies the twin domination of women and nature (Warren, 1991). For eco-feminists, therefore, the domination of women and nature is basically rooted in human thought. Hence, this twin oppression of women and nature determined women's production and environmental participation and it exacerbated ecological complications.

Absence of women's organizations also identified as determinants of women's advancement and participation in environmental management. Accordingly, autonomous women's groups should emerge because women's movement is very much fundamental to protect them from oppression. The campaign for women's rights challenged the dichotomy between public and private sphere, and the social, cultural, economic and political manifestations of gender (Bingeman, 2001; Labaris, 2009; Singh, 2015).

Lastly, lack of waste disposal equipment, social service inaccessibility, lack of access of clean water, human waste pollution, fumes from household fuel, and lack of awareness among the general public regarding to environment are identified as challenges faced by women that hindered their involvement in environmental administration (Bingeman, 2001; Labaris, 2009; Solomon et al., 2014; Singh, 2015).

Conceptual framework of the study

A conceptual framework was developed for the proposed study based on reviewed literatures as presented below.

Materials and methods

Research design

Using an appropriate research approach is a key step to achieve the objectives of the study so that a mixed research approach was employed. It is

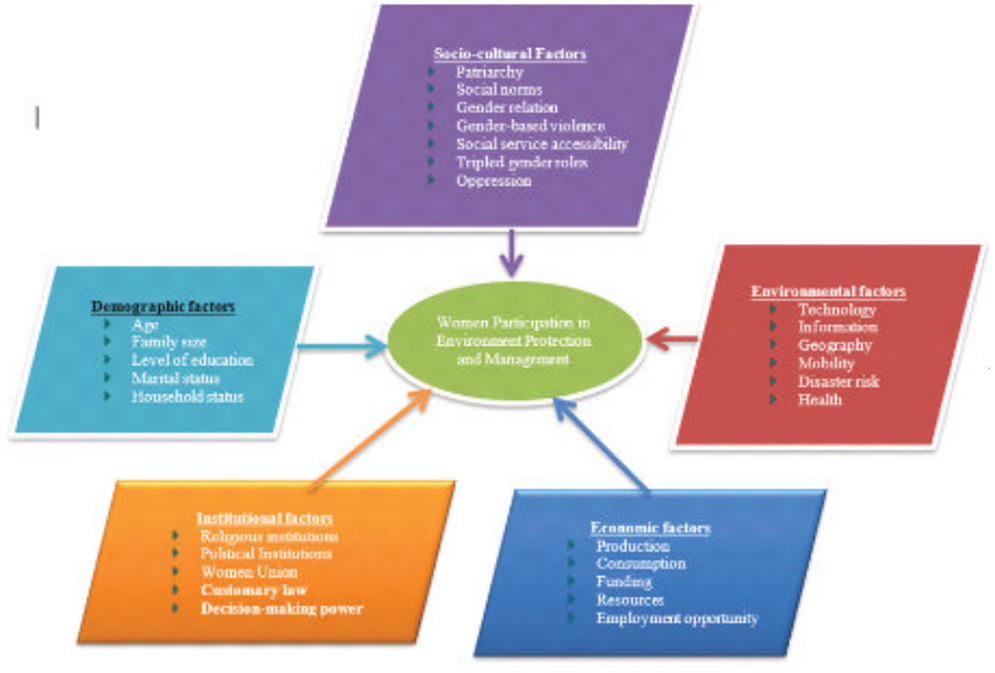

Figure 1 The relationship between dependent and independent variables

because the objectives of the research would demand to generate both quantitative and qualitative data. Moreover, Greene et al. (1989) and Creswell (2012) outlined that the rationale to employ mixed approach is that it helps to use multiple data collection methods, provides a better view of reality, remove weaknesses and address research problem accurately. Concurrent research design was employed for the reason that it allows the researcher to gather information from both quantitative and qualitative sources. To make it clear, Creswell (2012) delineated that the reason to employ concurrent research design is that it helps to give equal priority for both quantitative and qualitative data and it also enables the researcher to compare the results to determine if the two data bases yield similar or dissimilar results.

