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and
Technology Transfer**



“Joining Hands to Reverse the Alarming Situations”

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Geospatial Analysis of Wetland Dynamics on Lake Abaya-Chamo, The Main Rift Valley of Ethiopia

Tariku Zekarias, Vanum Govindu, Yechale Kebede, Abren Gelaw

Department of Geography and Environmental Studies, Arba Minch University, Ethiopia

Abstract

Wetlands worldwide and in Ethiopia have long been subject to severe degradation due to anthropogenic factors. This study was aimed at analyzing the impact of land use/land cover dynamics on Lake Abaya-Chamo wetland from 1990–2019. Data were acquired via Landsat TM of 1990, ETM+ of 2000, and OLI of 2010 and 2019 images plus using interview. Supervised classifications (via ERDAS14 and ArcGIS10.5) were applied to detect land use/land cover classes. Change matrix model and Kappa coefficients were used for analysis of the land use/land cover dynamics in the lake-wetland. It was found that forest; water body, shrub land, agricultural land, settlement and swamp area were the main land use/land cover classes. Wetland/swamp area has continuously declined throughout 1990–2000, 2000–2010 and 2010–2019 where its magnitude of shrinkage in the respective periods was 11.4 % (700 ha), 16 % (867 ha) and 31.3 % (1,424 ha). While ‘settlement’ and ‘water body’ of the lake-wetland increased at progressively increasing magnitudes of changes in three periods within 1990–2019, ‘shrubs land’ and wetland/‘swamp’ declined at progressively increasing magnitudes of loss in the same periods. Siltation, rapid population growth-led expansion of settlement and irrigation-based farming were the main drivers of the land use/land cover dynamics and degradation of the lake-wetland. Thus, consistent mapping and integrated actions should be taken to curb the threats on the sustainability of the lake-wetland in Southern Ethiopia. To reduce the impact of LULC dynamics on wetlands, the regime should: advance a clear political, institutional and legal framework for wetland management.

Keywords: Land use/land cover, Wetland dynamics Magnitude, Multispectral, Lake Abaya-Chamo wetland

Zekarias, T., Govindu, V., Kebede, Y., & Gelaw, A. (2021). Geospatial Analysis of Wetland Dynamics on Lake Abaya-Chamo, The Main Rift Valley of Ethiopia. *Heliyon*, 7(9), e07943.

Local perceptions of ecosystem services and human-induced degradation of lake Ziway in the Rift Valley region of Ethiopia

Hayal Desta

Environmental Planning Competence Center, Chair of Ecosystem Planning and Mngement, P. O. Box 518, EiABC, Addis Ababa University, Addis Ababa, Ethiopia

Abstract

Ecosystems supply beneficial contributions to people's quality of life and well-being. Freshwater lakes provide diverse consumptive and non-consumptive ecosystem services (ESs) to people. This study examined ecosystem goods and services that Lake Ziway in the Rift valley region of Ethiopia supply and identified the anthropogenic pressures that impact the lake and its services. The lake currently supports investment projects and livelihoods of the local communities. It contributes to the local and national economy from the export of cut flowers. The biggest commercial floriculture investment in the country is located on the shore of this lake, depending mainly on its water. Assessing the views and knowledge of local communities towards the contributions of ESs to human life, well-being, and livelihoods is important to protect and prolong the long-term benefits of ESs. A total of 41 experts, 137 households, and 20 discussants from two districts were selected for interviews and focus group discussions (FGDs). Pearson's Chi-square tests were used to test the association between dependent and independent variables. Multiple regression models were developed to examine the ESs of the lake and human impacts. The result showed that respondents prioritize the ESs of the lake as provisioning > supporting > cultural > regulating services. The Chi-square results revealed a strong association among ESs with respondents' type and residence locations. The multiple regression results revealed that respondents' types and residence locations were significant determinants in prioritizing the importance of ESs of Lake Ziway ($p < .01$). The degradation of Lake Ziway is increasing along with the increasing human population and increasing demands for provisioning services. The major anthropogenic activities are intensive water abstraction, pollution, overharvesting of resources, wetland conversion, and the introduction of invasive species. Such human activities are degrading the capacities of the lake ecosystem and its ecosystem service provisions. Our results indicate that understanding the links between these human pressures on Lake Ziway and its ES provisions is crucial for the sustainable management of the lake. The study could serve as a reference for decision-making for prioritizing the conservation measures needed towards ensuring the sustainable use of the various ecosystem services of the lake. Conservation interventions by involving local communities as major actors are needed to minimize human pressures and ensure the sustainability of the lake and its ESs.

Keywords: Ecosystem services, Anthropogenic pressures, Lake Ziway, Lake management; Ethiopia, Eastern Africa

Desta, H. (2021). Local perceptions of ecosystem services and human-induced degradation of lake Ziway in the Rift Valley region of Ethiopia. *Ecological Indicators*, 127, 107786.

Farmers' willingness to contribute to the restoration of an Ethiopian Rift Valley lake: a contingent valuation study

Haileyesus Girma¹, Jean Hugé², Mesfin Gebrehiwot³ and Steven Van Passel⁴

¹Department of Biology, Vrije University of Brussels, Pleinlaan 2, 1050, Brussels, Belgium.
Department of Environmental Health Science, Haramaya University, P.O.Box 235, Harar, Ethiopia

²Department of Biology, Vrije University of Brussels, Pleinlaan 2, 1050, Brussels, Belgium.
Center for Environmental Sciences, Hasselt University, Hasselt, Belgium. Open University of the Netherlands, Valkenburgerweg 177, 6419 AT, Heerlen, The Netherlands. Systems Ecology & Resource Management, Université Libre de Bruxelles, 50 Avenue Franklin Roosevelt, 1050, Brussels, Belgium

³Department of Biology, Vrije University of Brussels, Pleinlaan 2, 1050, Brussels, Belgium.
Department of Environmental Health Science, Wollo University, P.O.Box 1145, Dessie, Ethiopia. Ecosystem Management Research Directorate, Ethiopian Environment and Forest Research Institute, Addis Ababa, Ethiopia

⁴Department of Engineering Management, University of Antwerp, Antwerp, Belgium

Abstract

Lakes provide considerable social, economic, and ecological benefits. However, lakes are shrinking and the water quality is declining, due to human pressures such as water withdrawal and land use change, particularly in the developing world. Despite this, information regarding the economic impact of lake level reduction and local willingness to support restoration programs is lacking. This study employed a contingent valuation method to estimate willingness to pay and to contribute labor to Lake Ziway restoration program, Ethiopia. Face-to-face interviews were administered to 259 randomly selected respondents. Our findings revealed that about one-third of the respondents are willing to pay and about two-third are willing to contribute labor to restore the lake. From the interval regression models, the annual mean willingness to pay was estimated about 21.0 USD for the status quo scenario (the program works to keep water levels constant at current levels) and 31.1 USD for the improvement scenario (the program works to increase the water levels permanently). The annual mean willingness to contribute labor was estimated about 27.7 man-days for the status quo and 39.3 man-days for the improvement scenarios. 'Farm income' positively influenced the willingness to pay together with 'farm plot area.' Similarly, labor contribution was positively influenced by 'farm plot area' and 'education' and negatively by 'farm plot distance.' The economic values derived from this study reflect societal preferences and can form a significant input for policymakers, in support of informed and evidence-based decision-making regarding lake management and restoration in developing countries like Ethiopia.

Keywords: Contingent valuation, Willingness to pay, Willingness to contribute labor, Ecosystem services, Lake Ziway

Girma, H., Hugé, J., Gebrehiwot, M., & Van Passel, S. (2021). Farmers' willingness to contribute to the restoration of an Ethiopian Rift Valley lake: a contingent valuation study. *Environment, Development and Sustainability*, 23(7), 10646-10665.

