

RESEARCH AND CASE STUDY

PARTICIPATORY ENVIRONMENTAL COMMUNICATION FOR SUSTAINABLE NATURAL RESOURCE MANAGEMENT IN ETHIOPIA

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Abstract

Lake Tana is the largest lake in Ethiopia which has multifaceted socio-economic function in the country's development. However, the lake is infested by water hyacinth since 2011 and efforts have been exerted to control the weed. This study is meant to explore the perceptions and practice of ANRS Environment Forest Wildlife Protection and Development Authority development (EFWPDA) communication experts on Participatory environmental communication in eradicating water hyacinth from Lake Tana. The qualitative case study was conducted on the basis of the participatory development communication model which has been assumed to bring about sustainable natural resource management. The data were collected using in-depth interviews, Focus Group Discussion (FGD) and document analysis. The collected data were organised and analysed in the form of content and thematic analysis. The finding revealed that participatory communication in EFWPDA is equated to a public relation activity of organising campaigns and the local people are urged to participate by providing labour contribution of harvesting and collecting the weed from the lake. The communication approach was found to be a one way top-down approach which does not facilitate a horizontal dialogue among stakeholders.

Keywords: *Participatory Communication; Lake Tana ; Natural Resource*

Background of the Study

Lake Tana is the largest lake which is situated on the basaltic Plateau of the north-western highlands of the Ethiopia covering an area of about 3,150 km² with an elevation of 1830 m and an average depth of 8 m. The lake has provided multifaceted functions to the nation's development and beyond. Melese (2018) asserts Lake Tana, which is the source of the trans-boundary Blue Nile River, is a multi-purpose lake in which millions of people are dependent on it. Its overwhelming importance entails fishing, electric power generation, transportation, communal grazing land, drinking for humans and other animals. The lake is also prominent in its rich bio-diversity. Yismashawal and Azage (2017) also state due to Lake Tana's massive water resource potential for hydropower and irrigation development, the Ethiopian government is launching various development projects to stimulate growth and reduce poverty.

However, according to FAO (2013) in September 2011, it was officially recognised that one of the top ten ecologically dangerous and worst invasive weed, water hyacinth (*Eichhornia crassipes*), infested

Lake Tana. Dereje (2015) states water hyacinth are a free-floating perennial aquatic plant native to tropical and subtropical South America; with bright green, waxy leaves and attractive, violet flowers that have yellow stripes on the banner petals. Central to the impacts of water hyacinth, it has been exhibited to cause a devastating effect in many ways. According to Mbula (2016) the major problems include: hindrance to water transport, disrupting hydro-electric operations, blockage of canals and rivers, causing flooding and human health problem, increased evapotranspiration, interference with fishing, irrigation, navigation, livestock watering and reduction of biodiversity, water flow, recreational use of aquatic systems, and posing mechanical damage to hydroelectric systems. It has also an adverse effect on health. Regarding on this, Honlah (2019) witnesses there are increased incidents of skin rash, cough, malaria, encephalitis, bilharzias, gastro intestinal disorders, and schistosomiasis. Moreover, this pervasive weed was also found in the upper Blue Nile Basin which in turn in effect the Great Ethiopian Renaissance Dam. In this regard, Yihun and Wondwosen (2017) anticipated recently this deadly weed was found to occupy the upper Blue Nile River, the only out-flowing river from Lake Tana.

Given this reality, eradicating this deadly weed from Lake Tana, by all means should be one of the biggest priorities of the Amhara Region and the nation at large. In doing so, some efforts have been exerted by stake holders to combat water hyacinth colonisation of the lake. The undertakings are enshrined by the region's Environment Forest Wildlife Protection and Development (EFWPDA) as this is one of its duties involving in environmental protection activities. This organisation has been working with the local community, Bahir Dar University, Gondar University, Debre Tabor University and other institutions in eradicating water hyacinth from Lake Tana.

