



Evaluation of Existing Environmental Protection Policies and Practices vis-à-vis Sustainable Water Resources Development in Didessa Sub-basin, West Ethiopia

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ABSTRACT

In the effort to alleviate poverty and bring about sustainable development, Ethiopia is on the move to optimally utilize its natural resources, and hence the country has launched many water resources development projects aiming at the intensification of agricultural production and hydropower development. The Didessa Sub-basin is one of such watersheds where a number of large water management projects have been planned. The main objective of this study was to evaluate the environmental impact assessment (EIA) practices against the country's existing environmental protection and water resources management legislations, with an emphasis on Arjo-Didessa Dam and Reservoir Project. Documents on environmental protection and water resources management legislations, EIA report of the project and data on land use/cover and soils of the dam and reservoir area were considered for the study. The existence of EIA legislations and institutions would create the impression that the government is determined to national and global environmental concerns. Due to the project, about 98.6 km² of land with grasslands and riverine forest cover, and fertile soils with convenient land slope will be inundated by water. Besides, the role the community played in the project planning and EIA study was found to be inadequate. Although water withdrawal due to Arjo-Didessa Irrigation Project (about 19.75% of the mean annual stream flow at the dam site) is within the desired range of sustainable water resources development; and the mean annual instream flow requirements of 0.9 billion cubic meters (BCM) is fully delivered, the study has shown that some of the important decision making parameters of EIA like environmental flows assessment, dam-break analysis, environmental costs, and economic analysis, were bypassed, as observed from the EIA report of Arjo-Didessa Dam and Reservoir Project, although these are demanded by the environmental protection legislations.

INTRODUCTION

In the effort to alleviate poverty and bring about sustainable development, Ethiopia is on the move to utilize its natural resources to the maximum possible level. To this end, it has launched a number of water resources development projects in all major river basins of the country, aiming at the intensification of agricultural production and hydropower development. Didessa Sub-basin of the Abbay Basin is one of such watersheds, where some large water management projects have been planned, among which Arjo-Didessa Irrigation Development Project is one of them.

Environmental Impact Assessment (EIA) is a systematic process used to identify, evaluate and mitigate the environmental effects of a proposed project prior to making major decisions and commitments. It is a decision-making tool that evaluates the possible significant effects that a proposed project may exert on the environment (Lei & Hilton 2013). EIA usually adopts a broad definition of 'environment' considering socio-economic as well as environmental health

effects as an integral part of the process (UNEP 2007). Hence, it is a tool designed to identify and predict the impact of a project on the bio-geophysical environment and on human's health and well-being, to interpret and communicate information about the impact, to analyse site and process alternatives and provide solutions to sift out, or abate/mitigate the negative consequences on man and the environment. It helps in achieving sustainable development.

The major challenges posed by Ethiopia's hydrology are the lack of integrated water resources management and the land degradation-food insecurity-energy access-livelihood nexus (The World Bank 2006). According to the report, the latter includes unsustainable agricultural land management practices and heavy reliance on biomass energy. The use of biomass spurs deforestation and erosion and contributes to a significant environmental health problem like exposure to smoke and indoor air pollution, which causes elevated child mortality and a high incidence of respiratory diseases, mainly in women and children. On top of these challenges, large water resources projects, especially those involving dams

and reservoirs impose enormous environmental impacts over a wide geographic area. Through EIA processes, these impacts are identified and appropriate environmental protection and monitoring mechanisms are incorporated in the project design. To this end, conducive policies, rules, regulations and proper institutional setup need to be in place.

Arjo-Didessa Dam and Reservoir Project is aimed at developing a storage facility to supply water for about 80,000 hectares (ha) of the commanded area. Currently, the construction of the dam is underway on the upper reach of the river. The land area of the reservoir at the dam crest level (1359 meters above sea level/a.s.l) is about 98.6 km². The storage capacity of the reservoir at maximum water level (1357 meters a.s.l) and full reservoir capacity (1354 meters a.s.l), according to the project office, is, respectively, 2,256.3 million cubic meters (MCM) and 1,924.6 MCM. The project is planned on an area where several households have been relocated from drought-stricken zones of northern and eastern Oromia.