Firstly, a random sampling technique was applied to select the study towns and *kebeles*. Secondly, a stratified random sampling technique was used to select male and female-headed households from each *kebele*

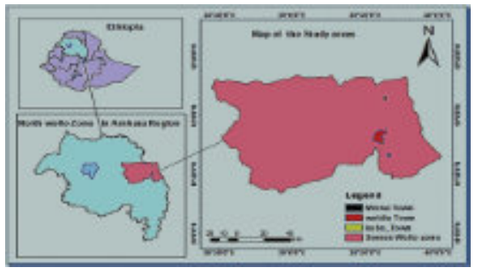

Figure 2: Map of the study areas; source: WGS-1984UTM-Zone 37N

considering women headed in male-headed households. Thirdly, a proportional stratified random sampling technique was used in accordance with the size of the kebele. Here,

each kebele's list of male and female-headed households was used as a sampling frame. Fourthly, a systematic random sampling technique was applied to select sampled women i.e. random selection and appropriate intervals were employed. Here, the target samples were accessed via their house number. On the other hand, a purposive sampling technique was employed to select the participants to obtain qualitative data.

Sample size determination

Cochran (1963), cited in Israel (1992), outlined that a formula to determine sample number is needed for a questionnaire-based survey studies when the population is large, and the needed sample is to analyze proportion. Likewise, to determine the representative sample size, the study employed sample size determination formula given by Cochran (1963), cited in Israel (1992). The formula is: $n_{=,}$ where, n= the required numbers of sample, z = the desired confidence level, e= maximum allowable error, p= the estimated proportion on past experience (pilot survey) and q= 1-p. Hence, n_0= = 118. As no related study is taken in the empirical setting, it is recommended to give 50% chance (0.5) as the maximum sample proportion and the range of acceptable errors that can be tolerated comprise 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, and 10% (Cochran, 1963, cited in Israel, 1992). Accordingly, the study employed 50% (0.5) maximum sample proportion, and 9% (0.09) margin of error. Therefore, the required sample sizes of this study were 118 women. To get sample women in each kebele, formula was run i.e. nj= where nj= the required number of sample in each kebele, Nj= total number of households in each kebele, N = the size of the total population, and n = sample size.

Data sources and data collection instruments

The study employed both primary and secondary data sources. Primary sources were survey respondents, key informants and FGDs whereas secondary sources were relevant books, documents, journal articles, and related works. Accordingly, survey questionnaire, interview and document review were data collection instruments. On the one hand, to gather the quantitative data, structured questionnaires i.e. both closed and open-ended questions were prepared. Hence, the questionnaires were distributed by enumerators for 118 sample women. On the other hand, to collect the qualitative evidences, focus group discussions were formed from 9 *kebeles,* each group containing 8 individuals. The discussion was held through selecting suitable places by the preference of discussants. There are rationales why FGD was employed. FGD provides an insight how people think and offer a deeper understanding of the phenomena. Besides, it has a high face validity and low cost. As well, an interview was conducted with 27 key informants. The key informants were 9 *kebele* administrators; 3 heads of Women and Children Affairs Office from 3 *woredas;* 3 city administrators; 3 women's league leaders from 3 *woredas*; and 9 women's league members from 9 *kebeles*. The reason why this data gathering tool was employed is that it can provide in-depth facts directly from concerned and knowledgeable individuals.