Soil erosion risk assessment in the Chaleleka wetland watershed, Central Rift Valley of Ethiopia

Kebede Wolka¹, Habitamu Tadesse², Efrem Garedew³ and Fantaw Yimer⁴

¹Hawassa University, Wondo Genet College of Forestry and Natural Resources, School of Natural Resources and Environmental Studies, P.O.Box 128, Shashemene, Ethiopia

²Hawassa University, Wondo Genet College of Forestry and Natural Resources, School of Natural Resources and Environmental Studies, P.O.Box 128, Shashemene, Ethiopia

³Hawassa University, Wondo Genet College of Forestry and Natural Resources, School of Forestry, P.O.Box 128, Shashemene, Ethiopia

⁴Hawassa University, Wondo Genet College of Forestry and Natural Resources, School of Natural Resources and Environmental Studies, P.O.Box 128, Shashemene, Ethiopia

Abstract

Background

Increased flooding and newly formed rills and gullies were observed in the Cheleleka wetland watershed, over the past three to five years. These events are due to problems related to land use changes and are adversely affecting land productivity. This study was conducted to quantify, analyze and map soil erosion risk areas using the Revised Universal Soil Loss Equation.

Results

Only 13.6 percent of the study area has a soil loss value less than 10 ton per hectare per year with the remaining area experiencing a higher soil loss value. A large area, 53.6 percent of the watershed, is under severe to extremely severe soil loss (>45 ton per hectare per year). Another 17.3 percent of the study area has annual soil loss of 20–45 ton per hectare.

Conclusion

A significantly large area of the Cheleleka wetland watershed has non-tolerable soil erosion that threatens annual crop production, land productivity, and hydrological functioning of the area. From the conservation perspective, a large proportion of the watershed needs immediate watershed management intervention.

Keyword: Conservation priority, Land use change, Topography, Soil erosion

Wolka, K., Tadesse, H., Garedew, E., & Yimer, F. (2015). Soil erosion risk assessment in the Chaleleka wetland watershed, Central Rift Valley of Ethiopia. *Environmental Systems Research*, 4(1), 1-12.

Wetland ecosystems in Ethiopia and their implications in ecotourism and biodiversity conservation

Israel Petros Menbere^{1*} and Timar Petros Menbere²

¹Department of Biology, College of Natural and Computational Sciences, P. O. Box, 419, Dilla University, Dilla Ethiopia.

²Department of Biotechnology, Addis Ababa Science and Technology University, Addis Ababa, Ethiopia.

Abstract

Wetlands are ecosystems in which water covers the land. They provide economical, ecological, societal and recreational benefits to humans. Although complete documentation is lacking, wetlands make a significant part of Ethiopia covering an area of 13,700 km². Wetlands with a great potential for ecotourism development in the country include the rift valley lakes, the floodplains in Gambella, the Awash River Gorge with spectacular waterfalls, the Lake Tana and the Lake Ashenge, the Wenchi Crater Lake and the Wetlands in Sheko district are among others. Similarly, the Wetlands of Ethiopia are home to various aquatic biodiversity. Some of the biodiversity potential areas are the Cheffa Wetland and Lake Tana basin in the North, the rift valley lakes namely, Lake Zeway, Abaya and Chamo, and the Baro River and the Dabus Wetland in the Western Ethiopia. However, the wetlands in the country are impacted by a combination of social, economic, development related and climatic factors that lead to their destruction. Correspondingly, the wetlands holding a considerable biodiversity potential in the country lack adequate management. To address the challenges and enhance the wetland's role in ecotourism and biodiversity, a sustainable form of wetland resource use should be developed. As a result, integrating wetlands with ecotourism and developing as livelihood option for local communities is important for sustainable conservation of wetlands. Awareness rising, empowering stakeholders involved in wetland resource conservation, enhancing stakeholders' participation, undertaking the restoration of degraded wetlands and promoting scientific studies on wetlands of the country are crucial to conserve wetlands and at the same time promote their ecotourism and biodiversity importance. Moreover, implementing the integrated wetland resource management approach and addressing policy, management and coordination issues that arise on wetland resource conservation aids to promote the significance of wetlands in ecotourism and biodiversity conservation in Ethiopia.

Key words: Wetlands, ecotourism, biodiversity conservation, implication, Ethiopia.

Israel, P. M., & Timar, P. M. (2018). Wetland ecosystems in Ethiopia and their implications in ecotourism and biodiversity conservation. *Journal of Ecology and The Natural Environment*, 10(6), 80-96.

Threats and Opportunities to Major Rift Valley Lakes Wetlands of Ethiopia

Teklu Gebretsadik* and Kassahun Mereke Hawassa

Agricultural Research center, South Agricultural Research Institute, Ethiopia

* Corresponding author : Teklu Gebretsadik, Hawassa Agricultural Research center, South Agricultural Research Institute, Hawassa, Ethiopia,

Abstract

Introduction Wetlands are among the most threatened habitats globally, and it is estimated that since 1900 more than half of the world's wetlands have been destroyed and lost to other land uses. Despite various forms of international and national legislation ratifying their protection [1], wetlands continue to be affected by human activities. The economic benefits and services provided by wetland ecosystems are frequently overlooked by 1. Governments 2. Developers 3. Private industry and other land users resulting in distorted decisions. Ethiopia is often referred to as the water tower of Africa creating an extensive wetland system throughout the country. The Ethiopian Rift system extends from the Kenyan border up to the Red Sea and is divided into four sub-systems. A. Lake Rudolf B. Chew Bahir C. The Main Ethiopian Rift (MER) and D. The Afar Some of the lakes are used for irrigation, water supply, soda abstraction, commercial fish farming [2,3], and recreation and support a wide variety of endemic birds and wild animals. Objective To assess the major rift valley lakes wetlands and describe the future treats for sustainability Wetland concepts While water is a major factor of wetland definition soils, vegetation and animal life also contribute to their unique characteristics. The definition that is used by the Ramsar Convention is as follows [4], "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters" [5]. The wide diversity of landscapes of the Ethiopian Rift Valley (ERV) and ecosystems comprise extensive biodiversity-rich wetlands. At the same time the ERV Agri Res & Tech: Open Access J 9(1): ARTOAJ.MS.ID.555751 (2017) 001 Review Article Volume 9 Issue 1 - July 2017 DOI: 10.19080/ARTOAJ.2017.09.555751 Agri Res & Tech: Open Access J Copyright © All rights are reserved by Teklu Gebretsadik Abstract Rapid declines threaten the persistence of many rift valley lake wastelands. Few populations recover rapidly, most exhibit little or no change in abundance up to recent years after a collapse. Reductions in fishing pressure, although clearly necessary for population recovery, are often insufficient. Persistence and recovery are also influenced by life history, habitat alteration, changes to species assemblages, genetic responses to exploitation, and reductions in population growth attributable to the wetland effect. Unprecedented reductions in abundance and surprisingly low rates of recovery draw attention to scientists' limited understanding of how fish behavior, habitat, ecology, and evolution affect population growth at low abundance. Failure to prevent population collapses and to take the conservation biology of marine resources seriously will ensure that many severely depleted rift valley species remain wetlands, ecological and numerical shadows in the ecosystems that they once dominated.

Keywords: Rift valley lake, Conservation biology, Lake wetlands, Threats and opportunities, Ethiopia

Gebretsadik, T., & Mereke, K. (2017). Threats and opportunities to major rift valley lakes wetlands of Ethiopia. *Agric. Res. Technol*, 9, 1-6.

Impact of land use/cover changes on lake ecosystem of Ethiopia central rift valley

Eyasu Elias¹, Weldemariam Seifu², Bereket Tesfaye³ and Wondwosen Girmay⁴

Manuel Tejada Moral (Reviewing editor)

¹Centre for Environmental Science, College of Natural and Computational Sciences, Addis Ababa University, Addis Ababa, Ethiopia.

²Centre for Environmental Science, College of Natural and Computational Sciences, Addis Ababa University, Addis Ababa, Ethiopia; Department of Horticulture, College of Agriculture and Natural Resources, Selale University, Fiche, Ethiopia.

