An Overview of Environmental Impact Assessment Study of Swan River Flood Management Project-II, District Una, Himachal Pradesh, India

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Abstract

Environmental Impact Assessment (EIA) appraise and predicts the impacts of a proposed project or action on human well & being, as well as the well-being of ecosystems on which human survival depends. Environmental Impact Assessment (EIA) is one of the major instruments integrated with a goal of making economic development project, environmentally sound and sustainable. The main objective of this paper is to give a combined and integrated overview of environmental, economic and social impact assessments of Swan River Flood Management Project-II. The Swan River of district Una, Himachal Pradesh, once, was known as River of sorrow as during monsoon period the flood creates havoc in District Una. During past 10-12 years loss of property due to floods in river Swan has been estimated as more than Rs. 1,666 million. Human and livestock loss has been to the extent of 50 and 236 numbers respectively. But it was taken under the reclamation process by Swan River Flood Management and Integrated Development Project and turned to the gift for district. This would revolutionise the economy of the farmers of Una district as it would result in raising of 1,500 metric tonnes of fish, 14,450 metric tonnes of food-grains, pulses, vegetables and 7,700 metric tonnes of fruits every year besides mitigating miseries caused due to floods to life and property both. This paper is an overview of EIA study of Swan River Flood Management and Integrated development Project-II. The EIA study gives the maximum thrust to the impacts on water environment and its cascading effects on the biotic as well as abiotic environment.

Keywords: *EIA, Environment, Sustainable, Flood Management, Economy*

Introduction

With the tropical climate and unstable landforms, coupled with high population density, poverty, illiteracy and lack of adequate infrastructure, India is one of the

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most vulnerable developing countries to suffer very often from various natural disasters, namely drought, flood, cyclone, earth quake, landslide, forest fire, hail storm etc. which strike causing a devastating impact on human life, economy and environment. However, if we are adequately prepared with disaster management, it is possible to severely reduce the impact of a disaster. The impact can be reduced through a good understanding of preventive actions, as well as having the knowledge of certain life-saving tools and techniques, which when used at the time of the event of disaster can control the total damage to life and belongings. Environmental Impact Assessment is the official appraisal process to identify, predict, evaluate and justify the ecological, social, and related biophysical effects of a proposed policy, program or project on the environment and plays a very significant role in any disaster management project. The overall objective of the EIA is to design developmental projects and activities taking into consideration the environmental perspective. India is the worst flood-affected country in the world after Bangladesh and accounts for one-fifth of the global death count due to floods. About 40 million hectares or nearly 1/8th of India's geographical area is flood-prone.

The River Swan flows through district of Una and after traversing a distance of 85 km, it confluences with River Satluj at Anandpur Sahib in Punjab. The catchment of River Swan is largely degraded due to significant human interferences. The forests have been cleared to meet the fuelwood, fodder and timber requirements, or for commissioning of various infrastructure projects. This has led to serious drainage problems. As a result, the entire precipitation results in rapid flow into the tributaries. It results in flash floods leading to heavy floods. During past 10-12 years loss of property due to floods in river Swan has been estimated as more than Rs. 166.6 crore. Human and livestock loss has been to the extent of 50 and 236 numbers respectively. Because of such misery caused by the swan river, it was called Sorrow of Una.

Considering the misery of the people, a flood control scheme envisaging construction of embankments on both banks of Swan River was conceived. In Phase-I the embankments were proposed to be constructed in the lowest reach of the river. The bed slope in the stretch is 1:1160. The State Government of Himachal Pradesh has now decided to undertake flood protection works between Gagret Bridge to Jhalera Bridge for a stretch of about 28.34 km. This will enable

reclamation of about 5,000 ha of land.

Methodology

The paper is based on the review of the relevant literature and internet sources on Flood management and overview of the EIA studies that are available on internet. That was supplemented with content analysis of secondary data and information from official publications and other related literature. The present paper covers the specific aspects of EIA which deals only with prevention of long term disaster impacts and flood management.

Location

District Una is situated on the bank of Swan River and spans between 75°58'2" - 76°28'25" East longitude and 31°17'52" - 31°52'0" North latitude. River flows from North to West direction. The river Swan originates from Joh-Marwari village near Daulatpur Chowk in Amb tehsil (nearly 35 km from Una) in district Una, Himachal Pradesh (Figure 1 & 2).

