Journal of Research in International Business and Management (ISSN: 2251-0028) Vol. 3(1) pp. 20-26, January, 2013
Available online @http://www.interesjournals.org/JRIBM

Full Length Research Paper

Impacts of Chotiari reservoir on environment and livelihood of local population in Sindh, Pakistan

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Abstract

Being an agro-based economy, the country depends mainly on fertile lands and *Indus* irrigation system. While the extensive expansion and unsustainable growth in the agricultural and water sectorsare rapidly degrading ecosystem and environmental services, which are undermining the rural livelihoods. The research explores root causes of poor performance of Environmental Impact Assessment (EIA) in land and water sectors, while discussing the case of Chotiari water reservoir construction. It further explores that the improper social assessments concerning Chotiari reservoir development project led to the destruction of environmental services, biodiversity, fertile agricultural lands and sustenance of local population in the region. The aim of the article is to highlight inadequacies of EIA framework in the country and to recommend good governance practices to promote regional sustainability through such infrastructural projects.

Keywords: Chotiari reservoir, Environment, Livelihood, Natural resources, Pakistan.

INTRODUCTION

In order to protect natural environment, the Environmental Impact Assessment (EIA) for infrastructural projects are imperative to accomplish sustainable development goals through better social and environmental assessment, planning and implementation of environmental management plansbut this potential is barely exploited in most of the developing nations like Pakistan (Aslam, 2006; Ahmad and Wood, 2002). The EIAstudies of all public or private projects are mandatory under Pakistan Environmental Act, 1997(Government of Pakistan, 1997). Moreover, the package of guidelines for preparation and approval of EIA for respected projects are also in place since 2000 (Government of Pakistan, 2000).The availability of guidelines does not mean the success of EIA, unless they are followed in practice (Fuller, 1999)

The aim of the article is to highlight inadequacies of EIA framework in the country and to recommend good governance in environmental management and mitigation practices to promote better environment and sustainable development through such infrastructural projects.The EIA framework of the country, with some shortcomings, has not performed well in some projects to achieve the intended purpose of sustainable development (Nadeem and Hameed, 2008; Aslam, 2006). Thus theflawed infrastructural projects have not only forced rural people to migrate, but also failed considerably to protect biodiversity (WWF, 2008b; Iqbal, 2004,). The case of Chotiari reservoir is an obvious and classic example.

The article is mainly descriptive, which discusses the case of reservoir construction in an economically and ecologically prosperous area of the Sindh province in Pakistan (Husnain et al., 2010; WWF, 2008a), which has not only devastated the natural resource dependant livelihoods of local population(Magsi, 2010), but also diminished ecological habitats (WWF, 2008; Nauman, 2003).The research explores root causes of poor performance of EIA, while discussing the case of Chotiari reservoir construction. It further explores the unilateral decision led towards the destruction of environmental services, biodiversity, fertile agricultural lands and sustenance of local population in the region.In the remainder of the paper, we outline the data collection methods, background and current situation of the

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reservoir. Then we expose the flaws in the EIA of the project as well as the depletion natural resources and their impacts on local population. Finally, discussing on the situation we give recommendations to improve the EIA of the similar projects, in-order to attain environmental protection and sustainabilityof development in the country.

METHODS: DATA COLLECTION

In order to accomplish the objectives of this study, the data were collected through various sources. Primarily, the structured interviews have been conducted from selected experts of various professional backgrounds (For this study, 32 experts have been selected, i.e., 10 from private organizations, 9 from researchers and legal advisors, 7 from administrations (water and irrigation), and 6 from affected family heads and land lords), for their opinion on this issue. Furthermore, to extract true picture of causes and consequences of the issue, secondary information was gathered through daily regional press (DRP). Therefore, the DRP are considered as an imperative source to understand the public voice on pre-, during- and post-conflict situation (Torre et al., 2010; Rucht et al., 1999; Mc Carthy et al., 1996). On the other hand, an additional secondary data for the study have been collected by analyzing published material from various public and private (national and international) organizations.

RESEARCH FINDINGS

It is much more complicated to explore the interests and involvement of multiple stakeholders from environmental impact proposals to the degradation of natural resources in the Chotiari area. Thus, in this section we are trying to give emphasis on the background as well as the current situations of the reservoir. Furthermore, the following sub-sections describe the environmental disturbances faced during and after project construction and the EIA of project and natural resource depletion of the reservoir area. Thus it helps in drawing out the different policy recommendation for improvement of EIA.