³Department of Ecobiology, College of applied sciences, Addis Ababa Science and Technology University, Addis Ababa, Ethiopia

⁴Horn of Africa Regional Environment Centre and Network, Addis Ababa University, Addis Ababa, Ethiopia
University of Seville, Seville, Spain

Abstract

Central Rift Valley (CRV) Ethiopia is an important region in terms of its vast ecosystem services (ES) and enriched biodiversity. However, its ES and biodiversity are under terrific pressure from hurried population growth, unsustainable developmental activities, unplanned urbanization, aggressive agricultural expansion, climate change, and the associated changes in land use and land cover (LULC). This study was aimed at analyze LULC changes in the Ethiopia CRV areas from 1985 to 2015 through Geographic Information System (GIS) and Remote Sensing (RS) techniques. Satellite images were accessed, pre-processed and classified. Field observations, discussion with dwellers (elders) were also employed to validate results from remotely sensed data. Major LULC types were detected and change analysis was executed. Consequently, nine LULC changes were successfully evaluated. The classification result revealed that in 1985 the area was covered by 44.34% with small-scale farming followed by mixed cultivated/acacia (21.89%), open woodland (11.96%), and water bodies (9.77%), respectively. Though the area measure varied among land use classes, the trend of share occupied by the LULC types in the study area remained the same in 1995 and 2015. In this research increase in small and large-scale farming, settlements and mixed cultivation/acacia while a decrease in water bodies, forest, and open woodlands is noted. Accordingly, the overall accuracy of this study was 84.46, 86.86 and 88.86 with kapa value of 0.82, 0.84 and 0.87, respectively. Lastly, the DPSIR framework analysis was done and integrated land use and policy reform are suggested as a response for sustainable land use planning and management.

Keywords: Central rift valley, Ethiopia, Landsat images, Lake, Land use/land cover

Elias, E., Seifu, W., Tesfaye, B., & Girmay, W. (2019). Impact of land use/cover changes on lake ecosystem of Ethiopia central rift valley. *Cogent Food & Agriculture*, 5(1), 1595876.

Local ecological knowledge and wetland management in the Ethiopian Rift Valley

Mesfin Gebrehiwot

Ecosystem Management Research Directorate, Ethiopian Environment and Forest Research Institute, Addis Ababa, Ethiopia

Department of Environmental Health Science, Wollo University, P.O. Box 1045, Dessie, Ethiopia

Abstract

Freshwater systems are productive environments and vital for the livelihood of local people. The provision of goods and services is, however, related to their functionality and sustainability. Like some other countries, Ethiopia lacks frequent and programmed freshwater inventories. As a result, threats facing freshwater ecosystems and management strategies cannot be tracked adequately. This research, therefore, aimed to identify main threats affecting the Ethiopian Rift Valley lake (Ziway) and forward possible management strategies. Structured questionnaire and focus group discussions were used to interview and discuss with the local people regarding the current status of the wetland and management practices. Relevant literature were also reviewed from articles, reports, and policies. To support the policy review, a semi-structured questionnaire related to Ethiopian water policy scenario was used to interview officials, who have a direct or indirect responsibility to protect wetlands. The results indicated that Lake Ziway is being highly degraded mainly due to lack of sense of ownership, poor policy implementation, and uncoordinated activities. The main policy gaps, which deter the conservation of wetlands in Ethiopia are generally classified into three as (a) issues not emphasized in the policies and strategies, (b) inconsistent policies and conflict among strategic issues, and (c) aspects considered by the policies but not implemented. Accordingly, (i) standalone wetland policy; (ii) implementation of existing water-related policies through (a) participatory stakeholder involvement and (b) multi-sectoral collaboration; and (iii) obeying international wetland conventions are recommended to enhance the functionality and sustainability of Lake Ziway and Ethiopian wetlands in general.

Keywords: Ecosystem service, Ethiopia, Stakeholder participation, Wetland management, Wetland policy

Gebrehiwot, M. (2020). Local ecological knowledge and wetland management in the Ethiopian Rift Valley. *GeoJournal*, 1-15.

The Challenges and Opportunities of Wetlands Management in Ethiopia: The Case of Abijata Lake Wetlands

Dabassa, Gemechu Bekele

Abstract

Abijata Lake wetlands are situated in Abijata-Shalla National Park (ASLNP) of Central Rift Valley of Ethiopia. This wetland has contributing significant roles in providing ecosystem functions and producing a number of products and services-that are socially and economically important to the local community. They also support a large population of migratory and residential waterfowl. The study was conducted to assess the challenges and opportunities of Lake Wetland's management;- and to recommendation future intervention measures for long term sustainable use. Different methods were used to collect primary and secondary data. The primary data were collected from 120 farm household; interviews and focus group discussions with different social groups, and key informants .The sample respondents were drawn from 3 kebeles adjacent to the lake wetlands. Moreover, land use/land cover change detection analysis was also made using satellite images (of 1973, 1986, 2000 and 2009) and ground truth. Lake Abijata and its wetlands provide the necessary services for eco-tourism development and economic base for the local communities. The result indicate that more than 83% of people depend on the wetlands for different types of subsistence including fodder, fuel wood, mining and mineral salt extraction. In recent years, however, these wetlands are degrading progressively due to natural and human factors. Farmland expansion, sand mining, mineral salt extraction, over use of water for irrigation and other development intervention like soda Ash factory are among the major threats of wetland management. The land use/land cover change detection analysis of satellite images between 1973 and 2009 depicts that the wetland under the study is continually converted to other land uses: there is a continuous expansion; for human settlement from 3.20%in the year 1973 to 25.61%in 2009, and from 27.81% in the year 1973 to 44.54%in the year 2009 for croplands. Importantly, Acacia woodland and wetlands around the lake were also reduced from 37.98% in 1973 to 18.02% in 2009 and from 31.01% in 1973 to 11.83% in 2009 respectively. Despite, the high dependence of the local people on Abijata wetland resources for their livelihood; however, these resources are under continuous threats. Managing the wetland on the basis of basin concepts and involving local people in alternative income generating activity has been suggested as a means of reducing pressure on land use and also reducing the threat to Abijata lake wetlands .Furthermore, the focal policy working on wetlands promulgations of regulations to govern wetland uses, capacity building for monitoring and control of wetland use ,integrated planning for water ,land ,forest resources utilization as well as wetland change detection(the temporal and spatial variability of wetlands or LU/LC change analysis)/monitoring seasonal changes, are recommended if possible.

Dabassa, G. B. (2010). *The Challenges and Opportunities of Wetlands Management in Ethiopia: The Case of Abijata Lake Wetlands* (Doctoral dissertation, Addis Ababa University).

Economic value of wetlands services in the Central Rift Valley of Ethiopia

Fitsum Dechasa, Feyera Senbeta & Dawit Diriba Guta

Center for Environment and Development Studies, Addis Ababa University, P.O. box 1176,
Addis Ababa, Ethiopia

Abstract

This study estimates the economic values of wetlands services in the Central Rift Valley of Ethiopia. A choice experiment valuation method was used to quantify monetary value of wetlands. The study used data collected from 405 households complemented with data collected using Participatory Rural Appraisals. Multinomial logit and random parameter logit models were used to analyze the data. The results have demonstrated the economic values of wetlands in the study area. Households ascribe the highest value for biodiversity (marginal willingness to pay value of US \$1.26 per percentage of biodiversity conserved), followed by water availability (US \$0.87 per ha increase in open water surface area). The statistical inferences, however, showed significant heterogeneity among households in their preference for wetland management alternatives. The probability of choosing improved wetland management is significantly reduced by age of the household head and distance; while, it is increased by education, income and location. The finding also revealed an average and aggregate willingness to pay of US \$7.5 and 694,141, respectively, for a change from status quo to high impact improvement scenario. It is, thus, recommended to take rehabilitation and conservation measures to ensure sustainable use and management of wetland resources in the area.