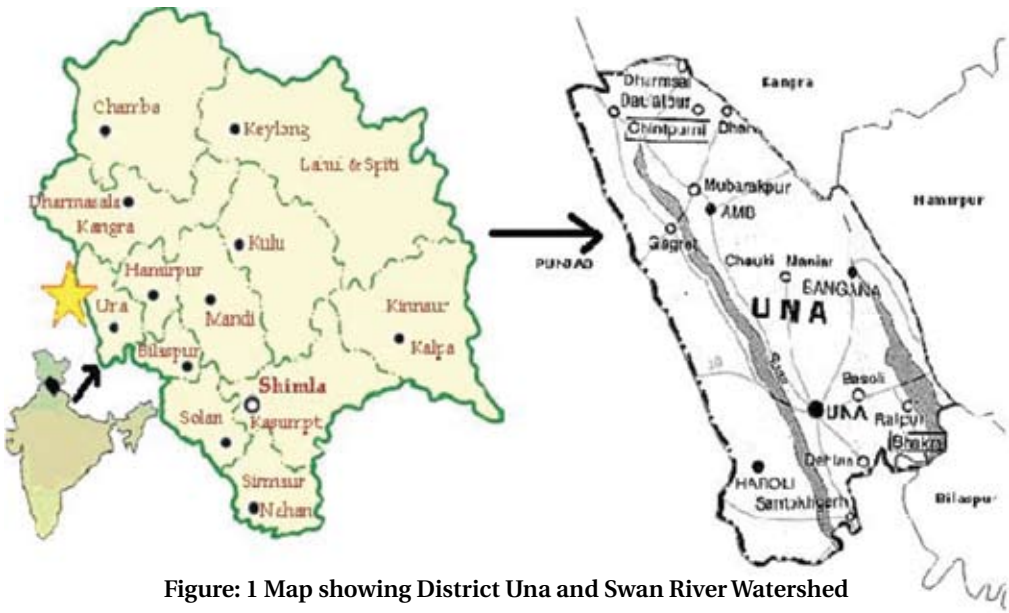

Figure: 1 Map showing District Una and Swan River Watershed

Figure 2: Map showing District Una and Swan River Watershed

Discussion

Table. 1 outlines the salient features of the Swan River Flood Management Project.

Table 1: Salient features of the Project

S.No.	Parameter	Value
General Information		
1	Length of Swan River in HP	65 km
2	Total catchment area of Swan	1400 Sq.Kms
3	Catchment area falling in HP	1200 Sq.Kms.
4	Nos. of Tributaries	73
5	Design Flood	5300 cumecs
6	Mean Annual Rainfall	1205 mm
7	Annual rate of siltation	0.25 ha m/yr/km

S.No.	Parameter	Value
Main Embankment		
1	Length	2x28.34 km
2	Free Board	1.00 m
3	Stone pitching	0.30 m thick in wire crate
4	Width of apron	
5	a) Gagret bridge to Loharli RD 47500 to 33200 6.00 m	6.00 m
6	b) Loharli to Jhalera bridge RD 33200 to 19160 7.00 m	7.00 m
7	Thickness	0.60 m in two layers & 0.30 m each
8	Spacing c) Gagret bridge to Loharli RD 47500 to 33200 555 m	555 m
9	d) Loharli to Jhalera bridge RD 33200 to 19160	665 m
10	Slide slope	2:1
Cost (Rs. Lacs)		
1	Civil Works	21524.94
2	Fishery Development	1058.00
3	Horticulture Development	438.03
4	Forestry Development	292.00
5	Agriculture Development	239.21
6	Total Project Cost (Rs. lacs)	23552.18
7	Benefits (Rs. lacs)	
8	Flood Benefits	485.63
9	Benefits from Fisheries Development	274.50
10	Benefits from horticulture development	365.38
11	Benefits from Forestry development	2617.67
12	Benefits from agriculture development	1307.83
Total Annual benefits (Rs. lacs)		**5051.01**
Benefit Cost Ration		**1.30:1**

Embankments & spurs

The core of the embankment shall be of clayey soil and spur will be in stones duly filled in wire crates. The top width of embankment is 6 m with side slope of 2:1. Free board of 1 m is kept and seepage protection is through clay core. The salient features of the project are given in Table 1.