Rationale

The cause of environmental problems and possibilities for addressing them depend on human perceptions, attitudes and behaviour, which are interrelated to values, preferences and beliefs about the world. In such a situation communication can play a great role in pinpointing a certain environmental issue. ECRC (2000) outlines how environmental communication encompasses individuals, institutions, societies, and cultures craft, distribute, receive, understand, and use messages about the environment and human interactions with the environment. Cox (2012) states this ranges from the interpersonal to virtual communities, participatory decision making, and environmental media coverage. This dissemination is mainly achieved by employing participatory environmental communication. Tufte and Mefalopulous (2009) also justify it is a vehicle to educate and alert people about environmental problems and influence their mindset and behaviour towards more sustainable lifestyles through a dialogical approach. Harris (2018) on his part illustrates participatory environmental communication as a process-oriented approach, which engages local people in dialogue about environmental issues so that they are able to identify the problems and are collectively empowered to make decisions to improve their situation.

Regardless of the strong efforts made by the local communities to control the weed manually, this weed still remains difficult to eradicate (even to control) from Lake Tana. In this regard, according to the EFWPDA and GCRLT (2017) report, the recent weed coverage estimation was about 5043ha, distributed in 21 kebeles (local neighbourhoods) and covering more than 130 km lakeshore length. Hence, it is the argument of the researcher in that the responsible organisation, EFWPDA should devise a participatory communication strategy that embrace all stakeholders from identifying the problems to evaluating activities in eradicating water hyacinth sustainably from Lake Tana. Therefore, based on the assumption that participatory communication is indispensable for the success of sustainable natural resource management, this study explores the experiences of participatory development communication efforts in EFWPDA, Amhara Region, Ethiopia.

In so doing the following research questions are posed:

- a. How do EFWPDA communication experts envisage participatory communication?
- b. How is participatory communication practiced by EFWPDA in eradicating water hyacinth?

- c. What are the factors that facilitating or hindering the practice of participatory environmental communication in EFWPDA's activity ?

Theoretical Framework

Participatory Development Communication

Since the study is keen to explore how participatory communication for water hyacinth eradication from Lake Tana is perceived and practiced by environment communication experts in EWFPA, it is inevitable and appropriate to use participatory communication theory as a theoretical framework. The notion of participatory communication is emanated from two approaches. According to Servaes & Malikhao (2008) it is the amalgam of Freire's dialogical pedagogy and the UNESCO's ideas of access, participation, and self-management. These are the underpinning elements of participatory communication. A development project calling itself participatory, accepts these core principles of democratic communication process in development endeavour. Ramirez and Quarry(2004) on their side state Participatory communication is about seeking change at different levels including listening, building trust, sharing knowledge and skills, building policies, debating, and learning for sustained and meaningful change. Thus, according to Yihun and Wondwosen (2017) as the weed regenerates year after year, it is mandatory to consider a participatory communication approach than seasonal campaigns for sustainable protection of Lake Tana from water hyacinth that is why the study is designed from the basis of participatory communication.

Environment Communication

The academic field Environmental Communication has emerged from multi disciplines: communication, environment studies, environmental science, risk analysis and related studies. Flor (2004) defines environmental communication as the application of communication approaches, principles, strategies and techniques to environmental management and protection Jurin et al. (2010, P.15) also states environmental communication is "the systematic generation and exchange of humans' messages in, from, for, and about the world around us and our interactions with it". Cox (2010) further demonstrates that environmental communication focuses on the way people communicate about the natural world and environmental affairs. Pearson et al. (2011) on their part, point out that environmental communication is a process by which information about the environment and environmental problems is exchanged between individuals through a system of common symbols, signs, and behaviour. Due to this reason, environment communication is enshrined to the other theoretical framework to explore the perceptions and practices of communication experts in their endeavour of eradicating water hyacinth from Lake Tana.

Research Methodology

Method

This study employed qualitative research method to understand how environmental protection experts perceive and experience participation and participatory communication in their daily routines of eradicating water hyacinth. Denzin and Lincoln (2000: 3) assert "Qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them". Employing the qualitative approach is believed to enable the researcher to have an in-depth understanding of the phenomena in question i.e. perceptions and practices of participatory communication for environment protection activities in eradicating water hyacinth.