Data analysis techniques

The study employed quantitative and qualitative data analysis techniques. Finally, the combination of data analysis methods was carried. Particularly, descriptive and inferential statistics were used to analyze the quantitative data. Upon the data collection task completed, the data were encoded edited and entered into the SPSS software version 20 and analyzed using both descriptive and inferential statistics. Hence, tables, frequencies, and percentages were used to run descriptive statistics whereas Pearson Chi-square test and binary logistic

Table 1*: Summary of sampled women by kebeles*

Sample City Administrations	Sample kebeles	Number of households in each kebele			Number of sample women taken from each kebele		
	Kebeles	MHH	FHH	Total	MHH	FHH	Total
Kobo	01	273	177	450	2	1	3
	02	437	482	919	3	3	6
	04	1707	1385	3092	10	7	17
Woldia	02	875	761	1636	5	5	10
	04	1207	1317	2524	8	9	17
	06	416	332	748	3	3	6
Mersa	01	1125	1375	2500	7	8	15
	03	1885	2062	3947	11	13	24
	04	1550	1575	3125	10	10	20
Total		9475	9466	18941	59	59	118

Source: field survey 2019.

regression were used for inferential statistics. Besides, qualitative analyses were performed by identifying major and sub-themes in each context. Then, triangulation took place between quantitative and qualitative data.

Model goodness-of-fit

To examine the adequacy of the model, Hozmer and Lemeshow model goodness-of-fit test (Pearson Chi-square test), and Omnibus tests of model coefficients were employed. As the regression analysis showed, Hozmer and Lemeshow test had a Chi-square value of 11.308 with 8 degrees of freedom and p=0.185; and theOmnibus tests of model coefficients had a Chi-square value of 38.880 with 27 degrees of freedom and significant at p<0.05 (Table8). It denotes that the selected predictor variables have a combined effect in predicting the outcome variables.

Issues of validity and reliability

To assure the reliability of the study, a reliability test was carried out. Pretesting and piloting were used. Cronbach alpha was employed to measure the internal consistency of the instrument. Accordingly, the reliability test statistics showed that the prepared questions were reliable at a Cronbach alpha value of 0.856. As well, the findings were triangulated with the literature review and previous studies for the purpose of analytical generalization.

Ethical consideration

This study was conducted with adherence to research ethics including the statement of confidentiality, refraining from deceptive practices, reciprocity, and maintenance of anonymity of participants.

Results and discussion

This section presents the findings of the study. The findings are summarized and grouped into four major themes i.e. the types of roles women play to environment protection and management; challenges and opportunities of women's roles to protect the environment; and factors that determine women's role in achieving sustainable environment goals.

Women's roles in environment protection and management

Initially, a single table was formed to show women's participation in soil conservation. Accordingly, almost all responses are located on all soil conservation activities. This implies that women are participating in initiatives to protect the soil.

T*able 2*

Sample City Administrations	Sample kebeles	Number of households in each kebele			Number of sample women taken from each kebele		
	Kebeles	MHH	FHH	Total	MHH	FHH	Total
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Source: field survey 2019.

ikewise, Key informants (KIS) stated that women have decisive roles in soil preservation activities such as mulching, tracing, planting and flood managing. FGDs also conveyed the qualitative facts concerning to participation of women in soil preservation activities as:

> *We are involving in soil preservation tasks. We are energetically participating in tracing, tree planting and flood administration activities. Our environment is our life. From the environment we get food to eat, water to drink, air to breathe and all the basic necessities required to our day to day living. Hence, these basic necessities are directly or indirectly influenced by the quality of soil. Soil provides support to the plants; absorbing rain water; holding moistures; and controlling water flowing. Not only these but also others such as soil maintains fertility for plants and vegetation to flourish. Thus, preserving the soil is not optional rather it is mandatory. We are happy to tell you our feelings at this time. You can imagine how we are busy. You can also see that how much we are vital to our community lives.*

Thus, the study revealed that women are actively involved to preserve the soil from degradation. This finding was confirmed with a study result found by Labaris (2009) & Chukwu (2014).

Hence, the majority of women (80%) are involved in farming and contributed in preserving the soil.