Background of the reservoir construction

In Pakistan agriculture is a major contributor of gross domestic product (GDP), which relies on the provision of irrigation water. The irrigation network widely expanded in the 20th century, to increase the cropping area and production in the country (FAO, 2002). This extensive flood irrigation-network had induced ground water to increase, which resulted in water-logging and salinity impacts, especially in the flat lands of the country in Sindh province (Alam et al., 2007).To tackle the problem, since 1960s Pakistan in assistance with World Bank and other donors, has been working to drain the effluents from the Indus basin.

During 1980s government revealed that a sustainable and environmentally sound strategy was needed to remove accumulating salt and salinity in the Indus basin. Under the strategy, the Left Bank Outfall Drainage (LBOD) project was executed at the tail end of the Indus to provide drainage in three districts of the country. The project was financially assisted by the World Bank (World Bank, 1984). The drainage was not only main purpose of the project, but the project was expended over other components, such as construction of Chotiari reservoir, which is located in south of the country (see figure 1), and remodeling of the existing Nara canal. Finally, the authorities approved the Chotiari water reservoir project in 1994 (Government of Pakistan, 1993).

The Chotiari reservoir

Chotiari is an ecologically rich area and unique wetland complex. It is characterized by mosaic of diverse habitats of riverine forest, fresh and brackish water lakes, agricultural lands, rangelands, sand dunes scrub, reed beds and swamps. Despite a very hot and arid climate the site is biologically most diverse and rare in the region. The region has high ecological significances as it is home to many internationally migrated and endangered species (Raza, 2009). The Chotiari reservoir is still the home to 14 species of large and 19 species of small mammals, 109 species of birds, 58 species of reptiles and amphibians and about 53 species of freshwater fish (WWF, 2008b). Besides that there are various surveys by different organizations and researchers reported that Chotiari could be the largest reserve of marsh crocodiles (*Crocodylus palustris*) (Husnain et al., 2010; WWF, 2008b, WWF, 2007), and touristic resort in the country (Laghari, 2001).

The Chotiari reservoir project is designed to increase the storage capacity of existing lakes in the Chotiari wetland area, which is inflated over 18,000 hectares. Primarily, it was designed to store Indus flood water during the flood seasons from June to September, and to release the water to lower Nara Canal during winter season from December to March as well as during early summer from April to June. Its main goal was to irrigate about 0.12 million hectares in the country. The capacity of the reservoir was increased to retain 0.75 million acre-feet (MAF) of water, which will flood an area of approximately 160 square kilometers (Government of Pakistan, 1993).The construction cost of the reservoir escalated to over approximately US $ 105 million, compared to the previous estimate of approximately US $