The Research Design

Hence, a case study of exploring how participatory communication is perceived and practised in Amhara National Regional State environment protection activities while eradicating water hyacinth from Lake Tana from one governmental organisation, Environment Wildlife Forest Protection Development Authority perspective. This government organisation is mandated to orchestrate the overall environment protection and natural resource management activities in the region by harnessing different stakeholders and large number of the entire public. Yin (2003) states a case study design is akin to empirical inquiry that investigates a contemporary phenomenon within its real life situation, especially when the demarcation between phenomenon and context are not clearly evident.

EFWPDA as a Case Study

ANRS Environment Forest Wildlife Protection and Development Authority (EFWPDA) is the target organisation for this case study with some reasons in mind. Basically, the Authority is established to ensure the region's overall environment protection and preservation for sustainable development. As it is stated in the proclamation of the establishment of the Authority, the mission of the organisation is "to follow up, examine and protect activities that can cause the region's environment problems; ensuring sustainable and legal environment, forest and wildlife protection and development without exploiting the future generation's resource on the basis of scientific knowledge" (ANRS Zikre Hig Proclamation232/2015).

Sampling Techniques and Samples

A purposive sampling was employed as the sampling technique of the study. Accordingly, the sample units were selected on the basis of their proximity as their particular features that assist in-depth investigation and understanding of the central issues of the research. In line with this, the study samples were environment protection professionals working in Amhara National Regional State EFWPDA, especially who are engaged in water hyacinth eradication activities. In this vein, four development workers who are working in Tana Biosphere directorate and two communication officers who serve in public relation and communication directorate of the Authority were purposively selected in the study. Moreover, the local people who live around the infested area of Lake Tana were also incorporated to obtain more data about the magnitude of the problem and for triangulation sake. In line with this, samples were taken from the local people from Fogera province kebeles where water hyacinth is pervasive. In doing so, six environment protection experts were taken for the interview and seven local people who live in Shina and Kidest Hana kebeles of the aforementioned province were chosen for the FGD session.

Data Collection Tools

Data were collected through interview, focus group discussion and document analysis. In the same token, in-depth interviews were conducted with environmental communication experts of EFWPDA. The focus of the individual interview was to access data on the perceptions and practice of the environment protection professionals about participation and participatory communication pertinent to their efforts in eradicating water hyacinth. Moreover, one focus group discussion session was held with the local people in the sites where water hyacinth is more prevalent.

Data Analysis and Interpretation Techniques

Qualitative data analysis and interpretation techniques were held. At this section, meticulous attention was given starting from preparing and organising the data for analysis. Following that reading and understanding the data, coding the data, generating description of the setting, the people and the categories were made. Thematic interpretation was conducted pertinent to the basic questions of the

study. Themes emerged from the data collected from different sources. . Hence, data collected from the interview, FGDs and document analysis were put side by side for the disposal of our analysis. Interpretations were made based on the findings and they are also substantiated by the literature.

Results and Discussion

This chapter presents the data analysis and interpretation of the study that focuses on the perceptions and practices of participatory communication in its environment protection activities of eradicating water hyacinth in Lake Tana.

Perceptions towards Participatory Environmental Communication

Exploring and understanding how participatory environmental communication is perceived in development efforts in eradicating water hyacinth in Lake Tana is one of the prior concerns of the study. In so doing, this section presents the perception of environmental protection development agents and communication officers of EFWPDA towards participation and participatory communication in their activities of eradicating the weed from the lake. In this regard Interviewee 1 points out:

In eradicating water hyacinth and other environment protection activities, participation in our organisation is conceptualised as harnessing all stakeholders and getting them involved in different activities. For instance, universities and other research institutions take part in technical support, Diasporas and other well-to-do individuals in providing money and the local people engage in manual harvesting of water hyacinth (CO 1).

The other interviewee of the development worker of the Tana Biosphere directorate also responds “Participation in our environmental protection activity is to mean that mobilising the community and other stakeholders as per our schedule of different campaigns”. The organisation’s official document also affirms:

In order to eradicate water hyacinth and other weeds in Lake Tana, engaging different Stakeholders such as different institutions, volunteers, NGOs, the local community and other development agents and preparing campaigns and getting these actors participate in the programme is fundamental (EFWPDA 2019 Annual Plan:32).