Key words: Choice experiment, Ecosystem service, Ethiopia, Valuation, Wetland

Dechasa, F., Senbeta, F., & Guta, D. D. (2021). Economic value of wetlands services in the Central Rift Valley of Ethiopia. *Environmental Economics and Policy Studies*, 23(1), 29-53.

Sesbania sesban, a fodder species potential to rehabilitate wetland vegetation in Lake Ziway, Ethiopia

Megerssa Endebu¹ and Feyisa Girma²

¹Fisheries Resources Research Center, P.O.Box 229, Batu, East Shoa, Ethiopia.

²Fisheries Resources Research Center, P.O.Box 229, Batu, East Shoa, Ethiopia.

Abstract

Wetland vegetation have significant roles in buffering effects of agro-chemicals and a mass of eroded soil entering in to lakes. Buffering wetland vegetation in the shore of Lake Ziway, a Lake in the Ethiopian mid-Rift Valley with 137 km shore length and 434 km² area supporting over 4,600 livelihoods in fisheries activity, is threatened by anthropogenic impacts in the semi-arid, drought stressed surrounding. A pre-test experiment was done to evaluate multipurpose, three fodder plant species, elephant grass, *Sesbania sesban* and *Leucaena pallida* in their potential to re-habilitate a degraded wetland around Lake Ziway. The planting materials of elephant grass and seeds of *Sesbania sesban* and *Leucaena pallida* were planted in a selected littoral zone of the Lake during June 2009, after which they were protected by fencing and let to grow. All of the three species were well established during the first season. However, *Leucaena pallida* and elephant grass were dry out after August when the Lake's water level increases and inundate the area. Being submerged partially under water, *Sesbania sesban* tolerated the inundation caused by the rise of water level in the late rainy months and developed a mass of adventitious roots from the stems which mechanically trapped the incoming eroded soil from the immediate farm lands. Very dense grass of height up to 1 m, established in the protected area around the experimental plots was also the indication of the rehabilitation of wetland vegetation for its better buffering capacity. The *Sesbania sesban*, multipurpose plant and the established grass, potentially provides a high protein source green roughage to livestock in this drought affected Rift Valley area.

Keywords: fodder plants, Lake Ziway, rehabilitation, *Sesbania sesban*, wetland vegetation

Endebu, M., & Girma, F. (2016). *Sesbania sesban* fodder species potential to rehabilitate wetland vegetation in Lake Ziway, Ethiopia. *International Journal of Fisheries and Aquatic Studies*, 4(3), 298-301.

Wetland Degradation in Ethiopia: Causes, Consequences and Remedies

Hagos Gebreslassie*, Temesgen Gashaw and Abraham Mehari

Department of Natural Resource Management, Adigrat University, Ethiopia

* Corresponding Author: hagmeb@gmail.com

Abstract

Ethiopia owns more than 58 different types of wetlands which provide enormous socio-economic and environmental values. Despite all those and other indispensable values, these wetlands are under severe pressure and degradation. Due to improper extraction of uses and misconceptions forwarded to wetlands, the health of the wetlands is continuously decreasing from time to time that in doubt their existence in the near future. Traditional and modern agricultural expansions, continuous land degradations, urbanizations and industrializations, lack of policies and institutional arrangements, lack of capacities, natural and ecological problems are the most dominant challenging factors of wetlands in the country. Malnutrition of children, extra loads on women and poor, absence of medicinal plants (healers), lack of water and forage, health problems and lack of recreational areas are the dominant consequences seen in parts of Ethiopia where wetlands get lost. As Ethiopia is prone to desertification and recurrent drought, the effects of wetland loss could be more visible in complicating the situation locally. In order to reverse these emerging problems and conserve these fragile but crucial wetlands, integrated problem solving approach through realizing the collaboration of relevant stakeholders from policy level down to grassroots community is indispensable opportunity to Ethiopian wetlands.

Key words: Wetland, Challenge, Opportunity

Gebreslassie, H., Gashaw, T., & Mehari, A. (2014). Wetland degradation in Ethiopia: causes, consequences and remedies. *Journal of environment and earth science*, 4(11), 40-48.

Aquatic macrophytes in Ethiopian Rift Valley Lake Koka: Biological management option to reduce sediment loading

Assefa Wosnie^a, Seyoum Mengistou^b, Miguel Alvarez^c

^a Dilla University, College of Natural and Computational Sciences, Department of Biology, PO Box 419, Dilla, Ethiopia

^b Addis Ababa University, College of Natural Science, Department of Zoological Sciences, PO Box 1176, Addis Ababa, Ethiopia

^c University of Bonn, INRES, Plant Nutrition, Karlrobert-Kreiten-Str. 13, 53115 Bonn, Germany

Abstract

Nowadays, due to deforestation, poor soil management and improper farming techniques, reservoir and lake sedimentation is a serious problem in Ethiopia. Despite the severity of the problem, there is no documented study on the use of macrophytes as a biological management option for sediment loading. A sediment trap field experiment was conducted from July to September 2017 to assess the efficiency of macrophytes in reducing sedimentation problem in Lake Koka. During the study period (90 days) on average a total of 1140 g DW m⁻² sediment was deposited at the vegetated stations and 336 g DW m⁻² at the open water site. The corresponding values for resuspension were 906 g DW m⁻² and 1680 g DW m⁻², respectively. Compared with the non-vegetated area, all macrophytes significantly facilitated sedimentation and reduced resuspension ($P < 0.05$). The order of the macrophytes in their sediment trapping efficiency was *Echinochloa stagnina* > *Typha angustifolia* > *Eichhornia crassipes* = *Leptochloa caerulea* and the corresponding order for restraining resuspension was *T. angustifolia* > *E. stagnina* > *E. crassipes* = *L. caerulea*. Generally, *E. stagnina* and *T. angustifolia* were better in trapping sediment and preventing resuspension. Development and maintenance of wetlands with these aquatic macrophytes may be an effective management tool for reducing the sediment load on Lake Koka, but would need further studies on the effect of wind velocity and direction on their efficiency.

Keywords: Macrophyte; Sediment trap; Sediment dynamics; Organic fraction

Wosnie, A., Mengistou, S., & Alvarez, M. (2020). Aquatic macrophytes in Ethiopian Rift Valley Lake Koka: Biological management option to reduce sediment loading. *Aquatic botany*, 165, 103242.

Geospatial Analysis of Wetland Land Use/Land Cover Dynamics On Lake Abaya-Chamo, Southern Rift-Valley of Ethiopia.

Tariku Zekarias, Vanum Govindu, Yechale Kebede, Abren Gelaw
Arba Minch University <https://orcid.org/0000-0003-4468-6924>

Abstract

Background: Wetlands worldwide and in Ethiopia have long been subject to severe degradation due to anthropogenic factors. This study was aimed at analyzing the impact of land use/cover dynamics on Lake Abaya-Chamo wetland in 1990 – 2019. Data were acquired via Landsat TM of 1990, ETM+ of 2000, and OLI of 2010 and 2019 images plus using interview. Supervised classifications (via ERDAS14 and ArcGIS10.5) were applied to detect land use/cover classes. Change matrix model and Kappa coefficients were used for analysis of the land use/cover dynamics in the lake-wetland.

Result: It was found that forest; water, shrub land, agricultural land, settlement and swamp area were the main land use/cover classes. Wetland/swamp area has continuously declined throughout 1990 – 2000, 2000 – 2010 and 2010 – 2019 where its magnitude of shrinkage in the respective periods was 11.4 % (700 ha), 16 % (867 ha) and 31.3 % (1,424 ha). While ‘settlement’ and ‘water body’ of the lake-wetland increased at progressively increasing magnitudes of changes in three periods within 1990 – 2019, ‘shrub land’ and ‘swamp’ declined at progressively increasing magnitudes of loss in the same periods. Siltation, rapid population growth-led expansion of settlement and irrigation-based farming were the main drivers of the land use/cover dynamics and degradation of the lake-wetland.