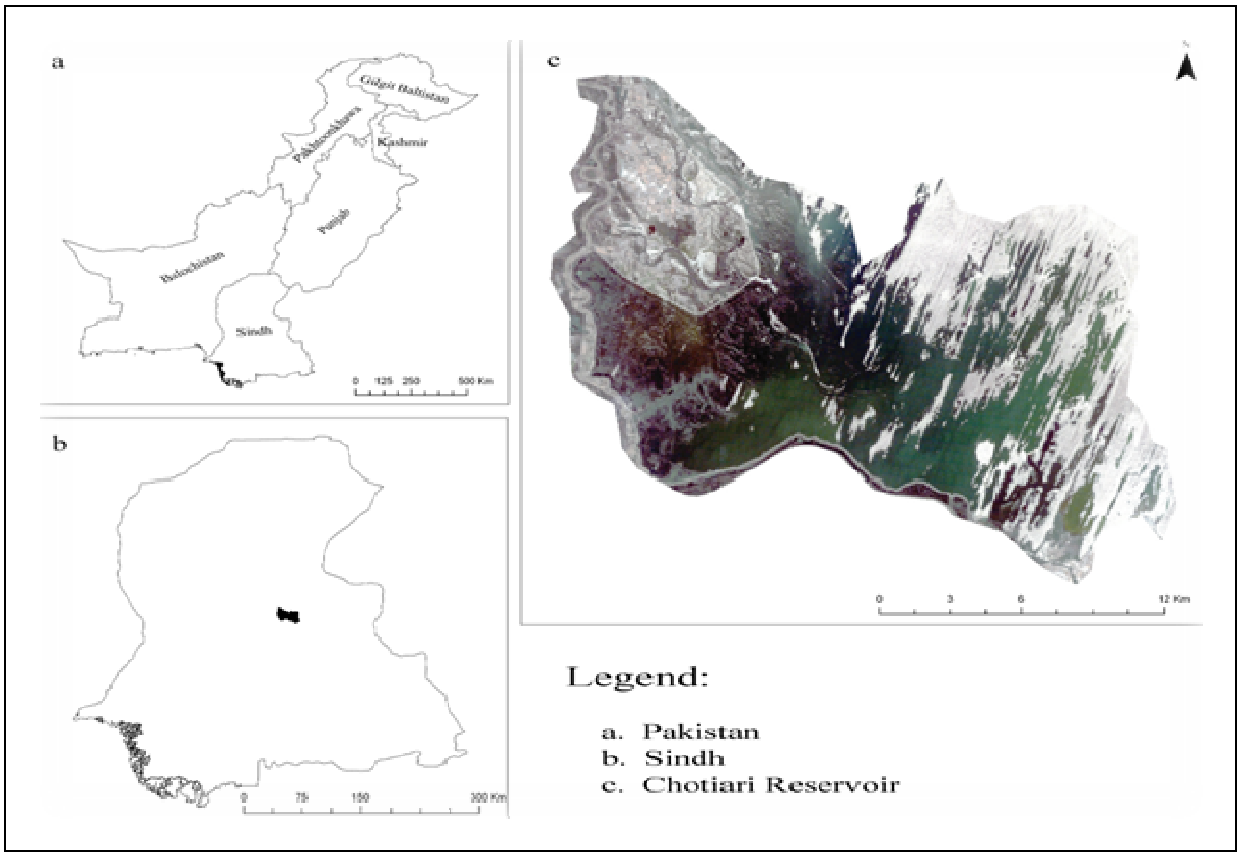

Figure 1. Location of the Chotiari water reservoir

26.3 million that was made when the project was expected to be completed in 1997 (UNEP, 2004). The financial assistance of this project mainly came from World Bank and partially by Saudi Funds for Development (Abro, 2001).

During construction period several times the donor agencies stopped funds, when the use of sub-standard materials and massive irregularities were detected. Moreover, the opposition of local communities (Shah, 2007; Mangrio, 2005) exposed that the proposed work has been planned in a top-down fashion without any consultative process. In fact, due to ineffectual planning and corruption the project was delayed by five years up-to December 2002 and inaugurated on February 2003 (Iqbal, 2004).

Current situation of the reservoir

The project has not only generated significant ecological impacts, but also resulted in immediate and long-term socio-economic consequences on local communities, i.e., farmers, fishermen, herders (which were main economic actors of the region) and other local population. Habitats of unique fauna and flora suffered from substantial losses and became fragmented. Excessive storage has submerged and destroyed the riverine forest and similar impact has been observed on rangelands that resulted in the loss of biodiversity and fodder. Thus, this rise in water table also became a source of seepage and water-logging, which is contributing to the destruction of adjacent agricultural lands. Almost in western and southern areas the good arable land is now being surrounded by saline waste water.

The major activities to earn livelihood of local population (fishing, agriculture and livestock keeping) have been adversely affected. As results, the increasing water not only inundated 47 villages and pastures, but caused displacement of about one thousand (According to the experts, the counting of displaced families became another conflict between government and local community based organizations (CBOs), where Government of Sindh has declared that 594 families were displaced but local CBOs has declared that there were 993 families who has directly affected by the project) families with their livestock.The project further exacerbated negative impacts on the habitats, fish catch, agricultural lands, , fodder for livestock, forest and associated biota that have been a major livelihood source For the area indigenous people (see figure 2) (Raza,