From the above responses of the interviewees and the official documents of the organisation, we may extrapolate that participation and participatory communication in eradicating water hyacinth from Lake Tana are perceived as the provision of labour, money, material and technical support by the community and other stakeholders. Moreover, participation has been exhibited as a public relation campaign which is organised by the center and ordered to be delivered by the people in the grass root. This kind of participation, according to Adem (2017), is the “conception of participation as passive collaboration which leads to manipulative consultation performed to achieve predetermined objectives. In such form of participation, the local communities are not part of the decision making process and it is referred as pseudo-participation. (Tufté & Mefalopulos, (2009) argue in this type of participation the local people are not empowered to make decisions so that they may not play the overall ownership role and self-management for sustainable natural resource management.

Conceptualising participation and participatory communication as instrumental functions may have a profound impact on the organisation’s practice on its effort in eradicating water hyacinth from Lake Tana sustainably. This pseudo participation may deter the local people and other stakeholders from playing their proper role in protecting the weed efficiently. Hence, as Basette (2004) illustrates participatory communication should be perceived as an act of arranged activities based on the

participatory process on media and inter personal communication to facilitate a dialogue about development issues and initiatives among stakeholders.

Practices of Participatory Environmental Communication

Central to natural resource management, it is better to operationally define about participatory communication so that our analysis and discussions are framed accordingly. In light of this, Keerajit and Flor (2013) state “Participatory communication in natural resource management is not just a set of techniques to make people change their knowledge, attitude and practices but the people should voluntarily engage in activities in natural resource management as part of a process of gaining critical understanding why they are doing so” (P.705). The finding reveals that there is no genuine participation going on by EFWPDA in efforts of eradicating water hyacinth from Lake Tana. It is mainly equated to a public relation campaign. In line with this, one of the interviewee responds:

We acknowledge the importance of participation in natural resource management activities. Hence, we organise forums and inform the community about the existing problem on the lake through leaders in the government structure from zone to kebele. And we set a campaign programme and mobilise the people in harvesting the weed and collecting [it] into the dry place. At this movement we allocate budget and provide technical and material support for the campaign. The community along with harvesting water hyacinth they participate in reporting to the organisation when the new infestation of the weed is seen (DW 1)

The other interviewee of the development workers also points out the trends of the organisation on the practice of participation and participatory communication from the perspective of water hyacinth management from Lake Tana:

From the outset by informing and persuading the local people the severity of the problem on the lake, we were able to engage the community in harvesting the weed voluntarily. Gradually, as the activity is tiresome, the local people became reluctant in participating in the campaigns. Then, we devised an incentive mechanism and pay them 100 birr for a day campaign. This even was not found to be successful as the farmers spent only 1-2 hours. Later, the board of the Lake Tana rehabilitation set a standard and decided to pay per hectare. In doing so, we currently pay 8000 birr to the local people for harvesting the weed per hectare and 1500 birr for collecting to the weed to the dry area. The money is generated from the Tana trust fund. Still the farmers are complaining about the amount of money they get in engaging the aforementioned activity. They request to be paid up to 15,000 per hectare. If not, they tend to take a position that the lake is not only ours. They start focusing on the amount of money to be given (DW 2).

The above justification is also shared by the communication officers of the organisation. In this regard, CO 2 responded “We were trying to use harvesting machines but as the weed mainly settle the lake shore areas, the machine does not move away from water. Many of the machines are also not functional because of technical problems. So the best alternative is using labour. However, as the local people get bored, we are forced to pay money at least for the areas of agricultural farms”.

As we could reveal from the above excerpts the participation of the local people is limited to labour contribution in harvesting water hyacinth and collecting the chopped weed into a dry place for further burning. Besides, they also play a reporting role when the new occurrence of the weed exhibited. Relying on participatory communication, it resides to informing people, preparing campaign and providing financial, material and technical support. This is not a genuine participation as it lacks a horizontal dialogue among stake holders in defining the problem and finding solution .Moreover, the local people in the grass roots are not empowered to make their decisions. Rather they are urged to engage in the physical

activities that require their labour. This practice is veers away from the notion of participatory communication. In this regard, Keerajit and Flor (2013) argue “participatory development communication means moving from a focus of informing and persuading people to changing their behaviour or attitudes and focus on facilitating exchanges between different stakeholders to address a common problem”(704).