Conclusion: Thus, consistent mapping and integrated actions should be taken to curb the threats on the sustainability of the lake-wetland in Southern Ethiopia. To curb the impact of LULC dynamics on wetlands, the government should: formulate clear policy, institutional and legal framework on the management of wetlands.

Keywords: land use/land cover, dynamics, magnitude, multispectral, Lake Abaya-Chamo wetland.

Zekarias, T., Govindu, V., Kebede, Y., & Gelaw, A. (2021). Geospatial Analysis of Wetland Land Use/Land Cover Dynamics On Lake Abaya-Chamo, Southern Rift-Valley of Ethiopia.

Water surface Changes of Lakes in the Central Rift Valley of Ethiopia

Nesibu KEDİRKAN

Res. Assist.Ethiopian Environment and Forest Research Institute

Abstract

Lakes are one of the most important biologically diverse ecosystems. However, extensive human and natural factors contributed to the loss of this ecosystem. Until recently, knowledge on the recent status of rift valley lakes was lacking. The aim of this study was, therefore, to estimate the current extent of selected lakes in the central Rift Valley of Ethiopia using Landsat image. Satellite images of Landsat OLI_TIRS for the year 2018 were used for this study. Selected bands (green, near infrared, shortwave infrared and middle infrared) were selected in calculating automated water extraction index to distinguish water surface from non-water. The result revealed that the extent of water surface was reduced between 2015 and 2018 with an amount of 47.6, 2.4 and 0.9 % for lake Abjata, Shala and Langano, respectively. Such rapid conversions of aquatic ecosystem need urgent management and policy intervention. Furthermore, applied researches are needed to reduce the magnitude of change.

Keywords: Landsat, Shala, Langano, Abjata

KEDİRKAN, N. (2019). Water surface Changes of Lakes in the Central Rift Valley of Ethiopia. *International Journal of Environment and Geoinformatics*, 6(3), 264-267.

Review on distribution, importance, threats and consequences of wetland degradation in Ethiopia

Bahilu Bezabih* and Tadesse Mosissa

Department of Natural Resource Management, Jimma University College of Agriculture and Veterinary Medicine, P. O. Box 307, Jimma, Ethiopia.

Abstract

Wetlands are the ecosystems that are found on the interface between land and water. It is also areas of marsh, ponds and swamps, whether natural or artificial, permanent or temporary, with water, that is static or flowing, fresh, brackish or salty, including areas of marine water, the depth of which at low tide, does not exceed six meters. Although, wetlands by nature are dynamic ecosystems, anthropogenic activities continuously changing the land uses in and around wetlands speed up the ecological changes in wetlands. Ethiopia exhibits a wide range of geologic formations and climatic conditions which create numerous wetland ecosystems including 12 rivers, eight major lakes and many swamps and floodplains. It is found on every agro-ecological zones from alpine (high mountains) to desert ecosystem in the low-lying regions and across all traditional climatic zones. Riverine wetlands are other common types of wetlands throughout the country. Based on scattered information, the total wetlands coverage of Ethiopia is approximately 2% (22,600 km²). This, wetlands provide natural resources and services for humanity. They are a source of food, tourism, cultural resources, flood control and improved water quality. They are also important for biodiversity and wildlife conservation. However, there are numerous threats to wetlands in developing countries including Ethiopia. Ethiopian wetlands are increasingly being lost or altered by unregulated over utilization, including water diversion for agricultural intensification, urbanization, dam construction, population pressures, food shortages, increased drainage and cultivation, collection of sedges and reeds for roofing and housing. The consequences of wetland loss and degradation in Ethiopia are enormous and directly affecting the livelihood base of rural communities. The change of wetlands has created numerous problems including decrease and extinction of wild flora and fauna, loss of natural soil nutrients, water reservoirs and of their subsequent benefits. They have affected various traditional occupations, socioeconomic conditions and cultural activities. Therefore, it needs intensive research and development works by different stakeholders and needs policy attention from the government to provide enabling environment for sustainable wetland management.

Key words: Wetland loss, drainage and cultivation, types of wetlands, threats to wetlands.

Bahilu, B., & Tadesse, M. (2017). Review on distribution, importance, threats and consequences of wetland degradation in Ethiopia. *International Journal of Water Resources and Environmental Engineering*, 9(3), 64-71.

Degradation of wetlands and livelihood benefits of Lake Abaya-Chamo wetland, southern Ethiopia

Tariku Zekarias, Vanum Govindu, Yechale Kebede and Abren Gelaw

Department of Geography and Environmental Studies, Arba Minch University, PO Box 21, Arba Minch, Ethiopia

Abstract

Abaya-Chamo and other wetlands of Ethiopia provide multiple ecosystem services, the wetlands are extremely affected by various anthropogenic factors. The unsustainable use of wetlands stems from the negligence of users about wetland degradation and limited policy attention by decision-makers. This study was aimed at analyzing the livelihood benefits of Abaya-chamo lake-wetland and the driving forces of its degradation. Data were gathered using a questionnaire survey of 384 households (selected via systematic random sampling), focus group discussion, and interview and field observation. Percentage, regression was used for data analysis. Multiple linear (binary logistic) regression model was applied to evaluate the impact of household-related independent variables on the dependent variable. It was found that Abaya-chamo lake-wetland offers fish, lumber, firewood, fodder, irrigation water, farmland, rainfall, recreation, tourism, aesthetics, carbon sinks, air quality, and climate regulation, services to local people. Farm expansion, sedimentation, irrigation, invasive plants (water hyacinth), open access and overuse of resources, lack of legal framework, and rapid population growth were the main causes of wetland degradation. Applying the lakes salty-water for irrigation is expected to lead to chemical land degradation in the next few decades. The invasive emboch (water hyacinth) plant results in dwindling aquatic resources (e.g., fish), loss of economic and tour benefits, and change in local climate, thereby depleting the lake water of the lake-wetland rapidly. The lakes salty-water-based irrigation is expected to result in land degradation to the extent of abandoning crop farming in the next few decades unless some actions are taken. Thus, the government should devise a clear policy and legal framework about sustainable management of wetland resources.

Keywords: Wetland degradation, Livelihood support, Overuse of resources, Lake Abaya-Chamo

Zekarias, T., Govindu, V., Kebede, Y., & Gelaw, A. (2021). Degradation of wetlands and livelihood benefits of Lake Abaya-Chamo wetland, southern Ethiopia. *Current Research in Environmental Sustainability*, 3, 100060.

Threats and Management Practices of Water Hyacinth (*Eichhornia Crassipes*) on Ethiopian Rift Valley Lakes

Tesfaye Bekele Hordofa, and Rahel Tilahun Abdi

Ethiopian Biodiversity Institute

Abstract

Background Water hyacinth (*Eichhornia crassipes*) is a rapidly establishing and spreading notorious aquatic plant in tropic, subtropic, and temperate regions of the world. It is destructively invading Ethiopian rift valley lakes and vital wetlands since the time its introduction. Appreciation of the extent and intensity of the impacts is needed to develop policy, guide lines, management plans, and for organizational supports. This survey assessed the threats and management practices of water hyacinth on Rift Valley lakes using semi-structured questionnaire and group discussion by consulting riparian communities on the areas. It was noted that the infestation was very severe and the damage to the livelihoods of the communities was bad. Results The adverse impacts included social: interfering with farming, water access, transportation, recreation which accounted 2% least impact to 46% highest impact; economic: reduction of fish and crop productions, damage of boats and fishing materials, interfering with fishing, narrow range of fishing; from the listed the crop production take highest percentage; health: snake bites, malaria, amoeba, cholera, typhoid; biodiversity: loss of native grasses, birds, and fishes. Conclusion Overall, the problems were public outcry, the infestation was rapid, and the threat was aggressive. The management practice was not strategically guided and it was instinctive. Therefore, it needs the effort of all government institution, NGOs, Civilian Societies and local communities to control and manage the impacts of the invasive alien species.