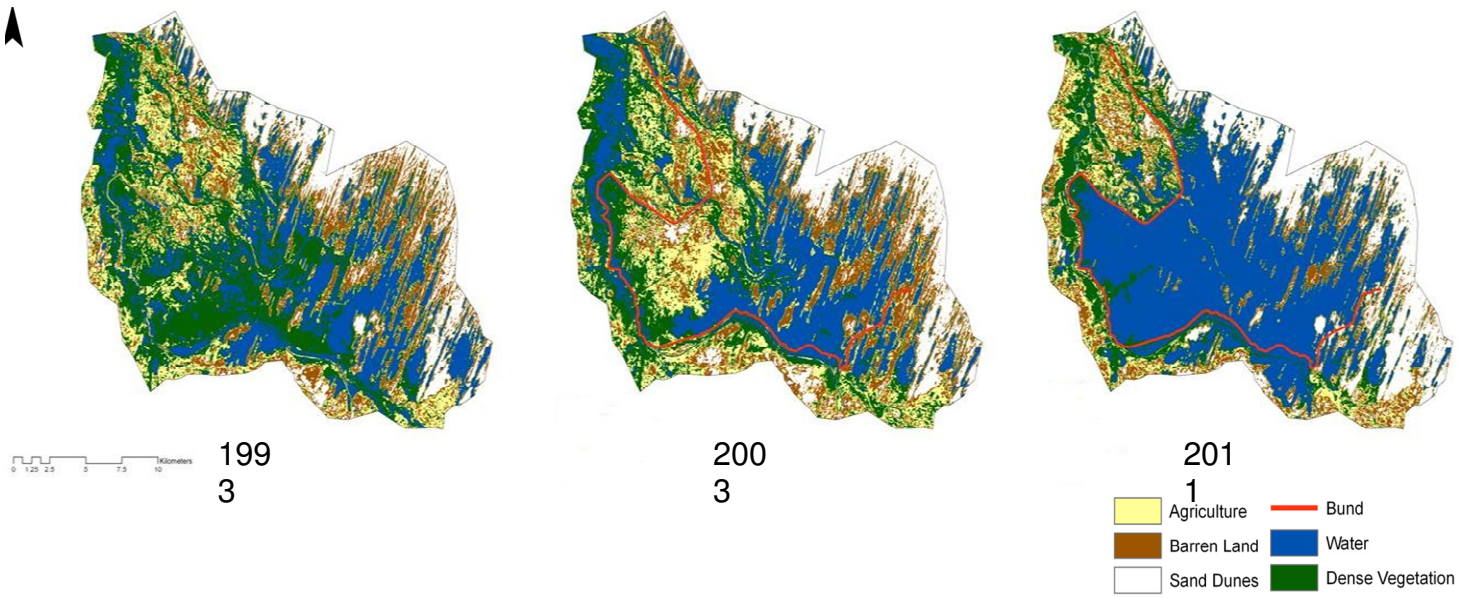

Figure 2. Increasing water and exacerbation of agricultural land and other natural resources
Source: Landsat, April 2011.

2009).

It was claimed that the reservoir at its full capacity would irrigate 60,700 hectares of land for winter cropping. But through the geographic image analysis it is shown that the rise in water level has destroyed about 30,000 hectares of cultivable land in and around the reservoir. Considering other factors (rangelands destruction, fish depletion, deforestation and biodiversity loss, water-logging) one can envisage that the economic losses for this development are much higher than its benefits.

Environmental impact assessment of the Chotiari reservoir project

In Pakistan the EIA studies of the projects are carried out, but have not seemed to be effectively implemented to protect socio-economic and environmental foundation of the corresponding communities (Aslam, 2006). Likewise, the environmental impact study of Chotiari reservoir identified that beside human population the wildlife would be affected or destroyed, i.e., habitats for a rich variety of fish, birds, reptiles and mammals in deep and shallow pools of wetlands, aquatic margin vegetations, reed bed swamps and woodlands (Government of Pakistan, 1998).

However, it failed to carry out a proper survey or assessment of adjacent wetlands where the displaced wildlife was expected to migrate. Local experts doubt about the surrounding areas of the reservoir, in which carrying capacity of wildlife safety is being destroyed due to rise in water. Therefore, there were two other shortcomings of the EIA that it neither included an evaluation of alternatives to the proposed reservoir nor the historical or cultural heritages of the area. The Chotiari project could be addressed with the possibility of improvements in the existing system of lakes and canals combined by proper de-silting to rehabilitate or restore an old designed system, which were functional since 1932. On the other hand the reservoir area is supposed to be biggest crocodile's home in Pakistan (WWF, 2008b), and more revenue could be generated then of its cost by promoting tourism (Laghari, 2001).

Thoughthe EIA report reasonably established the baseline of the site yet it faced many shortcomings in impact identification, prediction and mitigation. It identified some risks to Hog Deer and other key species of the site due to destruction of their habitats but failed to figure out any suitable mitigation. It did not provide the survey of adjacent habitats nor determine their carrying capacity for relocation of displaced fauna, yet the availability of adjacent habitats were given as justification for habitat loss (Nauman, 2003). The EIA report of the project shows that the reservoir enlargement probably benefited crocodiles and waterfowl. This statement is doubted as seasonal flooding of the reservoir could destroy the nesting and eggs of crocodiles (Santiapillai and Silva, 2001). Whereas, waterfowl like to be submerged in reed beds and swamps, while as they are not adapted to enlarged lakes or increase in water (Iñigo et al., 2008).

