

The effectiveness of Environmental Impact Assessment on Infrastructural development projects: the case of Chotiari reservoir in Sindh, Pakistan

Habibullah Magsi ^{1,2, #} and **André Torre** ¹

¹ UMR SAD-APT, INRA AgroParisTech, France

² Agricultural Economics, Sindh Agriculture University Tando Jam, Pakistan

Corresponding Author

Tele: (33)630437374; Fax: (33)144081657. E-mail: habib.magsi@agroparistech.fr

ABSTRACT

Being an agro-based economy, Pakistan depends mainly on fertile lands and Indus River irrigation systems. The extensive expansion and unsustainable growth in this sector is rapidly degrading ecosystem and environmental services, which leads to undermine the rural livelihoods. This research explores root causes of poor performance of Environmental Impact Assessment (EIA) in this sector, taking the case of Chotiari water reservoir construction as an example. It further explores the outcomes of the unilateral decisions taken towards development projects which had 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, EIA, Environment, Livelihood, Natural resource, 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 governance, but this potential is barely exploited in most of the developing nations like Pakistan (Aslam, 2006; Ahmad and Wood, 2002). The study of EIA of all public or private projects is mandatory under Pakistan Environmental Act 1997 (Government of Pakistan, 1997). Moreover, the package of guidelines for preparation and approval of EIA for respected projects was released later in 2000 (Government of Pakistan, 2000); Therefore, 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 practices to promote regional sustainability through such infrastructural projects. The EIA framework of the country has not performed well in some projects to achieve the intended purpose of sustainable development (Nadeem and Hameed, 2008; Aslam, 2006). Thus the flawed infrastructural projects have not only forced rural people to migrate, but also failed considerably to protect biodiversity (WWF, 2008b; Iqbal, 2004).

The article is mainly descriptive in parts, 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, 2012), 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 decisions 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, the data collection methods, background and current situation of the reservoir are outlined. The flaws in the EIA process is then exposed which had led to the depletion natural resources and the adverse impacts on local population. Finally, recommendations are given to improve the EIA of the similar projects, in-order to attain environmental sustainability in the country.

Methods: Data ollection

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 backgrounds¹, 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 press² (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.

Results and Discussion

It is much more complicated to explore the interests and involvement of multiple stakeholders from environmental impact proposals to the degradation of natural

¹ 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.

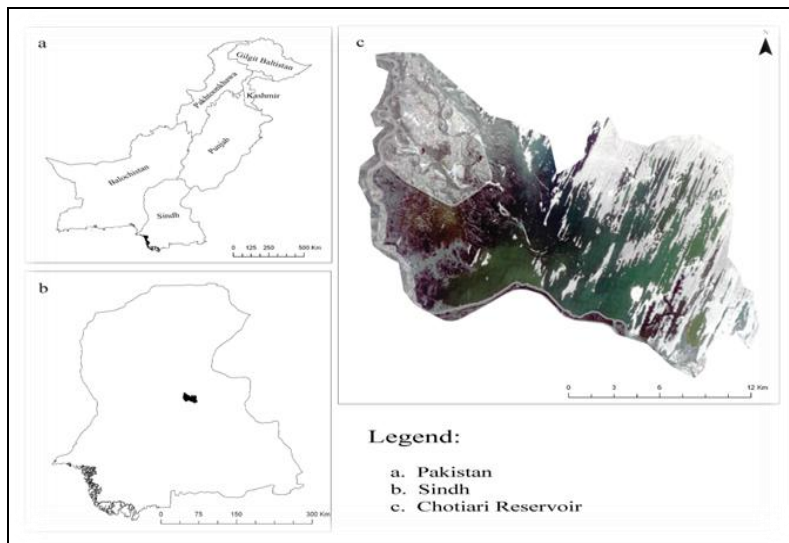
² To review daily regional press we have selected 10 local newspapers out of 21, which publishes in local languages and 6 national newspapers out of 30, which publishes in Urdu and English languages, since 1997 to 2011.

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, 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 map 1), and remodeling of the existing Nara canal. Finally, the public authorities have approved the Chotiari water reservoir project in 1994 along with LBOD (Government of Pakistan, 1993).



Map 1: Location of the Chotiari water reservoir

The Chotiari Reservoir

The Chotiari reservoir project is designed to increase the storage capacity of existing lakes in the Chotiari wetlands 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 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 is 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 is likely to escalate to over approximately US \$ 105 million, compared to the previous estimate of approximately US \$ 26.3 million that was made when the project was expected to be complete in 1997 (UNEP, 2004) where financial assistance of this project mainly born by World Bank and partially by Saudi Funds for Development (Abro, 2001).