Keywords: Water Hyacinth, *Eichhornia crassipes*, Invasive alien species, Rift valley lakes, Biodiversity, impact

Hordofa, T. B., & Abdi, R. T. Threats and Management Practices of Water Hyacinth (*Eichhornia Crassipes*) on Ethiopian Rift Valley Lakes. *Available at SSRN 4222826*.

Decentralization and local institutional arrangements for wetland management in Ethiopia and Sierra Leone

Roy Maconachie^a, Alan B.Dixon^{b1} and AdrianWood^{c2}

^aInstitute for Development Policy and Management (IDPM), University of Manchester, Oxford Road, Manchester M13 9PL, UK

^{b1}Department of Applied Sciences, Geography and Archaeology, University of Worcester, Henwick Grove, Worcester WR2 6AJ, UK

^{c2}Centre for Wetlands, Environment and Livelihoods, University of Huddersfield, Queensgate, Huddersfield HD1 3DH, UK

Abstract

In Ethiopia and Sierra Leone, recent social, political and environmental transformations have precipitated the intensification of wetland use, as local people have sought to safeguard and strengthen their livelihoods. Concurrent decentralization policies in both countries have also seen the government strengthen its position at the local level. Drawing upon recent field-based evidence from Ethiopia and Sierra Leone, this paper examines the compatibility between community-based local institutions for wetland use, and the process of decentralization. It argues that decentralization has in fact restricted the development of mature local institutional arrangements, due to its intrinsically political interventionist nature.

Maconachie, R., Dixon, A. B., & Wood, A. (2009). Decentralization and local institutional arrangements for wetland management in Ethiopia and Sierra Leone. *Applied Geography*, 29(2), 269-279.

Carbon Sequestration Potentials of Selected Wetlands at Lake Ziway, Ethiopia

Tesfau Bekele, Brook Lemma and Seyoum Mengistou

Department of Zoological Sciences, Addis Ababa University, PO box 1176, Addis Ababa, Ethiopia

Abstract

Wetlands are known for their high productivity owing to their high biomass content per unit area. This is however changing due to human needs to convert them to various land use types. The objective of this study was therefore to investigate the impact of wetland conversion on carbon sequestration potentials of selected wetland sites at shore area of Lake Ziway. Five sites were selected purposefully and triplicate vegetation and soil core samples were collected from each site in July and August 2015 and analyzed for above ground biomass, above ground plant carbon, and soil organic carbon contents. The results indicated that the least impacted wetland had significantly higher.

Mengistou, T. B. B. L. S. (2016). Carbon Sequestration Potentials of Selected Wetlands at Lake Ziway, Ethiopia. *Carbon*, 6(9).

Evaluating land use and land cover change of Tinishu Abaya wetland found in Silite Zone, SNNPRS, Ethiopia

Aman Nesre¹, Girma Tilahun², Ahmed Hussein³

¹ Department of Natural Resource Management, Werabe University, Werabe, Ethiopia

² Department of Natural Resource Management, Hawassa University, P.O. BOX 05, Hawassa, Ethiopia

³ Department of Animal Science, Werabe University, Werabe, Ethiopia

E-mail: ahmehussein2014@gmail.com

Abstract

Wetlands are among most important multi-functional and productive ecosystems on the earth but seriously threatened landscape by adverse human utilization practices and environmental changes like degradation. Thus, this study was conducted to determine the degradation level of Tinishu Abaya wetland in Silite zone, southern Ethiopia. The magnitude of land use and land cover (LULC) change was detected using Landsat images obtained in 1988, 2004, and 2018. LULC change was analyzed using ArcGIS of version 10.4. The findings from satellite imagery analysis revealed the prevalence of wetland degradation within the study area. The result from LULC change between 1988 and 2018 confirmed severe degradation of wetland mostly due to the expansion of farmland. The highest incremental change was observed in farmland, while the highest decrement was seen in the grassland that reached nearly 50% of LULC in 1988. On the other hand, wetland and the lake showed a declining trend up to 40% and 25%, respectively, while settlement showed an incremental trend reaching up to 46%. Even if the LULC change occurred between 1988 and 2018 years, remarkable changes were observed during 2004-2018 (14 years). Therefore, developing alternative methods of wetland resources, creating awareness about the indirect benefits of wetlands, monitoring of upstreamdownstream user relations, and developing an appropriate wetland management interventional policy are recommended

Keywords: degradation; land use and land cover change; remote sensing; satellite.

Nesre, A., Tilahun, G., & Hussein, A. (2022). Evaluating land use and land cover change of Tinishu Abaya wetland found in Silite Zone, SNNPRS, Ethiopia. *Proceedings of the International Academy of Ecology and Environmental Sciences*, 12(4), 340-351.

A preliminary survey of the ecohydrological management challenges faced by Lake Gudera, Sekela woreda, West Gojjam, Ethiopia

MiheretEndalew¹, GorawGoshu², WondieZelalem³

¹Amhara Regional Agricultural Research Institute, Bahir Dar Fish and Other Aquatic Life Research Center, P.O. BOX, 794. Bahir Dar, Ethiopia

²BahirDar University, College of Agriculture and Environmental Sciences, P.O. Box 1701, BahirDar, Ethiopia

³Amhara Regional Agricultural Research Institute, Bahir Dar Fish and Other Aquatic Life Research Center, P.O. BOX, 794. Bahir Dar, Ethiopia

Abstract

Lake Gudera, a highland lake, is highly degraded by agricultural activity, but still serves the local community for irrigation and livestock watering. Preliminary investigations indicated chemical composition of NO_3 (0.7 mg dm^{-3}), turbidity (26 NTU) and conductivity ($78 \mu\text{s cm}^{-1}$) with poor floristic and faunistic composition. The Community Elders explained that the wetland encroachment started in 1986/1987, was aggravated in 2002/2003 and now had resulted in 25% littoral zone macrophyte loss. Wetlands had been converted for agriculture, leaving reduced filtering capacity of the lake which impacted on the ecosystem services. Now there are growing calls for sustainable management for the various values and functions, involving different stakeholders to alleviate negatively impacting factors.

Key words: Biodiversity, degraded, ecosystem, open access, watershed, wetlands

Endalew, M., Goshu, G., & Zelalem, W. (2010). A preliminary survey of the ecohydrological management challenges faced by Lake Gudera, Sekela woreda, West Gojjam, Ethiopia. *Ecohydrology & Hydrobiology*, 10(2-4), 325-331.

Environmental implications of changes in the levels of lakes in the Ethiopian Rift since 1970

Tenalem Ayenew

Department of Geology and Geophysics, Addis Ababa University, PO Box 1176, Addis Ababa, Ethiopia

Abstract

The Ethiopian rift is characterized by a chain of lakes of various sizes and hydrological and hydrogeological settings. The rift lakes and feeder rivers are used for irrigation, soda extraction, commercial fish farming, and recreation, and they support a wide variety of endemic birds and wild animals. The levels of some of these lakes have changed dramatically over the last three decades. Lakes that are relatively uninfluenced by human activities (Langano and Abaya) remain stable except for the usual inter-annual variations, strongly influenced by rainfall. Some lakes have shrunk due to excessive abstraction of water; others have expanded due to increases in surface runoff and groundwater flux from percolated irrigation water. Lakes Abiyata and Beseka, both heavily impacted by human activities, show contrasting lake level trends: the level of Abiyata has dropped by about 5 m over three decades because of the extraction of water for soda and an upstream diversion for irrigation. Beseka has expanded from an area of 2.5 to 40 km² over the last three decades because of increased groundwater inputs from percolated irrigation water. Lake Awassa has risen slightly due to land use changes resulting in increased runoff in its catchment. This paper addresses these lake level changes and their environmental repercussions, based on evidence from hydrometeorological records, hydrogeological field mapping supported by aerial photography and satellite imagery interpretations, water balance estimation, and hydrological modeling. A converging evidence approach is used to reconstruct the temporal and spatial variations of lake levels. The results reveal that the major changes in the rift valley are mainly related to anthropogenic factors. These changes appear to have grave environmental consequences for the fragile rift ecosystem. These consequences demand the very urgent implementation of integrated basin wide water management practice.