OBJECTIVES AND LIMITATIONS OF THE STUDY

Sustainable water resources development is one which is in good harmony with the established processes of physical and socio-economic environment. In effect, preventive measures through EIA processes are more effective and efficient than remedial measures (Siddiqui et al. 2008). In line with this, the Ethiopian Water Sector Strategy (MWR 2001) advocates for environmental conservation and protection to be an integral part of water related projects, and to this end, EIA is made mandatory for all water resources projects.

Adverse environmental impacts of water resources development need to be eliminated, as much as possible, at early stages, in order to maintain the environmental quality. Therefore, consideration of potential environmental impacts starting from the outset of the project identification is essential for sustainable water resources development. In effect, EIA can be seen as a set of activities undertaken to ensure that a development project enhances both, the environmental context in which it is implemented, and the communities that it is meant to benefit.

The main objective of the study was, therefore, to evaluate the existing EIA legislations and practices of water resources development in Didessa Sub-basin, with an emphasis on Arjo-Didessa Dam and Reservoir Project. The EIA study report of the project was considered to demonstrate how the EIA processes have been proceeding in the sub-basin. As the project has not yet been commissioned, the study is limited to the assessment of the existing EIA legislations, EIA report of the project, anticipated land use/

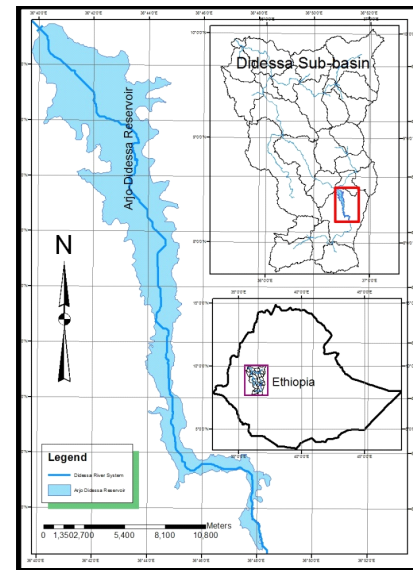


Fig. 1: Location map of Arjo-Didessa dam and reservoir project.

cover changes and evaluating selected EIA parameters against the existing legislations.

MATERIALS AND METHODS

The Study Area

Arjo-Didessa Dam and Reservoir Project is located in Didessa Sub-basin of Abbay Basin, West Ethiopia, at the upper reach of Didessa River. Geographically, the reservoir area is situated between 8°12'29.51" - 8°31'28.52" N latitude and 36°39'43.89" - 36°48'30.77" E longitude, at an elevation range of 1318 meters a.s.l to a contour of 1359 meters a.s.l closing at the dam crest level. The total area of the reservoir at the dam crest level is about 98.6 km².

Dataset and Data Sources

Existing EIA legal and institutional frameworks: Provisions for protection of the environment and the peoples' safety are made in the Constitution of the Federal Democratic Republic of Ethiopia. Particularly, article 92 of the Constitution provides for the implementation of programs and projects in a way that does not damage or destroy the environment. It also provides for the people to have the right to full consultation and to the expression of views in the planning and implementations of environmental policies and projects that affect them directly.

According to one of the policies of the Environmental Protection Policy of Ethiopia (EPA 1997), all major water conservation, development and management projects are subjected to the EIA process, and the costs and benefits of

protecting watershed forests, wetlands and other relevant key ecosystems should be included in the economic analysis of water projects. It is stated that the policy demands the full economic, social and environmental costs and benefits of natural resource development to be incorporated into the planning, implementation and accounting processes by a comprehensive valuation of the environment and the services it provides, and by considering the social and environmental costs and benefits which cannot currently be measured in monetary terms.

One of the water resources management policy objectives of the Ethiopian Water Resources Management Policy (MWR 1999), as depicted under no.5 of sub article 1.2 (General Water Resources Policy Objectives), advocates for conserving, protecting and enhancing water resources and the overall aquatic environment on a sustainable basis. The policy demands the incorporation of environmental conservation and protection requirements as integral parts of water resources management, and stipulates environmental impact assessment and protection requirements to serve as part of the major criteria in the evaluation and selection of all water resources projects. Particularly, the irrigation policy claims to minimize and mitigate the negative environmental impacts associated with irrigation development.

EIA is made mandatory for all water resources projects, and standards and classification systems will be established in conjunction with the various water uses in terms of quality and quantity including limits and ranges for desirable and permissible levels, waste discharges, source development, catchment management, etc. (MWR 2001). Moreover, it is mentioned that the reliability and sustainability of water resources should be determined, particularly in drought conditions in water-scarce areas. At the same time, reducing adverse impacts and increasing positive impacts through better project design and operation is mentioned among the strategies of ensuring environmental and health standards.