Another single table was constructed for respondents' responses to their roles in cultivation and plant protection. Thus, almost all responses are located on all cultivation activities, and plant protection tasks. This indicates that

women have a significant contribution in cultivating and protecting plants to preserve the environment.

Table 3

Options	Responses		Percent of Cases
	N	Percent	
Crop cultivation	98	14.0%	83.1%
Vegetable cultivation	97	13.9%	82.2%
Fruit cultivation	111	15.9%	94.1%
Gardening	118	16.9%	100.0%
Watering	118	16.9%	100.0%
Plant protection	105	15.0%	89.0%
Others	16	2.3%	13.6%
Total	700	100.0%	593.2%

Source: survey data, 2019. NB: the total is not 100% because of multiple responses.

Similarly, the participants mirrored the qualitative information that women are busy in doing of cultivation tasks including crop, vegetable and fruit cultivation. They further described as women are highly participated in protecting of plants to manage the environment. Hence, this finding was consistent with a study result founded by Singh (2015). Accordingly, women are actively involved in managing the environment through cultivating fruits and vegetables and protecting plants in their living areas. In cultivation of crops, fruits, vegetables, flowers, honey, mushroom, hops and medicinal plants, women have been playing a pioneer role in environmental administration. Besides, a single table was created for respondents' responses to the variables shown in Table 4. Thus, almost all responses exhibited that women have essential roles in managing water resources.

Also, KIs reported the qualitative data analogous to the quantitative facts. Accordingly, women are playing a part in managing, protecting and providing water for the household. Parallel with KIs, participants of one of the FGDs reported:

> *It is obvious for everybody that we women are carrying out all activities regarding to water management*

Table 4

Options	Responses		Percent of Cases
	N	Percent	
Managing communal water resources	118	19.0%	100.0%
Managing household water requirement	118	19.0%	100.0%
Prevent children from damaging water pipes	118	19.0%	100.0%
Keep rivers from untreated sewage	117	18.8%	99.2%
Irrigation management	33	5.3%	28.0%
Controlling water pollution	118	19.0%	100.0%
Total	622	100.0%	527.1%

Source: survey data, 2019. NB: the total is not 100% because of multiple responses.

> *inside and outside of the home. Amazingly, cleaning, refining and sheltering the water both at public and household levels are our daily tasks. Additionally, we are actively contributing in supervising of communal taps; protecting water pipes at household level; replacing old water pipes by the new one; and protecting rivers from damage. Not only these but also others such as the burden of proper consumption of water resources during fetching, cooking, drinking and washing are left for women. Further, we are participating in conserving of natural resources. You know that division of labor is based on sex and age. Therefore, we women perform the majority of these responsibilities in our community.*

Hence, the study revealed that women are significantly participated in water resource management. This finding was similar with the survey out puts found by Labaris (2009); Chukwu (2014); Kumar (2016); Eminel (2018). Accordingly, women are always at the center of the management of water resources both at communal and household levels. They are in-charge of the control and management of communal taps; and preventing children from damaging the water pipes. The burden of fetching water for cooking and other home use falls on the women and girls. They make use of streams, pond, wells, rivers water when the tap water is not available. In addition, they take care of these water bodies to avoid water pollution which will be detrimental to aquatic lives.

Another single table was produced to women's participation in managing the forest. Hence, the majority of responses are located on tree planting, rehabilitation, providing seedlings, and reducing hazards. It denotes that women play key roles in forest management activities to preserve the environment.

Table 5

Options	Responses N	Responses Percent	Percent of Cases
Soil protection	93	9.4%	78.8%
Water sheds	28	2.8%	23.7%
Climatic stability	102	10.3%	86.4%
Tree planting	118	11.9%	100.0%
Rehabilitation	118	11.9%	100.0%
Protection	90	9.1%	76.3%
Providing seedlings	95	9.6%	80.5%
Reducing hazard	118	11.9%	100.0%
Biodiversity preservation	91	9.2%	77.1%
Wildlife protection	59	6.0%	50.0%
Sowing	42	4.2%	35.6%
Transplanting	37	3.7%	31.4%
Total	991	100.0%	839.8%

Source: survey data, 2019. NB: the total is not 100% because of multiple responses.