During construction period several times the donor agencies have stopped funds, when the use of sub-standard materials and massive irregularities were detected, even though a monitoring committee was formulated priors to the project approval. Moreover, the opposition of local communities has exposed that the proposed work has been planned in a top-down fashion without any consultative process (Shah, 2007; Mangrio, 2005). Majority of the experts opined that project is poorly planned and no proper feasibility study was carried out to establish the reservoir, with no proper extent of its adverse impacts. They further argued that local population raised their voice against mismanagement in land acquisition and misuse of funds allocated for land compensation to the farmers by public officials. 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; Nauman, 2003).

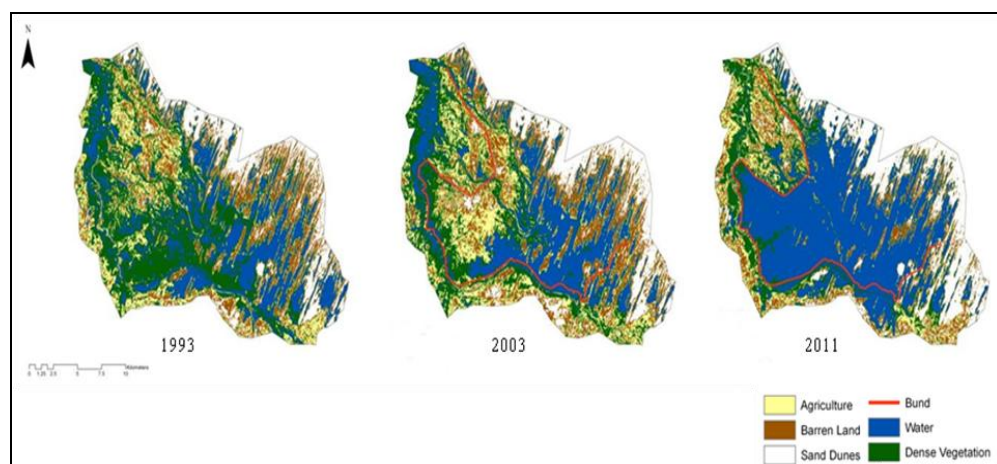
Chotiari is an ecologically rich area and unique wetland complex. It is characterized by mosaic of diverse habitats of riverine forest, fresh and brackish water lakes, agricultural lands, rangelands, sand dunes scrub, reed beds and swamps. Despite a very hot and arid climate the site is biologically 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).

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.

As results, this increasing water has not only inundated 47 villages and pastures, but caused displacement of about one thousand³ 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 map 2) (Raza, 2009).



Map 2: Increasing water and exacerbation of agricultural land and other natural resources

Source: Captured through Landsat, April 2011

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 of *Makhi* forest, biodiversity losses, and water-logging) one can envisage that the economic losses for this development are much higher than its benefits.

Environmental Impact Assessment of Chotiari Reservoir Project

³ 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.

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). Similarly, in the case of Chotiari reservoir it failed to carry out a proper survey or assessment of adjacent wetlands where the displaced wildlife is expected to migrate and survive. 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. Besides that, 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 are 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 than of its cost by promoting tourism (Laghari, 2001).

The EIA report was not quite sound in establishing the baseline of the site and faced many shortcomings in impact identification and prediction. However 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). Majority of the experts have opined that the EIA completely neglected to evaluate any alternative site or option for endangered species. It did not justify the reservoir construction at the site, which is prone to high evaporation rate and seepage (as we see the result from figure 2). The EIA report of the project shows that the reservoir enlargement would benefit crocodiles and waterfowl. This statement is doubted as seasonal flooding of the reservoir can 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).

Degradation of Natural Resources

Beside the socio-economic consequences the project has long term impacts on natural resources. The reservoir has not only adversely affected the habitats and associated biota, but also given birth to poverty among the displaced communities (Magsi, 2012). For example, it became the cause of displacement of local 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 public authorities (WWF, 2008; UNEP 2004), nor a proper survey has been carried

out (Magsi, 2012; Shah, 2007). 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 since generations. Major economic activities of the local population were fishing in the existed lakes, cultivation of crops inside the reservoir, collection of firewood and honey from the Makhi forest inside the reservoir area, 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 loss⁴ 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.

Furthermore, the analysis of data collected via the expert opinion survey and DRP reveals the extent of degradation of various natural resources during last five years (see figure 1). Response rates (percentage of respondents) and their average (mean) perceptions have been reported. In this regard we 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 scale⁵ i.e., the symbol 1 for strongly agree; 2 for agree; 3 for undecided; 4 for disagree and 5 for strongly disagree.