Figure 3: Photo graphs depicting structural mitigation measures viz. stone spurs, embankments, aprons and stone pitching.

Demography

The total population of district Una is 378,269. The population of the Swan sub-catchment is about 0.25 million of which 92% lives in the rural areas. The construction of the embankments will mitigate the measures of flood in various villages in district Una. As per 2001 census, the population affected due to the floods is likely to be of the order of 102,737.

Land use pattern

The major land use category in the study area is, area under barren land, which accounts for 37.81% of the study area. The other dominant land use categories are open forest (23.77%), agricultural land (21.24%) and medium forest (15.65%). Details of the land use pattern of the study area given in table 2.

Table 2: Land use pattern of the study area

Land use Cover	Area (in %)
Water bodies	0.35
Scrub	0.16
Open forest	23.77
Medium forest	15.65
Agricultural land	21.24
Settlements	1.02
Barren land	37.81
Total	100.00

Source: IPH (1999)

Environmental Baseline Status

Before start of any Environmental Impact Assessment study, it is necessary to identify the baseline levels of relevant environmental parameters which are likely to be affected as a result of the construction and operation of the proposed project. Table 3 outlines the environmental baseline status of the study area.

Table 3: Environmental baseline status

S.No.	Component	Remarks
1.	Geology	main formations are alluvial fans, river terraces and gravel beds of the recent age & the sandstone, clay stone and conglomerates belonging to Shivalik group.
2.	Soils	Developed from colluvium & alluvium brought down & deposited in the valleys. The pH of soil at various sites lies within neutral range. The general soil composition includes 84% of sand, 11% of silt and 5% of clay. Thus, the soils have low clay.
3.	Meteorology	Area lies within Outer Himalayan zones. Climatically, the year can be divided into four well defined seasons.
4.	Water resources	The steep slope results in quick build up of runoff into steep, nallas, outfalling in river Swan. The major contribution to river Swan is monsoon months is the direct runoff.
5.	Water quality	The total hardness in various water samples ranged from 152-200 mg/l. The low calcium and magnesium levels are responsible for soft nature of water. The EC and TDS values indicate the lower concentration of cations and anions
6.	Ambient air quality	At all monitoring stations, the SPM level was much below the permissible limit, specified for residential and rural areas.
7.	Ambient noise level	The noise level at various sampling stations ranged from 32 to 40 dB(A), which were very well within permissible limits specified for residential area.
8.	Vegetation	Flora: Two types (Northern dry mixed deciduous type and Lower Shivalik Chil pine type) Fauna: No major faunal species and wildlife. Mainly livestock, etc. Few rabbit, blue bull and jackal, etc. are reported
9.	Fisheries	The major species found in river Swan are Sal, Mahseer, Gid & Dol
10.	Agriculture	Major crops are wheat and maize, pulses, mash and moong the other major crops grown during the Kharif season.

Overview of EIA of Swan River Flood Management Project

Based on the project details and the baseline environmental status, potential impacts which will help in mitigating flood damages and development of the project area as a result of the construction and operation of the proposed Swan river flood management are summarised in the following sections.

Operation Phase

The construction of the proposed embankment would lead to reclamation of 5000 ha of land. The land reclaimed from the floods in phase-II will be earmarked to various departments such as Agriculture, Fisheries, Forestry and Horticulture Departments.

Table 4: Land Reclaimed from Floods

The afforestation component envisages the following:		
S.N.	Component	Area
1.	Plantation along embankment	52 ha
2.	Pasture development	21 ha
3.	Plantation over government land	400 ha
4.	Distribution of saplings to public for afforestation over an area	857 ha
Total		1330 ha
The land earmarked for use by various departments is as follows:		
1.	Fisheries Department	400 ha
2.	Horticulture Department (Guava=120 ha, Pear=220ha , Grapes=110 ha, Pomegranate=220 ha ,Total =670 ha)	670 ha
3.	Forest Department	1330 ha
4.	Agriculture Department	2600 ha
	Total	5000 ha

The increase in vegetation cover will increase the microbial activity, organic matter with an improvement in soil binding capacity. The vegetal cover would reduce the velocity of runoff, reducing the vulnerability to soil. The increase in vegetal cover and increased agriculture production would increase the fodder availability.