FGD participants and KIs also shared similar ideas in line to the numerical data as women in the empirical settings have numerous roles in forest management such as tree planting, rehabilitating, transplanting and protecting it from damages. Hence, the finding publicized that women play pivotal roles in forest management. This finding was related with previous research findings of Labaris (2009) & Bingeman (2001); i.e., women have been actively involved in monitoring, protecting, and managing of village forest areas. There are women who participated in forest management through plantation, rehabilitation, and protection. Thus, water and air pollution, ozone depletion, and desertification could be controlled or minimized. Besides, Singh (2015) noted that conservation of natural resources in rural areas cannot be done without the involvement and training of women.

Extra single table was made to women's participation in air pollution protection. So, 100% of responses are located on alternative fuel wood, improved cook stoves, prevention of burning of litters, and indoor and outdoor air pollution. This shows that women are engaging in air pollution protection activities to manage the environment.

Table 6

Options	Responses N	Responses Percent	Percent of Cases
Use alternative fuel wood	118	25.0%	100.0%
Use improved cook stove	118	25.0%	100.0%
Prevention of burning of litters	118	25.0%	100.0%
Preventing indoor and outdoor air pollution	118	25.0%	100.0%
Total	472	100.0%	400.0%

Source: survey data, 2019. NB: the total is not 100% because of multiple responses.

Participants one of FGDs also reported that women play immunes roles to protect air pollution. Besides, a participant from KIs noted:

> *I am carrying out numerous reproductive, productive and community tasks. Thus, I have roles in air pollution protection. You know how much fresh air is crucial for human beings, but it is polluted by both natural and synthetic factors. Therefore, we shall protect it from pollution otherwise we will influence by air born related diseases. As you see now I am using improved cook stove. This helps to reduce both indoor and outdoor air pollution. I believe that this will reduce fuel consumption not only pollution. Besides, this adoption decision is also cost-effective. For your surprising, it is better than using traditional stoves in producing better tasting food, less smoke emissions, less cooking time and less fuel collection time. As you can see the villages around, improved cook stoves are few and not generally adopted properly. This will damage the environment. Hence, we need help from the government.*

This result was comparable with the research findings of Labaris (2009) & Chukwu (2014). Accordingly, women have knowledge in protecting the environment, natural resources and air pollution significantly through waste disposal management. Moreover, Moser (1991), cited in Labaris (2009), noted that women are more concerned about environmental protection and ecological preservation via managing, rehabilitating, and innovating appropriate technology in the creation of new environments.

Moreover, a single table was generated based on women's participation in environmental hygiene. Therefore, almost all responses are located on all activities listed out in Table 7. It suggests that women are highly responsible to make the environment safe.

Analogously, findings from KIs supports this result, showing women have indispensable roles to make the environment clean and safe through washing, sweeping, avoiding wastes, burning of litters and protecting waste emission. Thus, the finding revealed that women powerfully play a part to make the environment hygienic. This result compares with a research finding by Labaris (2009) & Chukwu (2014).

Challenges, opportunities and determinants of women's role in environmental protection and management

Binary logistic regression outputs

Variables in the equation

Selected predictor variables, challenges and opportunities of women's participation in environmental protection and management are discussed below simultaneously. The study