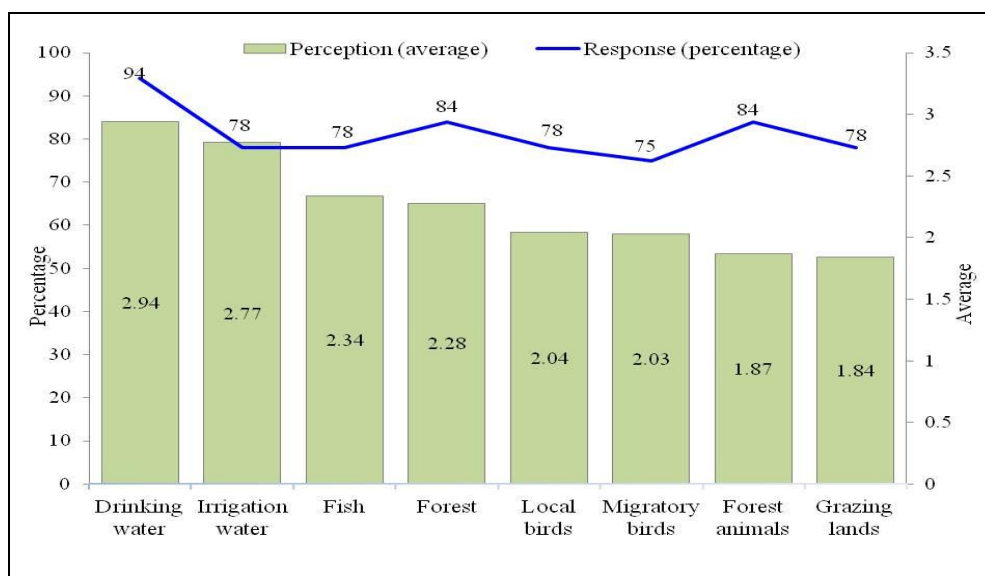


Figure 1: Degradation of natural resource

⁴ Before the Chotiari reservoir settings the average per month income of each family was computed as Rs. 6619 (approximately US \$ 80) (WWF, 2008). Fortunately, the amount is not as big as to pass a luxurious life, but is sufficient for a family lived in a rural area.

⁵ A commonly used approach to measure responses in psychometric scales in survey research (Likert, 1932).

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.

Conclusion

In developing countries many loopholes and weaknesses have been identified in EIA framework and practice, which led 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.

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,
- inefficient coverage and follow-up procedures, with inadequate capacity of concerned agencies and departments to review and analyze the EIA reports,
- weak implementation of mitigation and offset measures for socioeconomic and environmental degradation,
- unavailability of baseline data and information especially about environmental values, including biodiversity, in order to calculate environmental cost benefits,
- no assignment of economic or intrinsic value to ecology while evaluating the project costs,
- selection of biased EIA reports to give favor to contractors (by consultants) due to hidden interests 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 on 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 technical evaluation committee for efficient review and analysis of the project 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 process the consultant and proponents should be encouraged to involve in local communities, in order to avoid unilateral decisions.
- During construction, the monitoring committee should adopt a follow-up-procedure according to the monitoring plans.
- 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 courts in case of violation of environmental norms.