Keywords: Environmental changes, Ethiopian Rift, Lakes, Over-irrigation, Salinization, Water resources

Ayenew, T. (2004). Environmental implications of changes in the levels of lakes in the Ethiopian Rift since 1970. *Regional environmental change*, 4(4), 192-204.

Water management problems in the Ethiopian rift: Challenges for development

Tenalem Ayenew

Addis Ababa University, Department of Earth Sciences, P.O. Box 1176, Addis Ababa, Ethiopia

Abstract

The Ethiopian rift is characterized by many perennial rivers and lakes occupying volcano-tectonic depressions with highly variable hydrogeological setting. The rift lakes and rivers were the focal points for relatively large-scale water resources development. They are used for irrigation, soda abstraction, commercial fish farming, recreation and support a wide variety of endemic birds and wild animals. Ethiopia's major mechanized irrigation farms and commercial fishery are confined within the rift. A few of the lakes have shrunk as a result of excessive abstraction of water; others expanded due to increased surface runoff and groundwater flux from percolated over-irrigated fields and active tectonism. Excessive land degradation and deforestation have also played a role. Human factors, in combination with the natural conditions of climate and geology have influenced the water quality. The chemistry of some of the lakes has been changed dramatically. This paper tries to present the challenges of surface water resources development with particular reference to environmental problems caused in the last few decades. The methods employed include field hydrological mapping supported by aerial photograph and satellite imagery interpretations, hydrometeorological and hydrochemical data analysis and catchment hydrological modeling. A converging evidence approach was adapted to reconstruct the temporal and spatial variations of lake levels and the hydrochemistry. The result revealed that the major changes in the rift valley are related mainly to recent improper utilization of water and land resources in the rivers draining the rift floor and the lakes' catchment, and to direct lake water abstraction, aggravated intermittently by natural factors (climate and tectonism). These changes appear to have grave environmental consequences, which demand urgent integrated basin-wide water management practice.

Keywords: Environmental problems; Ethiopian rift; Lake level changes; Irrigation; Salinity; Water management

Ayenew, T. (2007). Water management problems in the Ethiopian rift: Challenges for development. *Journal of African Earth Sciences*, 48(2-3), 222-236.

Mechanism of degradation of the quality of natural water in the lakes region of the ethiopian rift valley

TesfayeChernet⁺¹, YvesTravi¹, and VincentValles¹²

⁺¹Present address: P.O. Box 40950, Addis Ababa, Ethiopia.

¹Lab. Hydrogéologie, Université d'Avignon, 33 rue Louis Pasteur, F 84 000 Avignon, France

¹²Laboratoire Chimie et Environnement, Case 29, Université de Provence (Aix-Marseille I), 3 place Victor Hugo, 13331 Marseille Cedex 3, France

Abstract

The natural waters of the Lakes Region in the Main Ethiopian Rift (MER) show serious problems of chemical quality. The high content of fluoride reaches 300 mg l^{-1} and affects the health of the population who live in this area. Furthermore, the alkaline and sodic characteristics ($8 < \text{pH} < 10$ and $0.9 \times 10^{-4} < \text{Na} < 0.35 \text{ M l}^{-1}$) of these waters destroy the soil for agricultural use. This geochemical study is conducted using analytical data issued from literature (UNDP, 1973; Chernet, 1982) and several field sampling and laboratory analyses completed during the last 4 yr. Chemical analyses of 320 samples taken throughout the region have been analysed using the computer software AQUA for geostatistic, statistic, chemical equilibria and simulation of evaporative concentration process. The results show that the waters issuing from volcanic rocks are characterised by a positive alkalinity residual of calcite. When they concentrate due to the effect of climate, the precipitation of calcite causes a decrease in the chemical activity of calcium. This results in an increase in solubility of fluoride, previously controlled by equilibrium with CaF_2 , and the element concentrates without being significantly affected by the precipitation of fluorite. As water concentrates, the low concentration of dissolved calcium emphasises the alkaline characteristics. As a consequence, the pH reaches very high values (9–10) which make the waters unsuitable for agriculture. The adverse elements, namely fluoride, sodium, and alkalinity accumulate in the lower zones of the basins. The acquisition of high fluoride content and the alkaline-sodic characteristics depends primarily on the unbalanced initial stage between the carbonate alkalinity and calcium [$(\text{HCO}_3) > 2(\text{Ca} + \text{Mg})$], which results from the weathering and dissolution of the volcanic rocks. The predictive qualities of the model AQUA were tested in the context of this region. A simulation of the concentration of the waters by evaporation has shown chemical variations relatively similar to those obtained with field data which include the minor chemical elements such as the fluoride or the dissolved silica. For field data, enrichment is more variable and may represent localised conditions of mineralization. This model is then used to study a method of defluoridation by supplying these waters with calcium in the form of gypsum. This method also allows the reduction of the alalinizing and sodifying characteristics of the waters without reaching the fluoride standard concentration accepted for drinking waters. For drinking purpose, waters of the Ethiopian rift should undergo another method of defluoridation.

Keywords: fluoride; alcalinisation; ethiopia; rift; hydrochemical modelling; gypsum treatment

Tesfaye C., Yves T., and Vincent V. (2001). Mechanism of degradation of the quality of natural water in the lakes region of the ethiopian rift valley, Water Research, Volume 35, Issue 12, ISSN 0043-1354.

Building foundations for source-to-sea management: the case of sediment management in the Lake Hawassa sub-basin of the Ethiopian Rift Valley

Mulugeta Dadi Belete^a, David Hebart-Coleman, Ruth E. Mathews & Cryton Zazu

^a Institute of Technology, Hawassa University, Hawassa, Ethiopia

^b Stockholm International Water Institute, Stockholm, Sweden

Correspondence: mulugeta.belete9@gmail.com

<https://orcid.org/0000-0001-7781-7252>

Abstract

This article discusses experiences of applying the source-to-sea approach, contextualized to source-to-lake, in the Lake Hawassa sub-basin of the Ethiopian Rift Valley, particularly for the purpose of generating in-depth knowledge on sediment flows, building a geographically relevant comprehensive stakeholder and governance analysis and using this to design impactful interventions that can reduce sediment flux into Lake Hawassa. The source-to-sea approach has proven to be a useful and flexible for evaluating sediment management in the context of a sub-basin such as that of Lake Hawassa.

Keywords: Source-to-sea, Source-to –lake, Sediment, Lake Hawassa, Ethiopia, Rift Valley

Belete, M. D., Hebart-Coleman, D., Mathews, R. E., & Zazu, C. (2021). Building foundations for source-to-sea management: the case of sediment management in the Lake Hawassa sub-basin of the Ethiopian Rift Valley. *Water International*, 46(2), 138-156.