The worst case scenario would be the trend of paying money is exhibited for water hyacinth management in Lake Tana. This is mainly attributed to the misconception and practice of participation and participatory communication in the organisation so that they fail to empower the stakeholders specially the local people to take the initiative and belongingness for sustainable water hyacinth management in particular and environment protection activities in general. Needless to say that this activity may create a dependency syndrome among the local people and it will have also a devastating impact for other agriculture extension packages, watershed management, forestation and other related development activities. Consistent to my argument, Tuft and Mefalopulous (2009) argue that if people understand why and voluntarily change their practices and activities, such changes are likely to be long lasting. In such a situation, the people should be given the chance to identify the problems and find the solution to the problems. The grassroots should be given the opportunity in the decision making process. On the other hand, stakeholders need to be in a position to have practices and take control over local decisions for sustainable natural resource management including water hyacinth control endeavours (Adem, 2017; Huesca 2002; Mefalopulos 2008).

Participatory Communication in Different Stages of Water Hyacinth Management

Huesca (2002) states the concept of community participation refers to process through which beneficiaries are involved in the development process ranging from the conceptualisation to the planning, implementation, monitoring and evaluation of a particular development project hence total community ownership and long term sustainability of any particular development project and process. Central to the above guiding principles stated by scholars in the area we are going to see the practice of participatory communication against each stage of the communication activities in EFWPDA in its endeavour in water hyacinth management. It was found that the local people seem to be not involved in the problem identification and planning stages of the water hyacinth management activities in Lake Tana. In this vein, one of the development workers responds:

We have water hyacinth eradicating government organisational structure from the region to kebele level. Then once the planning is prepared in the top (at regional level), we call leaders of the different organisational structures and have a meeting, During which the plan is presented to them and we reach a common understanding afterwards the campaign programmes are set and the local people act accordingly (DW 1).

The above justification is also consistent to the public relation and communication department of the organisation. As it is stated in 2019 public relation and communication directorate annual plan activities “We are going to organise different forums in different levels and make the organisation’s top management, practitioners and other stakeholders to have a discussion about the prepared plans”(P.7).The local communities also witness that they are not engaged in the problem identification and planning activities. In light of this, one of the discussants of the FGD reported:

In our kebele there is a government structure called the ‘Development Team’. In this team we are organised into ‘one to five’ development groups in our village. When there is a campaign we are informed by this development team. Sometimes, we are penalised to pay 5 birr when we miss the programme. We do not participate in planning (FGD discussant 5).

It seems that there is no platform that different stakeholders make a dialogue via two way communication towards the existing problem and become a part of a solution for further stages. This, in

turn, leads us to say that the failure of the genuine participation in water hyacinth management in the lake is mainly attributed to the failure in the engagement of the local community from the outset of problem identification and planning. In line with this, Kheerajit and Flor (2013) strengthen genuine participation increases the sense of project ownership by local stakeholders, thus enhancing sustainability. There has to be critical understanding why they are doing so at the initial stage.

There is pseudo participation at the implementation stage. The local inhabitants are not a part of a decision making process, rather their contribution is limited to providing labour. They participate only in harvesting and collecting the weed from the lake. In response to the local people's participation at the phase of implementation, he states "We urge the local people to be engaged in harvesting and collecting the weed" (DW 1). In the same vein, as it is reported in the organisation's public relations' 2019 annual report, 310,000 people were participating in water hyacinth management in the year 2018 (P.15). The local people also witnessed to the FGD that their participation resides to harvesting and collecting the weed:

When there is a campaign, we are informed in the church and our vicinity by the kebele officials and development agents. Then we participate in harvesting the weed and we carry it and put it in dry areas. These activities are organised by the kebele leaders. Once we were also penalised when are absent in the campaign (FGD discussant 7).