On the EIA Proclamation (No. 299/2002), it is stated that EIA is used to predict and manage the environmental effects, which a proposed development activity, as a result of its design sitting, construction, operation, or an ongoing one as a result of its modification or termination, entails and thus helps to bring about intended development. The assessment of possible impacts on the environment prior to the approval of a public instrument would provide an effective means of harmonizing and integrating environmental, economic, cultural and social considerations into a decision making process in a way that promotes sustainable development. Besides, the role of EIA in bringing about administrative transparency and accountability, as well as the involvement of the public and, in particular, communities in the plan-

ning of and decision making on developments which may affect them and their environment, was also forwarded as the background to the issuance of the proclamation. Among the general provisions of the proclamation, the first sub-article compels any person to secure authorization from the concerned authority or from the relevant regional environmental agency before commencing the implementation of any project that requires EIA.

Regarding institutional arrangements, the Environmental Protection Authority (EPA) was established through a proclamation (No. 9/1995), that was issued by the House of Peoples' Representatives to provide for the establishment of the unit. The objective of the authority as set in the proclamation is to ensure that all matters pertaining to the country's social and economic development activities are carried out in a manner that protects the welfare of human beings as well as sustainably protect, develop and utilize the resource bases on which they depend for survival. The authority was re-established through a proclamation provided for the establishment of environmental protection organs (No. 295/2002), with the objective of formulating policies, strategies, laws and standards, which foster social and economic development to enhance the welfare of humans and the safety of the environment sustainably, and to spearhead in ensuring the effectiveness of the process of their implementation. Besides, each national, regional state was mandated to establish an independent regional environmental agency or designate an existing agency that shall be responsible for coordinating the formulation, implementation, review and revision of regional conservation strategies; and environmental monitoring, protection and regulation.

The Ministry of Water, Irrigation and Energy of Ethiopia is a unit of the federal government, established to undertake the management of water and energy resources. The mandates of the ministry include planning, development and management of water and energy resources, development of policies, strategies and programs, development and implementation of water and energy sector laws and regulations, conducting study and research activities, providing technical support to regional water and energy bureaus and offices and signing international agreements (MWR 2010). Regional water resource management bureaus and irrigation development authorities are also responsible for water resources management in their respective regions.

Land use/cover, soils and land slope maps: The 2014 land use/cover and soils maps of Didessa Sub-basin were obtained from Oromia Water Works Design and Supervision Enterprise. Then, the reservoir area was clipped and the required attributes were extracted. The salient features of Arjo-Didessa dam and reservoir was used to delineate and clip the reser-

voir area.

Fig. 2 shows that the reservoir area is predominantly covered with Savannah grassland, which, according to OWWDSE (2014), is being cultivated.

Fig. 3 shows the soils map of the study area. The soil of the area is predominantly vertisols soil type.

The slope map of the reservoir area was generated from the DEM (20 meters horizontal resolution) of the area. Fig. 4 shows the land slope map of the reservoir area.

EIA study report of the project: The EIA study of the project was conducted in 2007. The EIA report has highlighted the major components of potential environmental impacts of large water resources development projects alongside suggested mitigation measures. Table 1 gives the proportion of different land use/cover types of the reservoir area as per the EIA study report.

RESULTS AND DISCUSSION

Legal and institutional aspects, and the commitment to conduct EIA: In Ethiopia, legislations pertinent to the environmental impacts of development/investment projects and programs have been issued, and institutions that are meant to monitor the effectiveness of the legislations have been put in place. The Environmental Protection Agency was established with the powers to ensure whether all matters pertaining to the country’s social and economic development activities are carried out in a way that will protect the welfare of human beings as well as sustainably protect, develop and utilize the resource bases on which they depend for survival. The agency has formulated different directives, principles and procedures of EIA of different development programs and projects. Hence, it is possible to observe that legislations and the environmental protection concerns mentioned therein have sufficiently addressed the issues of environmental impacts of water resources development, demonstrating that there is a clear legal base for the implementation of effective EIA procedures.