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References

- Abro, A. A. (2001). Chotiari Reservoir: Resettlement Action Plan. In: DevFound (Eds.) *At Odds or At Ease? NGOs and Local Communities in World Bank Supported Projects in Pakistan*. Islamabad. 66-86.
- Ahmad, B. and C. M. Wood (2002). "A comparative evaluation of the EIA systems in Egypt, Turkey and Tunisia" *Environmental Impact Assessment Review*, 22: 213-34.
- Alam, U., P. Sahota and P. Jeffrey (2007). "Irrigation in the Indus basin: A history of unsustainability?" *Water Science & Technology: Water Supply*, 7(1): 211-218.
- Aslam, F. (2006). Environmental impact assessment system in Pakistan – overview, implementation and effectiveness. Master thesis. Stockholm: KTH Royal Institute of Technology.
- FAO (2002). "Pakistan- Development of Research Program in Irrigation and drainage". United Nations Food & Agricultural Organization, Program formulation report n° 9, April 2002.
- Fuller, K. (1999). Quality and quality control in environmental impact assessment. In Petts, J. (eds.) *Environmental impact assessment in practice: impact and limitations*. Oxford: Blackwell. 55–82.
- Government of Pakistan (2000). Pakistan environmental protection agency (review of IEE and EIA) regulations, Islamabad.
- Government of Pakistan (1998). Environmental Management and Monitoring plan. LBOD Stage 1 project. Water and Power Development Authority, April 1998.
- Government of Pakistan (1997). Pakistan environmental protection act, 1997: Gazette of Pakistan. Islamabad.
- Government of Pakistan (1993). Resettlement Plan and Environmental Impact Assessment for Chotiari Reservoir and Nara Remodeling. LBOD Stage I project. Water and Power Development Authority, December 1993.
- Husnain, M., W. Wende, and E. Bruns (2010). Impacts on the Environment and Biological Diversity of Chotiari Reservoir in Pakistan. 30th Annual Meeting of the International Association for Impact Assessment, 6-11 April 2010.
- Iñigo, A., B. Barov, C. Orhun and U. Gallo-Orsi (2008). Species action plan for the Marbled Teal *Marmaronetta angustirostris* in the European Union. Bird Life International, p 12.
- Iqbal, N. (2004). Affecteds of Tarbela and Chotiari Dams: A struggle for social justice. United Nations Environmental Program. Addressing Existing Dams, Issue based workshop, 14-15 June 2004. p 69-72.
- Laghari, A. (2001). Bakar, a tourist resort thrown to disaster. DAWN International, 1 February 2001. Available from <http://news.dawn.com/wps/wcm/connect/dawn-content-library/dawn/new> [Accessed 14 February 2010].
- Likert, R. (1932). "A technique for the measurement of attitudes" *Archives of Psychology*, 22(140): 1-55.
- Magsi, H. (2012). "Development Projects and Land use Conflicts in Pakistani rural settings – An Analysis" *International Journal of Rural Studies*, 19(1): 3-7.
- Mangrio, M. (2005). Brief history of Chotiari reservoir project. Report Sustainable development foundation. Sanghar Pakistan.
- McCarthy, J. D., C. Mc-Phail and J. Smith (1996). "Images of protest: dimensions of selection bias in media coverage of Washington demonstrations, 1982-1991" *American Sociological Review*, 39: 101-112.
- Nadeem, O. and R. Hameed (2008). "Evaluation of Environmental Impact Assessment System in Pakistan" *Environmental Impact Assessment Review*, 28: 562-571.
- Nauman, M. (2003). "Ravaged Ecology, Cruel Displacement and Impoverished Livelihoods" *Water Nepal*, 9(½): 313-318.

- Raza, A. (2009). Chotiari threatened by water reservoir. The NEWS International, November 12, 2009. Available from: <http://www.thenews.com.pk/TodaysPrintDetail.aspx?ID=208120&Cat=5&dt=11/21/2009> [Accessed 27 February 2010].
- Rucht, D. and F. Neidhardt (1999). Methodological Issues in Collecting Protest Event Data: Unit of Analysis, Sources and Sampling, Coding Problems, in Rucht, D., Koopmans, R. and Neidhardt, F. (Eds.) Acts of Dissent: New Developments in the Study of Protest, Lanham, Rowman and Littlefield Publishers.
- Santiapillai, C. and Mangala de Silva (2001). "Distribution and Conservation of Crocodiles in Srilanka" *Biological Conservations*, 97(3): 305-318.
- Shah, Z. (2007). In the name of development, The NEWS International, 14 January. Available from: <http://www.jang.com.pk/thenews/jan2007-weekly/nos-14-01-2007/spr.htm#6> [Accessed 27 February 2010].
- Torre, A., R. Melot, L. Bossuet, A. Cadoret, A. Caron, S. Darly, P. Jeanneaux, T. Kirat and H. V. Pham (2010). "Comment Evaluer et Mesurer la Conflictualité liée aux Usages de l'Espace? Eléments de méthode et de repérage" *VertigO-la revue en science de l'environnement*, 10(1): 1-26.
- UNEP (2004). Dams and Development Projects. United Nations Environmental Program. Issue based workshop proceedings, June 14-15 2004.
- World Bank (1984). Staff Appraisal Report on Pakistan Left Bank Outfall Drainage Project. November 1984.
- WWF (2007). Preliminary Baseline Environmental Assessment Report of Indus for All Program Sites. Indus Eco-region Conservation Program 2007.
- WWF (2008a). Socio Economic Assessment Study: Indus for All Program. Management and Development Centre, Hyderabad, Pakistan 2008.
- WWF (2008b). Detailed Ecological Assessment of Fauna including Limnology studies at Chotiari Reservoir. Indus for All Program under Indus Eco-region Conservation Program 2008.