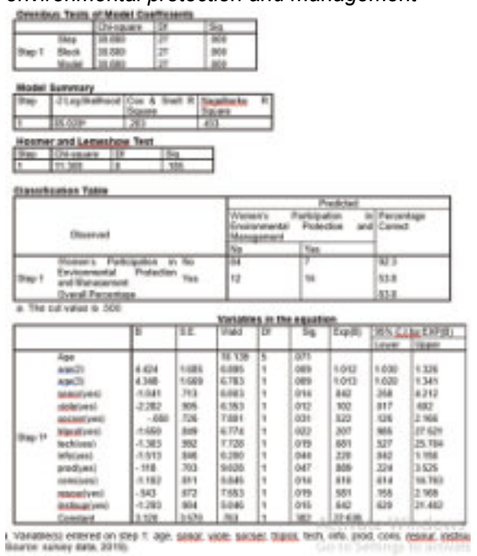
Table 7

Options	Responses N	Responses Percent	Percent of Cases
Waste disposal	107	12.8%	90.7%
Keeping waste emission	118	14.2%	100.0%
Weeding	118	14.2%	100.0%
Sweeping	118	14.2%	100.0%
Cleaning drainages	93	11.2%	78.8%
Washing	89	10.7%	75.4%
Packing refuse	94	11.3%	79.7%
Filling ditches	68	8.2%	57.6%
Others	28	3.4%	23.7%
Total	833	100.0%	705.9%

Source: survey data, 2019. NB: the total is not 100% because of multiple responses.

employed a binary logistic regression model to identify determinants variables. Thus, from 28 explanatory selected variables, 12 variables were identified as determinants of the dependent variable. Accordingly, being other variables constant, the multiple regression analysis showed that a unit increase of age (28-37, 38-

T*able 8: determinants of women's participation in environmental protection and management*



47), women's participation in environmental protection and management is more likely to

increases by the odds ratio of 6.895 & 6.783 as compared to women under other age categories. A significant relationship was also observed at $p<0.05$ in both cases (Table8). As well, the qualitative data exhibited that as age increases; women's participation in environmental management also increases. This result was somewhat likened with a finding outlined by Chukwu (2014). Accordingly, majority of the women (38%) are in their middle ages (30-39 years) so that they can participate actively in environmental protection activities. But the current finding was in agreement with a study result found out by (Basnayake and Gunaratne, 2002); i.e., age could be determinant of various human development stages accompanied by the ability to perform certain activities. The age of a person is usually a factor that can explain the level of production and efficiency.

Besides, being other variables constant, for every one-unit increases of the influence of social norms, gender-based violence, social service inaccessibility, tripled gender roles, dearth of information-technology, least possible production-consumption, lack of resources and institutions; women's participation in environmental protection and management is more likely to decreases by the odds ratio of 6.003, 6.353, 7.801, 6.774, 7.728, 6.200, 9.028, 5.845, 7.653, and 5.046 as compared to these women who responded as no. Statistical relationships were perceived at $p<0.05$ in all cases (Table8). The KIs also conveyed the qualitative details similar with the numerical facts. They identified the challenges that deterred women's participation in environmental management. Accordingly, patriarchal thinking, gender relations, low decision-making power and lack of awareness among the general public were challenges women faced, but food and material aid were opportunities that sometime provided for women as opportunities to participate in environmental protection and management activities.

A participant from KIs noted:

> *Women have direct contact with natural resources such as fuel, forest, water and land. Thus, they have knowledge to manage the environment. They are participating in environmental protection and management activities including planting and protecting, flood controlling, keeping waste emission, waste disposal, cleaning, and soil and water managing. Thus, conservation of natural resources and promotion of environment cannot be done without women's participation. However, their participation in environmental protection and management is being faced by various challenges including social norms, poor infrastructure development, lack of access to, and control over resources, household food insecurity, limited livelihood options, lack of decision making power, gender-based violence, and lack of training and awareness rising regarding to environmental administration. Occasionally women gain a few opportunities from the government and NGOs such as food and material aid.*

Similarly, a participant from of a women's FGD reported:

> *Surely, we are playing vital roles to safeguard our environment. We strive day and night to make our environment fresh, clean, and comfortable. We are planting trees; washing the living house and compound; avoiding and burning disposals; protecting both public and household water sources. Even we are using improved cook stoves to make the air fresh and save the forest from cutting for firewood. Despite doing these; however, things are not as such contented for work. We are producing but not consuming; traditional customs and beliefs are influencing us; higher prestige is giving for males than females; every decision is passing by males rather than females. Our challenges are not only these but also others. For example, lack of waste disposal equipment, healthcare facilities (i.e. vaccination, glove, health related training and awareness-raising) and access of clean water. Besides, people's poor drainage system, human waste pollution, and fumes from household fuel are challenges for us.*

The finding compares with similar studies in the (See Bannerjee, 1991; WEN, 2007; Catalyst, 2007; Labaris, 2009; Ogra, 2012; Solomon et al., 2014; SSNC & Singh, 2015; Marius & Maxim, 2017; SEI, 2018; WHO, 2019). These studies highlighted that productive, reproductive and community managing roles as well as access to, and control of technology, information, resources, and production consumption are adversely affected women's participation in environmental management.

The results above align with the eco-feminist concept of Carolyn Merchant (1983) which argues men have always seen both nature and women as a resource which can be exploited for their personal use, and he doesn't see any value for both. Both nature and women are created for their benefit and they seem to assume themselves as the master of both. This is the reason why they want to control both and displays no revere for both. In patriarchal societies, a woman is compared to nature and a man is compared to culture. Women and nature were always an inspiration for men or rather we could say that the women and nature were mere instruments for the masculine ego. This masculine ego and the patriarchal mindset of the society led to the degradation of both human life and ecology. Besides, Reshma (2017) underlined that ecofeminism grew out of radical or cultural feminism which holds that identifying the dynamics behind the dominance of male over female is the key to comprehending every expression of patriarchal culture with its hierarchical, militaristic, mechanistic and industrialist forms. Hence, this could hamper women's participation in environmental administration.

The current findings were also analogous with the eco-feminist concept of Hosseinnezhad (2017) provided that men are dominant over women and nature and it is a men's claim that women and nature are inferior to men. This could discourage women's ecological management attitude. This author further emphasized that the schema of patriarchy which is governed by hierarchy and by conflicting dualism such as male/female, mind/body, reason/emotion, universal/particular, and culture/nature, where the first term is associated with men and is elevated, the second is associated with women and is devalued. These patriarchal ideals of women and nature, science and development and rationale and awareness have brought us to this downtrodden situation where we can see the fate and plight of women and the irreparable damage caused to nature and the natural resources, which has led to its exhaustion.

Conclusion

In a nutshell, this study shows that men and women experience the environment differently. Both men and women have different roles, responsibilities, and knowledge on the environment, denoting that alike men, women make a significant contribution in environmental protection and management. They are indispensable in soil preservation, resource management, pollution fortification and environmental hygiene. However, they are hindered by several factors (social service inaccessibility, dearth of information-technology, least possible production-consumption, social norms, gender-based violence, gender power relations, low decision making power, and lack of access to, and control over resources), but enjoyed limited opportunities such as food and material aid. This condition deters their participation in environmental protection and management, and it come to be difficult to promote gender-based environmental outcomes. It has also negative effects on the global environment. Hence, this issue becomes a field of inquiry wide-reaching.

Recommendation

To tackle the identified problems, the government, and the local NGOs (Women Support Association and Save the Children) work cooperatively have to provide extensive training for both men and women

together with reference to social norms, social capital, and gender-based violence to create smooth gender relations, to ensure women's access to, and control over resources, and to assert women's decision-making power and property rights. This might help them to increase their participation in environmental protection and management. Moreover, the government and the local NGOs should jointly focus on both men's and women's awareness rising regarding to technological advancement and technology gender gaps via sharing empirical evidence. Besides, considering women, the government makes social service delivery available i.e. healthcare facilities, education and infrastructure development. Additionally, the government should provide fund for women's organization and has to attempt to improve women's participation in environmental protection and management.

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