EIA study of Arjo-Didessa Dam and Reservoir Project: Evaluation of practice vs. Legislations: The EIA report of Arjo-Didessa Dam and Reservoir Project has been reviewed. Conducting the EIA study would give the signal that there is a genuine concern to identify the positive and negative impacts of the project and thereby its cumulative effect on the environmental setup of the project area. However, the study was conducted before 2007, and the final report was produced in May 2007; whereas the project construction was commenced in 2011, where the socio-economic and ecological setup of the project area during the two periods were completely different. Moreover, as the height of the dam

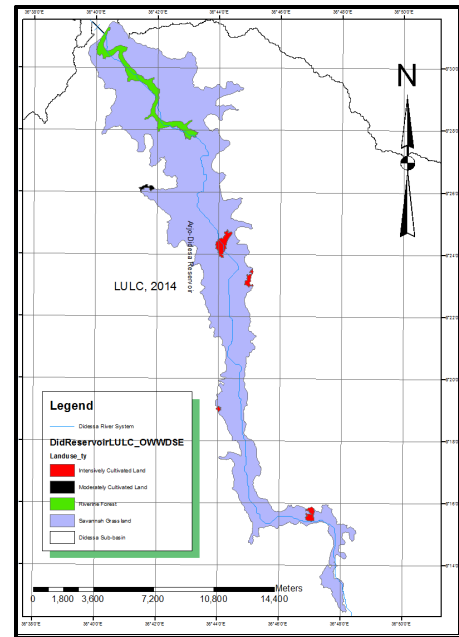


Fig. 2: Recent land use/cover map of Arjo-Didessa Reservoir Area. Source: Extracted from land use/cover map of Didessa Sub-basin (OWWDSE, 2014).

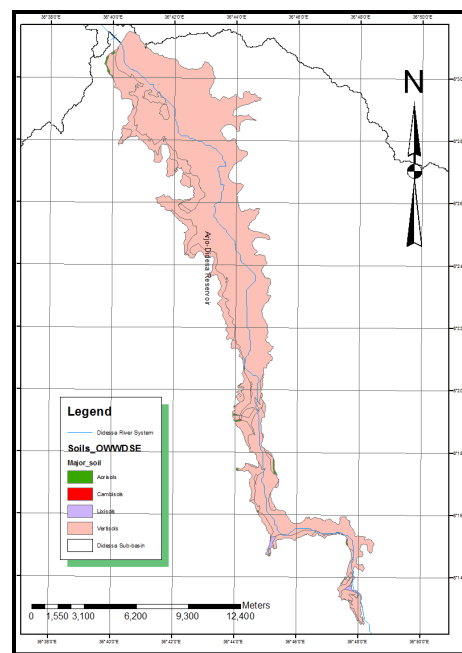


Fig. 3: Soils map of Arjo-Didessa reservoir area. Source: Extracted from the soil map of Didessa Sub-basin (OWWDSE, 2014)

which is currently under construction is 47.0 meters (7.0 meters higher than the original plan), the EIA report would apparently undermine the actual area affected by the reser-

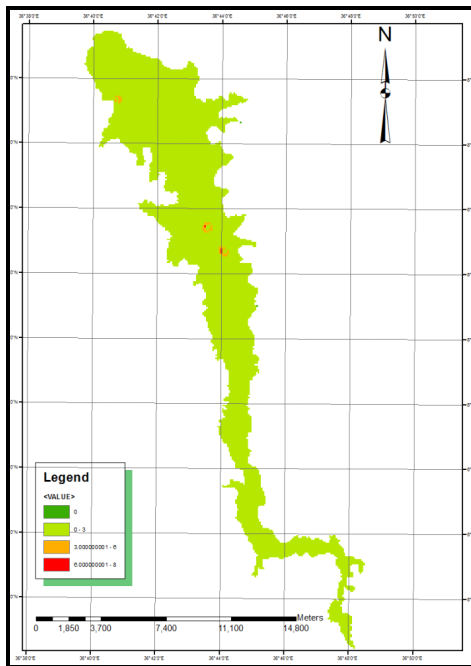


Fig. 4: Land slope of Arjo-Didessa reservoir area.

voir. The same is true with the irrigation command area. Hence, the EIA recommendations and environmental management plan (EMP) would obviously undermine the exact area which needs to be mitigated for losses due to the project.

The environmental protection laws of the country demand any project proponent to obtain project construction permit from EPA before commencing the project construction. It is evident that this is meant to ensure the elimination or minimization of the environmental crisis that might happen due to the use of natural resources and avoid unplanned project components. However, the construction of the dam has already been commenced before even revising and adjusting the EIA study of the project to the existing socio-economic and physical situations.