The same is true for monitoring and evaluation phase. The stakeholders' participation is minimal. For the sake of in appearance, EFWPDA organise a forum and some representatives gather at the regional level and try to discuss the issues related to water hyacinth. In light of this, in 2019 annual plan of the organisation it is stated that "Relying on eradicating water hyacinth from Lake Tana, a consultation forum is organised quarterly with representatives of zones, woredas and kebeles where the weed is prevalent along with experts and coordinators. After evaluating the activities feedback is given by the organisation (P.32).

By and large, the EFWPDA practice of participatory communication in eradicating water hyacinth from Lake Tana resides to passive participation and participation by consultation. Bessette (2004) illustrates in passive participation the stakeholders of a project are characterised as "empty vessels" and receive information. Participation by consultation, on the other hand, researchers and experts pose questions to stakeholders. In put can be provided at different level in time but the final analysis and decision making power lies on the external professionals who may or may not take the stakeholders' decisions in to considerations.

Factors Affecting Participatory Communication in EFWPDA

One of the major factors that can potentially affect the proper utilisation of participatory communication in water hyacinth eradication in particular and natural resource management at large is attributed to the way different development actors and the organisation perceives participation and participatory communication. As it was presented in section earlier, participation is conceptualised as engaging stakeholders in the provision of technical, material, financial, most importantly labour support in eradicating the weed from Lake Tana. The other factor would be the recent mentality of the local people of harvesting and collecting water hyacinth from the lake is a means of income. It creates a dependency syndrome. The other factor to the poor practice of participation and participatory communication is exhibited by negative reinforcement towards and punishment of the local people. In line with this, one of the participants of the study responds:

Right after the occurrence of the weed in the lake, the participation of the people was fascinating. People came to the lake from the different parts of a country and engage in rigorous campaigns of eradicating the weed, but it was seasonal. Gradually, the activity of

eradicating the weed is left for only the local people. Through time when their engagement intended to be very weak, they were forced to harvest the weed through punishment (CO 2).

The other is structural factor. Paradoxically speaking, all the environment, forest and wildlife protection and development activities are done with the larger community requires high community drivers, but the communication department which is the fabric and engine of the organisation is not given due attention. The entire activities of the region's community participation and empowerment are facilitated by six officers. They are all not from the discipline of journalism and communication. Needless to say this immensely affects the perception and practice of participatory communication in eradicating water hyacinth from the lake. Harnessing all stakeholders and getting them act in harmony may be adversely affected. Moreover, the organisation has no communication policy and strategy.

Conclusion

The finding reveals that participation and practice of participatory communication in EFWPDA are perceived and practiced as a public relation activity which is mainly equated to conducting campaigns. It is highly limited to mobilising the local people in harvesting and collecting water hyacinth from Lake Tana. In so doing, participation and participatory communication are conceptualised as engaging stakeholders in labour, material, financial and technical support in the Authority's effort of eradicating the weed. In such context we may deduce that participation is poorly conceptualised as instrumental function and the basic pillars of participatory communication such as, dialogical approach, access, empowerment and self-sufficiency are downgraded. This, in turn, leads us to conclude that this misconception of participation has had an adverse effect on the overall activities of EFWPDA's endeavour of sustainable water hyacinth control in particular and natural resource management in general. It is safe to conclude that the type of participation leveled under information sharing and consultation lacks a horizontal dialogue among stakeholders in defining the problem and finding solution. Moreover, the local people in the grass roots are not empowered to make their decisions.

On the basis of the finding, it can be concluded that the major factors that may potentially affect the EFWPDA's proper utilisation of participatory communication in eradicating water hyacinth from Lake Tana are attributed to the perception of development and communication officers towards participation and participatory communication, dependency syndrome by the local community, negative reinforcement and punishment, little attention to the role of communication and structural factors. All these factors hinder the genuine participation of the local people for sustainable water hyacinth management from Lake Tana.