The report absolutely failed to identify indirect and secondary impacts on biodiversity. Many resident birds lost their tree nesting due to submergence of the forest. Similarly the Hog Deer habitat carrying capacity is undermined due to increased pressure of grazing owing to rangelands inundation in the reservoir. Majority of the experts have opined that the EIA completely neglected to evaluate any alternative site or option. It did not justify the

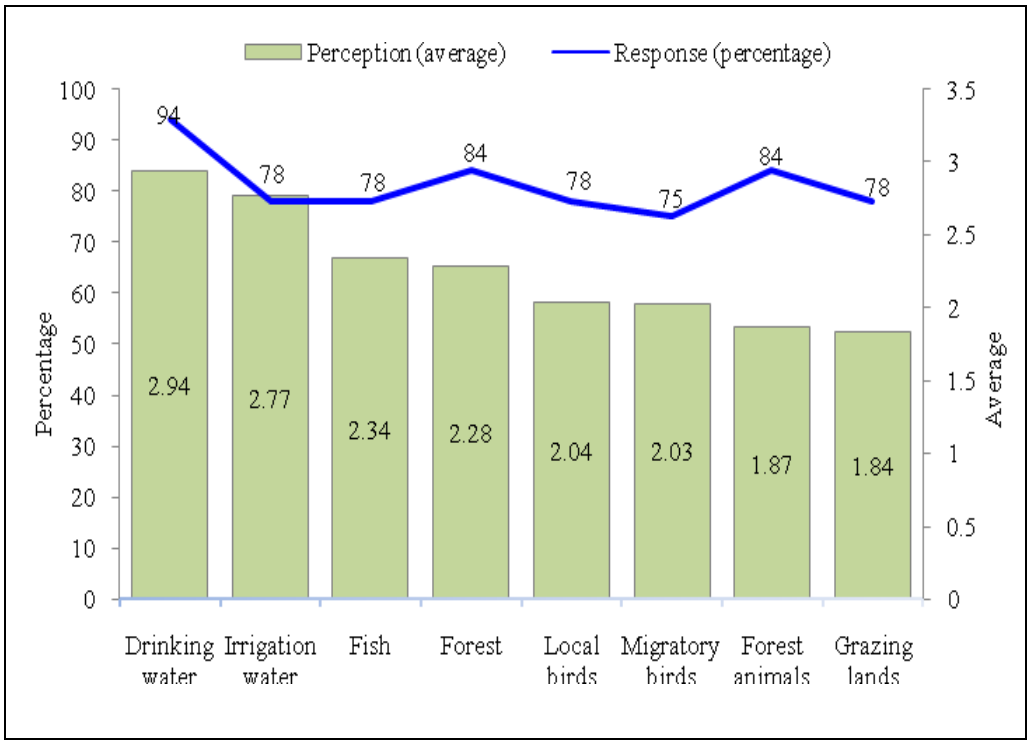

Figure 3. Degradation of natural resource
Source: Authors calculation from expert opinion survey (2010)

reservoir construction at the site, which is prone to high evaporation rate and seepage (as we see from figure 2).

Degradation of natural resources

Beside the socio-economic consequences (Magsi, 2010) the project has long term impacts on natural resources. In addition, local communities used to generate their sufficient income from marginalized resources, where the reservoir has not only adversely affected the habitats and associated biota, but also given birth to poverty among the displaced communities. For example, displacement of families without relocation and compensation (Mangrio, 2005) deforestation of Makhi forest, destruction of ecological beauty of wetlands, as well as increasing stress on flora and fauna of the area (Raza, 2009). Therefore, the substantial increase in the water level has drowned grass species, trees and the complex ecosystem around the lakes (Siddiqui, 2009). However, neither the devastation of such natural environment is adequately addressed by the authorities (WWF, 2008), nor a proper survey has been carried out (Shah, 2007).

Analysis of data collected via the expert opinion survey and daily press reveals the extent of degradation of various natural resources during last five years (see figure 3). Response rates (percentage of respondents) and their average (mean) perceptions have been reported.In this regardwe have asked a research statement or hypothesis; “are natural resources sharply degraded during last five years with the commencement of reservoir?"In order to analyze the responses from experts in a psychometric scales we have used Likert type scale (A commonly used approach to measure responses in psychometric scales in survey research (Likert, 1932) i.e., the symbol 1 for strongly agree; 2 for agree; 3 for undecided; 4 for disagree and 5 for strongly disagree.