Table 5: Impact on Water Environment

S.N.	IMPACT on Water environment	
1	Water Resources	Construction of embankment leads to the reduction in the valley storage. Hence, the flood peaks in Swan river stretches downstream of the embankment will increase. The effect of the increase in the flood intensity will be mainly felt in the Anandpur Sahib area of Punjab where the impact due to flooding would be minimal.
2.	Changes in water levels	The construction of embankment will constrict the width of flow channel in river Swan. This would lead to increase in the water level. The height of the embankments is 2.6 to 3.0 m which is much higher than 1.55 m, the highest increase in water level (1.55 m) for a discharge of 4500 m^3/s. This flood would neither overtop the embankment, nor would affect the structural stability of the embankments.
3.	Effect on flow velocity	Range of velocity remains same throughout the stretch of river Swan. Therefore, no downstream erosion of land due to increased velocity of the river in response to the training of the river is expected.
4.	Effect on discharge intensities	The maximum increase in depth is of the order of 0.7 m. As far as discharge is concerned the increase is more pronounced on the downstream side.
5.	Impacts of silt deposition	The canalisation from Santokhgarh bridge to Jhalera bridge would prevent the deposition .The silt deposition with sand content and low organic matter led to reduction in soil productivity. Thus, the canalisation project would lead to improvement in productivity of soils. An area of about 5,000 ha is likely to be reclaimed on this account.
6.	Effect on drainage system	About 26 small streams/tributaries join the Swan river. During high floods, the tributaries may be blocked at junction point with the main river. To counteract this problem of interface, drainage and for the safety of the embankment, provision for channelsing the tributaries upto the HFL line has been made.

Impacts on Socio Economic Environment

The river Swan is notorious for its flash floods causing damage to land, property and even human and cattle lives along its banks. The construction of embankments will mitigate the damages due to flood and reclaim the land for other productive use (Table 5). This will also increase the employment opportunities in and surrounding areas of Project site.

Table 6: Impact on Socio-economic Environment

S.N	Impact on socio-economic environment	
1.	Fisheries Development	Proposed to bring about 400 ha of land under pond fisheries in the low lying areas adjacent to river Swan which will be saved from floods as a result of the construction of embankments. The net profit will be Rs. 91,500 ha/year. About 1200 unemployed youths are likely to be benefitted.
2.	Horticulture Development	Will develop orchards (including demonstration areas) in an area of 670 ha over the reclaimed land. Guava, grape and pear are proposed to be grown for development of orchards in the area.
3.	Agriculture Development	About 2,600 ha of the total reclaimed land will be brought under agriculture. At present, most of the land in the flood-prone areas is left fallow. However, once the embankments are constructed, these lands can be tilled. The increase in revenue generation from agriculture production over reclaimed has been estimated as Rs.130.78 million per annum.
4.	Afforestation	About 1,330 of reclaimed area would be afforested. This will result in direct benefits to the tune of Rs. 3.9 million/ha of afforestation on government land behind embankment. Likewise, a benefit to the tune of Rs. 2.98 million is estimated on plantation over. Government/ reclaimed land behind embankments.
5.	Employment generation	The agriculture component alone will ensure employment to about 3,450 persons per year, which is a significant positive impact. Another 1200 unemployed youths are likely to get employment due to fisheries component of the project; overall, it can be concluded that the project would significantly improve the employment scenario in the area.

Figure 4 : Reclaimed Area of Swan River Catchment near Gagret, District Una, Himachal Pradesh.

Figure 5 :The Land reclaimed from the Floods being used for agricultural activities near Gagret, Dist. Una, Himachal Pradesh

Conclusion

The objective of EIA is to foresee and address potential environmental problems/ concerns at an early stage of project planning and design. The present paper is based on the overview of The EIA report of Swan Flood Management Project and covers the specific aspects of EIA which deals only with prevention of long term disaster impacts and flood management. Management of activities within the flood-prone area can significantly reduce flood damages to existing development and prevent the amount of damages from rising in the future. The river Swan is notorious for its flash floods causing damage to land, property and even human and cattle lives along its banks. The construction of embankments and the project will mitigate the damages due to flood and reclaim the land for other productive use. The paper is intended to provide an overview of the prevailing baseline conditions and the aspects which will directly help in mitigation to attenuate the impacts. It can be concluded from the impact matrix that the project will help not only in flood management in future but also in improving the socio-economic conditions of the area surrounding the project site as a whole.

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