Among the specific policy objectives of the Environmental Policy of Ethiopia, it has been mentioned that the policy demands the full economic, social and environmental costs and benefits of natural resource development to be included in the planning. From this policy objective, it is evident that all kinds of resources at the expense of which the project/program is realized should be identified and economic analysis should be conducted, so as to ease decision making on the fate of the project/program. In the case of the EIA of Arjo-Didessa Dam and Reservoir Project, the possible impacts of the project have been outlined, and mitigation and compensatory actions have also been suggested. However, the environmental costs of the impacts have not

been worked out and no economic analysis was done. Much of the environmental impacts listed in the document and their corresponding mitigation measures are the obvious and general environmental issues related to a dam and reservoir project.

Dam projects definitely result in the interruption or alteration of the course of flow of water during and after construction. Besides, they alter water flow downstream, threatening agricultural activities on floodplains, and change normal ecological functioning of rivers at the upstream and downstream. This is a universal phenomenon that Arjo-Didessa Project as well will experience. Hence, to minimize this effect, the EIA report has suggested to consider sufficient compensation flow for downstream requirements including environmental flow requirement, but did not define how much 'sufficient' is and when.

Generally, the EIA report lacks the required quantitative evidences and analyses some of the basic EIA parameters relevant to dam and reservoir projects; for example, economic analysis, EFA, and dam-break flood wave and inundation mapping. Hence, decisions made by the environmental agency under such circumstances may suffer lack of legitimacy that the environmental legislations demand.

Among the several powers and responsibilities vested in the EPA, formulating policies, strategies, laws and standards are mentioned in the establishing proclamation. However, different guidelines on EIA, which were drafted in 2004 are still as a draft, and hence, they are not open for citation, which would mean that, to date, no formally endorsed EIA guideline is existent.

Almost all EIA rules and regulation demand public participation right from the very inception of investment/development projects/programs. On the basis of one of the specific policy objectives of the Environmental Policy, which is aimed at ensuring the empowerment and participation of the people and their organizations at all levels in environmental management activities, there is a need to engage the public in monitoring environmental changes, the formulation and implementation of EIA recommendations and the EMP. Nonetheless, it seems that the role of the communities was lessened to gathering their opinion about the project, which, by any means, cannot substitute public empowerment, and, hence it is observed that there is a missing or weakened link of public involvement in the stages of formulation and implementation of EMP.

The role of dams in the socio-economic advancement of nations is self-evident. Nevertheless, it has been witnessed in history that disasters resulting from dam-break and the resulting inundations have been tremendous. Hence, the

inclusion of dam-break analysis and inundation mapping into the EIA of the project would enable all stakeholders to take the necessary precautions against potential dam-break and the resulting disaster. However, this important parameter is missing in the EIA report of Arjo-Didessa Dam and Reservoir Project. Moreover, environmental flow (instream flow requirements) has not been determined.

Other studies have also reported that despite the proliferation of policy documents, the gulf between stated policy and actual practice is often deep. One notable instance is that despite the existence of federal legislation on the subject of water resources management (the Ethiopian Water Resources Management Proclamation No. 197/2000), water abstraction is not tightly controlled or enforced, as the inventory of water resources and users is not properly documented. Moreover, despite the good intentions stipulated in the policies and significant efforts by different stakeholders, improving agricultural water management is hampered by constraints in policy, institutions, technologies, capacity, infrastructure, and markets (Carter & Danert 2006, Awulachew 2010).

One study has also shown that in the EIA of Ethiopia, there exists inconsistency on institutional level, non-existence of complementarities between institutions, and contradiction between environmental and investment policy and proclamations and the enforcement of the EIA law (Ruffeis et al. 2010). Moreover, it has been portrayed that the community involvement in the planning, development and management of water resources systems is challenged by bypassing the steps where community engagement is crucial, or performing it below the standards. Hence, a gap yawns between legislations and practices. Ruffeis et al. (2010) also commented that as most politicians are focusing on profit maximization and short-term benefits, they recognize planning and decision-making tools, like EIA, as obstacles, contrary to the contributions of these tools towards sustainable and environmentally sound planning and construction.