Above figure indicates that majority of the respondents were undecided about the drinking and irrigation water whether the quality and quantity of water has been degraded or not in last five years. On the other hands the questions concerning about the depletion of other natural resources, the respondents expressed their views as they were agreed, about the decline in fish catch and depletion Makhi forest and forest life, local as well as migratory birds and grazing lands.The above estimates exposes that local population around the reservoir have much concern about natural environment (forest, animals, birds and grazing lands), which have been depleting due to the reservoir construction.

The analysis of DRP shows that project has dispossessed and displaced all of the families from the region, which were depending over the natural resources of Chotiari wetlands, during construction period.For example, fishing in the existed lakes, cultivation of crops inside the reservoir, collection of firewood and honey from the Makhi forest, grazing animals on lake fringes,

entertaining the tourists in the region, etc. As the results, after construction the reservoir started depleting natural resources gradually. Since the degradation of natural resources, majority of experts have opined that highest estimated income loss was recorded for agriculturists because they lost everything. The experts and the DRP equally put stress on the loss of income of fishermen, because fishing was the major source of income of majority of the households, followed by the loss of income of forest dependants, herders and tourist entertainers in the region.

DISCUSSION AND CONCLUSION

In developing countries many loopholes and weaknesses have been identified in EIA framework and practice, which leaded towards flawed decision making (Ahmad and Wood, 2002), where Pakistan is not an exception in this regard. Consequently,EIA does not appear to be an effective tool to safeguard the environment and the socio-economic fabric of the communities in Pakistan (Aslam, 2006). Therefore, federal and provincial environmental agencies and departments under ministry of environment are responsible for review and approval of both public and private projects. The same agencies are also responsible for updating of environmental legislation and preparation of necessary guidelines (Government of Pakistan, 1997).

The Chotiari reservoir is one of many projects executed in the country in which EIA has failed to address the issues of biodiversity, sustainability of natural resources and socio-economic rights of local communities (Husnain et al., 2010). The project EIA can be characterized by absence of alternative analysis, poor evaluation of socio-economic, environmental impacts and non-compliance of mitigation measures.No doubt the country's legislative and guideline packages are much comprehensive but the obstacles to produce desired quality EIA of development projects like Chotiari include the following;

- inadequate evaluation of alternatives,
- poor and inadequate guidelines on methodology of impact scoping especially on impact identification and predictions,
- inadequate capacity of agency and departments to review and analyze the reports,
- weak implementation of mitigation and offset measures for socioeconomic and environmental degradation,
- inefficient coverage and follow-up procedures,
- unavailability of baseline data and information especially about environmental values, including biodiversity,
- no assignment of economic or intrinsic value to ecology while evaluating the project costs,
- biased EIA reports for favoritism by consultants due to interest lies in projects,
- influence of powerful lobbies/ landlords on decision making to construction of public sector development projects, etc.

RECOMMENDATIONS

The legal framework for EIA in country is strong enough (Nadeem et al., 2008) and with inclusion of follow up procedures can be tapped to result in desired quality with the protection of economic, social and environmental norms. Due to the non-follow-up procedure EIA, the Chotiari project is losing its natural resources, which is a significant impact ion livelihood. In order to reverse the ecological disaster at Chotiari reservoir, there is need to focus on promotion of sustainable fishing practices, recovery of endangered species, sustainable rangeland management, management and control of water-logging and reforestation for the growth and improvement of livelihood of local population.

It needs strong political will and institutional capacity to take action against violators of EIA. The following measures can be taken to improve the quality of EIA for better decision making to attain environmental sustainability;

- Capabilities of EIA directorate of environmental protection agency (EPA) should be enhanced, where adequate and qualified staff should be appointed. More powers and resources should be provided to directorate for better inspection and monitoring.
- By involving NGOs and academia in review process for better analysis of proposals.
- Registration, certification, rating and ranking of consultants will promote a culture of competition, which can lead to quality reports. If the consultants coupled through training workshops and seminars by national and international experts will certainly help in achieving the desired goal of sustainability.
- During EIA preparation the consultant and proponents should be encouraged to involve in local communities, in order to avoid unilateral decisions.
- During construction, follow-up-procedure should strictly be adopted.
- Awareness about the importance and environmental valuation should be promoted among all stakeholders of the project.
- Local communities to be authorized to raise petition to the courtsin case of violation of environmental norms.

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