Reference

- Ali, A. C. (2017). *Participatory development communication in Ethiopia: A local development organization in focus*. Unpublished doctoral dissertation, University of South Africa.
- ANRS Environment, Forest and Wildlife Protection and Development Authority. (2018). *Implementation guideline on use of neochetina weevils for water hyacinth control around Lake Tana*. Retrieved from <http://tanacoalition.org/wp-content/uploads/2018/12/Biocontrol-Implementation-guideline-Final.pdf>.
- Besette, G. (2004). *Involving the community: A guide to participatory development communication*. Ottawa: International Development Research Center.
- Coldevin, G. (2003). *Participatory communication: A key to rural learning systems*. Rome: Food and Agriculture Organization of the United Nations.
- Cox, R. (2010). *A review of design principles for community-based natural resource management*. Lanham: Lexington Books.
- Cox, R. (2012). *Environmental communication and the public sphere*. Thousand Oaks, CA: Sage Publications.
- Denzin, N. K., & Lincoln, Y. S. (2000). *Handbook of qualitative research* (2nd ed). Thousand Oaks, CA: Sage Publications.
- ECRC. (2005). *Environment Communication Resource Center*. School of Communication, Northern Arizona University.
- Flor, A. G. (2004). *Environmental communication: Principles, approaches and strategies of communication applied to environmental management*. Diliman, Quezono City: University of the Philippines.
- Food and Agriculture Organization of the United Nations (FAO). (1994). *Applying DSC methodologies to population issues: A case study in Malawi*. Rome: Food and Agriculture Organization of the United Nations.
- Harris, U. S. (2018). *Participatory media in environmental communication: Engaging communities in the periphery*. London: Routledge.
- Honlah, E., Segbefia, A. Y., Appiah, D. O., & Mensah, M. (2019). The effects of water hyacinth invasion on smallholder farming along River Tano and Tano Lagoon, Ghana. *Cogent Food & Agriculture*, 5, 156-167.
- Huesca, R. (2001). Conceptual contributions of new social movements to development communication research. *Communication Theory*, 11(4), 415-433. <https://doi.org/10.1111/j.1468-2885.2001.tb00251.x>.

- Jurin, R. R., Roush, D., & Danter, J. (2010). Communicating without words. In R. R. Jurin, D. Roush, & J. Danter (Eds.), *Environmental communication* (2nd ed.) (pp. 221-230). Dordrecht: Springer.
- Kheerajit, C., & Flor, A. G. (2013). Participatory development communication for natural resources management in Ratchaburi Province, Thailand. *Procedia - Social and Behavioral Sciences*, 103, 703-709. <https://doi.org/10.1016/j.sbspro.2013.10.390>.
- Mbula, M. (2016). *Impacts of water hyacinth on socio-economic activities on Kafubu River in the Copperbelt Province: A case study of Ndola District, Zambia*. Unpublished master's thesis, University of Dar es Salaam, Tanzania.
- Mefalopulos, P. (2008). *Development communication sourcebook: Broadening the boundaries of communication*. Washington, DC: The World Bank.
- Pearson, J. C., Nelson, P. E., Titsworth, S., & Harter, L. (2011). *Human communication* (4th ed.). New York: McGraw-Hill.
- Ramirez, R., & Quarry, W. (2004). *Communication for development: A medium for innovation in natural resources management*. Retrieved from <http://www.fao.org/3/AD661E/AD661E00.htm>.
- Servaes, J. (Ed). (2008). *Communication for development and social change*. Los Angeles: Sage Publications.
- Tewabe, D. (2015). Preliminary Survey of Water Hyacinth in Lake Tana, Ethiopia. *Global Journal of Allergy*, 1(1), 13-18. DOI:10.17352/2455-8141.000003.
- Worku, M., & Sahile, S. (2018). Impact of water hyacinth, *Eichhornia Crassipes* (Martius) (Pontederiaceae) in Lake Tana Ethiopia: A Review. *Journal of Aquaculture Research & Development*, 9(1), 1-3. DOI:10.4172/2155-9546.1000520.
- Zikargae, M. H. (2018). Analysis of environmental communication and its implication for sustainable development in Ethiopia. *Science of the Total Environment*, 634, 1593-1600. <https://doi.org/10.1016/j.scitotenv.2018.04.050>.