In general, genuine legislations that advocate for sustainability coupled with stable institutional setup, community awareness and involvement in the water resources development, and level of commitment of all actors, etc. are the basis for sustainable water resources. The water resources and environmental management legislations of Ethiopia are formulated in a way that they can address most of the globally and nationally demanded requirements for sustainable water resources development. Nonetheless, the foregoing discussions show that the institutional setup lacks the commitment and buoyancy to enforce the laws. This has resulted in inconsistencies in accomplishing the plans at the required standard, irregularity, and sometimes discontinu-

Table 1: The 2007 land use/cover types of the reservoir area.

Sr. No.	Description	Area	
		km ²	%
1	Open Grassland	27.20	32
2	Woodland & Wooded Grassland	51.85	61
3	Riverine Forest	4.25	5
4	Swamp & Temporary Swamp	1.70	2
	Total	85.00	100.00

Source: EIA report, WWDSE (2007)

Table 2: The 2014 land use/cover types of the reservoir area.

Sr. No.	Description	Area	
		km ²	%
1	Intensively Cultivated land	1.30	1.33
2	Moderately Cultivated land	0.17	0.18
3	Riverine Forest	3.87	3.94
4	Savannah grassland	92.66	94.55
	Total	98.00	100.00

Source: Extracted from the land use/cover map of study area (OWWDSE, 2014)

Table 3: Proportion of major soils of the reservoir area.

Sr. No	Major Soil	Area km ²	%	Surface Steepness (%)	Texture
1	Lixisols	0.32	0.33	0-2	Loam
2	Acrisols	0.34	0.35	2-5	Silty loam
3	Cambisols	0.02	0.017	0-2	Silty clay
4	Vertisols	14.46	14.76	0-2	Clayey loam
5	Vertisols	3.63	3.71	0-2	Clayey loam
6	Vertisols	79.22	80.85	0-2	Loam, clayey loam
	Total	97.99	100		

ity in the enforcement of laws, and ultimately, abuse of the natural, material and human resources.

Land use/cover changes: Table 2 shows the proportion of land/use cover types of the reservoir area in 2014.

The total reservoir area at the dam crest level (maximum water level plus some buffer zone) is estimated to be about 98.6 km². About 3.94% of the area is covered by riverine forest, and about 94.55% is covered by Savannah grassland, which is presumably used as grazing grounds for livestock and habitat for wildlife. The remaining 1.51% is cultivated land. The area lying within 3 km radius of the reservoir area is estimated to be in a range of 101 km² to 113 km². This area is assumed to be part of the reservoir buffer zone, and shall be excluded from human interactions. Most of the cultivation was started in the last few years by new settlers (WWDSE 2007).

In 2007, the reservoir area (85 km² according to WWDSE, 2007) was covered with woodland and wooded grassland (61%), open grassland (32%), riverine forest (five percent) and swamp and temporary swamp (two percent). It can be observed that the land use/cover has changed to predominantly Savannah grassland in 2014. On the course of this massive land use/cover change, it is natural that wildlife associated with the original ecosystems might have migrated to some other places.

Table 3 shows the proportion of different soil classes of the reservoir area (OWWDSE 2014).

The reservoir area is predominantly composed of vertisols soil types. These soils form deep wide cracks from the surface downward when they dry out, which happens in most years. Vertisols are productive soils if properly managed (FAO 2001). The land slope of the reservoir area ranges from zero to about six percent (Fig. 4 and Table 3). This is a slope range which is typically appropriate for surface irrigation.

Settlement and resettlement: According to the 2014 land use/cover report of OWWDSE, about 1.51% of the area is intensively/moderately cultivated. Besides, as the lion's share of the area has already been changed to Savannah grassland, it can be speculated that animal rearing is being practiced in the area. This may be accounted to both self-motivated settlement and the government-backed extensive relocation of people from drought-stricken areas. About 7,000 households are directly affected by the construction of the reservoir (WWDSE 2007).

The movement of people from the highlands to Didessa Valley was triggered mainly by shortage of land and land degradation caused by population pressure. The settlement and resettlement of people has become the reason for not only the drastic change in land use/cover of the area, but also shows that the area has become the source of livelihood for several farm households.

Instream and downstream implications of the dam and reservoir project: The mean annual flow of upper Didessa River just downstream of Arjo-Didessa Dam is about 1.98 BCM (Tena et al. 2015a). The annual instream flow requirements is 0.90 BCM, while the annual demand of water due to the development is 0.391 BCM. The study has shown that the annual instream flow requirements and the water demand due to the development (19.75% of the stream flow) are fully delivered. The mean annual instream flow requirements of 5.46 BCM at the outlet of Didessa River is also fully delivered. The annual water demand at Arjo-Didessa Dam is about 3.65% of the mean annual flow of Didessa River (10.71 BCM) (Tena et al. 2015b).