Macrophyte species diversity and distribution in relation to water quality of the Cheleleka Wetland in Ethiopia

Haymanot Tesfaye¹ & Bikila Warkineh²

¹ Environmental Science Center, Addis Ababa University, Ethiopia

² Department of Plant Biology and Biodiversity Management, Addis Ababa University, Ethiopia

Correspondence: haymanotandualem2015@gmail.com

<https://orcid.org/0000-0003-2152-8894>

Abstract

The Cheleleka Wetland is located in the Ethiopian Rift Valley on the upper shore of Lake Hawassa, after which the regional capital is named. This study investigated the relationship between water quality and the occurrence and diversity of macrophyte species of the wetland. Spatio-temporal variability in terms of water quality and macrophytes were studied in the wet and dry seasons at purposely-selected sites selected based on human disturbance levels. Six sites were selected, two from each of ‘severely’, ‘moderately’ and ‘least disturbed’, and data collected on water quality parameters, macrophytes richness and abundance. The results showed 25 macrophyte species dominated by Cyperaceae (24%), Poaceae (20%) and Nymphaeaceae (12%). Species diversity and abundance were significantly different between seasons and among the sampling sites ($p < 0.05$), with the richest taxa recorded at the least disturbed sites. A redundancy analysis of the species–environment relationships identified nutrient loads as significant drivers of macrophyte diversity and abundance in the wetland. Generally, the results showed the spatial and temporal variation of macrophyte diversity and abundance are affected by water quality, and poor water quality has resulted in poor ecological conditions of the Cheleleka Wetland.

Keywords: Aquatic ecosystem, Ecological condition, Nutrition, Redundancy analysis, Species richness

Tesfaye, H., & Warkineh, B. (2022). Macrophyte species diversity and distribution in relation to water quality of the Cheleleka Wetland in Ethiopia. *African Journal of Aquatic Science*, 47(1), 36-46.

A review of Wetland Conservation and Management Policy in Ethiopia

Tadesse Amsalu¹, Solomon Addisu²

¹ PhD in forestry (Natural resources policy), Institute of Land Administration, Bahir Dar University, Bahir Dar, P.O.Box 79, Ethiopia Email: tadesse_2@yahoo.co.uk, Ethiopia

² MSC in Environmental Sciences, College of Agriculture & Environmental Sciences, Bahir Dar University, Bahir Dar, P.O.Box 79, Email: soladd2000@yahoo.com, Ethiopia

Abstract

In Ethiopia, wetlands cover nearly 2% of the total land area of the country. They are one of the most productive ecosystems and perform many functions that maintain ecological integrity. They provide lots of goods and services that encompass agricultural production, tourism, and biodiversity conservation, social, economic as well as cultural activities. More specifically, wetlands are crucial resources of income generation and livelihood for local communities. Despite the diverse benefits that wetlands provide, lack of effective management has led to their continued degradation that includes unsustainable activities such as converting wetlands into agricultural and grazing lands, using them as waste disposal sites, and overexploitation of resources. Misconception about wetlands and considering them as wastelands and breeding grounds of mosquitoes and also absence of clearly defined tenure right on wetlands are further challenges that exacerbate wetlands' degradation. In response to the aforementioned challenges and threats, there have been commendable efforts exerted by scholars in the last decades to publicize the value of wetlands to the national and local economy in a number of national and regional awareness-creation workshops. In many of these workshops, apart from emphasizing the significance of wetlands and expressing the looming threats imposed on them, the need for formulating a national policy or a wetland development strategy that could enhance sustenance of their ecological and socioeconomic functions for the present and future generations of the country was boldly stated. Ethiopia stands for environmentally safe world and has given due consideration to natural resource protection and management in which wetlands are a component. Although the country hasn't adopted clearly defined national policy on wetland conservation and management, the issue of wetlands has been indirectly mentioned in various policies and legal frameworks including the National Water Resources Management Policy, the Federal Environmental Policy, the Biodiversity Policy, Agricultural and Natural Resources Development Policy and the Land Administration and Use Policy, National Conservation Strategy of Ethiopia. Though these policy frameworks are potentially helpful to introduce better management of wetlands in the country, the reality on the ground shows that wetlands are being mismanaged and some of them are in a state of extinction. To assure a sustainable wetland ecosystem development and addresses the multiple interests of stakeholders, it seems rational either to strengthen and act in accordance with the existing policy frameworks or to initiate a National Wetland Conservation and Development Policy. Adopting international conventions, such as the Ramsar Convention, that facilitate wetland conservation and sustainable utilization is also very important. To influence policy makers appreciate the value of enacting a strong policy framework for wetland conservation and management professionals would be required to further strengthen their efforts to produce more tangible data on current status of wetlands and also clearly demonstrate how wetlands support the livelihood of the local people and the ecosystem in general. Considering the cross-sectoral nature of wetland management, it is of crucial importance to designate a responsible agency to guide and coordinate the development interventions in wetland resources.

Index Terms: Community-based wetland management, Ramsar Convention, Wetland conservation, Wetland policy, Wetland tenure

Amsalu, T., & Addisu, S. (2014). A review of wetland conservation and management policy in Ethiopian. *International Journal of Scientific and Research Publications*, 4(9), 656.

Effects of anthropogenic activities on macroinvertebrate assemblages in the littoral zone of Lake Hawassa, a tropical Rift Valley Lake in Ethiopia

Tarekegn Wondmagegn¹, Seyoum Mengistou²

¹Debre Markos University, Debre Markos, Ethiopia

²Department of Zoological Sciences, Addis Ababa University, Addis Ababa, Ethiopia

Abstract

In developing tropical countries, the littoral region of lakes is exposed to high human pressures, and the degradation effects are more evident on riparian vegetation and macrophytes. Human impacts on other biological entities, such as plankton and macroinvertebrates, are rarely investigated and reported. The present study focuses on assessing the effects of habitat disturbance on the littoral macroinvertebrate assemblages in Lake Hawassa, Ethiopia. Samples were taken from February to November 2015/16 from 12 sampling sites purposefully selected on the basis of percentage disturbance score (PDS) and categorized into minimally disturbed (four sites), moderately disturbed (five sites) and highly disturbed (three sites). Macroinvertebrate samples were collected from each site using a D-frame net of 500 μm , with both in situ measurement and laboratory analysis of the environmental variables being conducted. A total of 23,051 macroinvertebrates belonging to 43 families were identified. Analysis of similarities (ANOSIM) and non-metric multidimensional scaling (NMDS) analyses revealed significantly different macroinvertebrate assemblages among the disturbance levels (ANOSIM: $p = .004$, $R = .55$). Variables such as Biological Monitoring Working Party, Shannon diversity index, Ephemeroptera and Trichoptera (ET) family richness, and family richness exhibited a flawless pattern of decrease with increasing human disturbances and a negative correlation with nutrients. The reduction of these metrics for highly disturbed sites was attributable to the deterioration of vegetation and bottom substrate qualities, increasing stormwater inputs, lack of buffer zones and well-planned land use induced by human interventions. It was evident anthropogenic activities in and around the littoral zone of the lake contributed to the degradation of habitat quality and decreased macroinvertebrate richness and abundance. Thus, effective lake management practices are recommended to rehabilitate the degraded littoral habitat quality in order to realize the sustainable use of this natural resource.

Wondmagegn, T., & Mengistou, S. (2020). Effects of anthropogenic activities on macroinvertebrate assemblages in the littoral zone of Lake Hawassa, a tropical Rift Valley Lake in Ethiopia. *Lakes & Reservoirs: Research & Management*, 25(1), 61-71.

Current Ecological Scenario of some Rift Valley Lakes of Ethiopia: A review

Lemma Abera Hirpo*
Ziway Fishery Resource Research Center, Ethiopia

Abstract

Lake Ziway and Abiyata are found in the Central Ethiopian Rift valley area and forms a complex and vulnerable hydrological system with unique ecological characteristics and well-known for their biodiversity. The most important components of the water resources of the lakes are precipitation and river inflow and the lakes are used for smallholder to large scale agriculture, domestic water use, fishery, industrial water use and associated eco-tourism. Based on these facts different organization has been settling down in the area due to suitability of environmental conditions and other infrastructures. The major threats that are common and need due attention are water use conflict; unplanned land use; pollution; deforestation; urbanization and population migration for the demand of resources; wetland interruption without considering their natural environment and others. Recent abstraction of water for irrigation and soda ash production has drastically changed both the lake level and its ecology. Thus, the issues of appropriate management systems are argment needs for the then development of the resources.

Keywords: Ecology; Lake Level; Water quantity; Ziway-Abiyata Lake watershed

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