Evaluation of EIA practices vs. legislations: Coherent

legislations, stable institutional arrangements and robust community involvement in the planning, design, construction and management of water resources are vital for the sustainability of the water systems. Under the Ethiopian context, the existing water resources management and environmental protection legislations are more or less comprehensive to realize sustainable water systems. However, some of the manifestations of the existence of gaps between legislations and practices are outlined below.

- There is little doubt that the awareness, commitment and participation of the community in the water systems development is not to the desired level, as some of the SSI schemes developed through financial and technical assistance from the government and donor agencies have ended up with failures of varying magnitudes, as reported by the Ministry of Agriculture, contrary to the traditional SSI schemes which have been developed through the farmers' own initiative (Belete 2006). Besides, institutional turmoil, indistinct and sometimes overlapping mandates, unclear relationships between the units at different levels are some of the drawbacks observed regarding the water sectors and environmental agencies of the government. The institutional setup is unable to enforce the existing environmental protection and water resources management legislations, as a result of which many of the issues pertinent to sustainable development are overlooked in the planning, designing and construction of water resources projects/programs.
- Sustainable water resources systems are expected to comply with the expectations of future generations, given several future uncertainties, including the uncertainty of what exactly the future generation expects to take over, and unforeseen climate change circumstances. In the case of Didessa Sub-basin, though water resources development is at an early stage, the EIA study of Arjo-Didessa Dam and Reservoir Project reveal that some of the parameters, that attribute most to sustainable water resources systems, are being overlooked.
- The ecological integrity and ecosystem services that the water resources provides, need to be integrated into the planning and design of the water system so as to avoid water allocation which favours one service over the other after symptoms of water shortage in the basin have been detected. This principle was outlined in the EIA study document of Arjo-Didessa Dam and Reservoir Project, but how much instream flow requirements should be delivered at the downstream of the dam was not specified.
- Potential dam-break and inundation mapping was not included in the EIA study of the project.
- Environmental costs, benefits and economic analysis

have not been performed.

- Sustainability of the water systems in its wholeness is the ability to provide services without ceasing, today and in the future. It is evident that while developing the resources today for the current generation, options need to be provided to meet future generations' expectation. Although the current development will somehow benefit the future generation, as witnessed from the existence of many huge water management schemes of several decades age, the future generation should still be left with an open opportunity through which they can cope up with challenges based on felt needs. This demands the current generation to interfere as minimum as possible in the water resources systems. In other words, it would be unfair to plan and execute developments to the maximum potential of the water resources in the river basin. In Didessa Sub-basin, too, these guiding principles (sustainability criteria) need to emerge at every stage of project implementation, and in all water resources development projects.

CONCLUSIONS

The environmental protection and water resources management legislations of Ethiopia are equipped with provision which can ensure sustainable water systems. Institutions which would monitor the enforcement of the legislations have also been put in place. Moreover, as EIA is made mandatory for all water resources development projects, an EIA study document is made available for the case project. These may show that the government is concerned about sustainability of water resources development in the country.

Nonetheless, there are areas where discrepancies are observed between legislations and practice. The ones identified by the study includes the disregard of some of the important EIA parameters in the planning, design and implementation of water resources development projects. Loose connection to and insufficient involvement of the communities directly affected by the project in the project planning, disregard of the environmental costs of the project and the required economic analysis, and the lack of documenting the consequences of potential dam-break and inundation, and lack of quantifying the downstream hydrological implications of the project and the required compensatory action, are some of the basic EIA decision making parameters that the EIA study document did not incorporate. Moreover, the socio-economic and physical situations which the EIA study document has addressed and the present condition are different.

In general, despite the existence of the policy and strat-

egy documents, rules and regulation with provisions that could sufficiently address the sustainability of water resources systems, the gap between the stated policies and practices on ground is often wide. Bridging the gap can be possible by capacitating and empowering the environmental protection and water resources management institutions so as to enable them enforce the legislations, and by acknowledging formal and informal (traditional) community institutions with all their ownership rights over the area so that they are positively engaged in the development and environmental management endeavours afterward.

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