

CHAPTER - IX

ENVIRONMENT IMPACT ASSESSMENT AND SOCIO ECONOMIC STUDIES

9.0 Objectives of the study

The objective of environmental impact assessment and socio-economic studies is to identify the possible environmental and socio-economic effects due to the proposed Kosi-Mechi intrastate link project of Bihar and to suggest measures to mitigate or ameliorate the anticipated adverse impacts on the environment. The study was assigned to M/s Economic Development Trust (EDT), New Delhi. A brief account of the study is presented in this chapter.

9.1 The project proposal

The Kosi-Mechi intrastate link project envisages diversion of 7,825 MCM of Kosi water from existing Hanuman Nagar Barrage on Indo-Nepal border to Mechi river (a tributary of Mahananda) about 1.5 km upstream of its confluence with Mahananda river in Makhanpur village of Kishanganj district of Bihar state. The proposed link canal offtakes from the left side (eastern side) of the barrage near Hanuman Nagar at FSL 74.371 m and outfalls into Mechi river at FSL 54.239 m. The total length of the link canal is 117.50 km. This link canal will cross number of streams/rivers, road and railway lines for which 9 canal syphons, 14 syphon aqueducts, 42 road bridges and 9 hume pipe culverts have been proposed. 28 head regulators, 10 cross regulators and 3 escapes have also been provided for the link canal regulation.

9.2 Project justification

Bihar is India's most flood-prone state, with about 76% of the population in north Bihar living under the recurring threat of flood devastation. According to some historical data, 16.5% of the total flood affected area in India is located in Bihar while 22.1% of the flood affected population of India lives in Bihar.

The Government of Bihar vide letter dated 28.07.2008 has proposed to extend existing EKMC beyond its tail end RD 41.30 km so that rivers Kosi and Mechi which flow through Bihar itself after crossing Indo-Nepal border, can be linked within Bihar State by taking off the link canal from existing

Hanuman Nagar barrage and outfalling in river Mechi at suitable point while running the canal adjacent to Indo-Nepal border. It will provide irrigation in Araria and Kishanganj districts depending upon pondage available in Hanuman Nagar barrage. Though this intrastate link canal will not have any back-up storage scheme presently, it can be later supported by and linked with proposed Kosi High Dam which is likely to take concrete shape after joint surveys and investigations by Government of Nepal and India.

9.3 Legal status of the project

Though there are large benefits that may accrue after implementation of the project, due weightage has to be given to the social and environmental aspect. One of the important social considerations is the process of public consultation. The Wildlife (Protection) Act-1972 provides for protection of the listed species of flora and fauna and establishes a network of ecologically important areas. The provisions of this Act have also been kept in view while dealing with the wildlife issues in the project area. Techno-economic clearance of the project is required from the CWC/MoWR. No objection certificate from the Ministry of Coal and Mines is not required as no potential minerals are likely to be submerged due to the project. In Kosi-Mechi basin Link Project, protection for wildlife and archaeological monuments (as per 1972 Act) is not required due to non-availability of any wildlife activity and absence of archaeological monuments falling under the project area. However, attention has to be paid to the various provisions of National Policy on RandR and the policy enunciated by the Government of Bihar regarding the RandR of displaced people due to the construction of the project.

9.4 Study area of the project

The project area lies in Kosi and Mechi basins covering Purnea, Araria, Katihar and Kishanganj districts of Bihar state. The study area for the project has been considered as:

- 1 km either side of the link canal
- 10 km radius around the project area from periphery of the existing barrage.

9.5 Environmental impact assessment

EIA consists of a systematic investigation of both positive and negative impacts on the physical, biological and socio-economic environment that would be caused or induced due to a proposed

developmental consideration in planning and decision making and to ultimately arrive at actions that are environmentally more compatible.

EIA studies are carried out for construction and operation phases both using qualitative or quantitative methods (wherever possible) and using predictive modelling techniques.

9.5.1 Air environment

There is almost fresh air in the project area except the pollution due to vehicular traffic. Use of machines, crushers, and transport vehicles etc. at the time of construction of the project infrastructure may lead to air pollution. Climate of the project area is very hot in summer season and very cold during the winter season. The temperature goes up to 45⁰ C during the month of May and down upto 5⁰ C during the January. The dry season normally is from October to May and the wet season from June to September. The night breeze is from northeast to southwest and the day breeze from southeast to northwest generally. The relative humidity is generally above 70% in most part of the year.

9.5.2 Water environment

The water regime is not going to change since it mainly depends upon the precipitation. Only a certain percentage of water is going to be diverted and that too during monsoon.

The hydrologic cycle in the Ganga basin is governed by the southwest monsoon. About 86% of the total rainfall occurs in the monsoon from June to September, and it is not going to make any change during the construction phase. Even after completion of the project, hydrological cycle shall improve due to flow regulation.

9.5.2.1 Surface water hydrology

The Kosi river is a plain fed and flood prone river which damages the human lives, livestock, crops, houses and other infrastructure in the study area every year.

The water from barrage will be of good quality. However, the surface water quality in the d/s command area may be polluted due to excessive use of fertilizers, pesticides and insecticides so as to obtain maximum crop yield in irrigation. It is therefore necessary to educate the farmers to use right amount of fertilizers needed for different crops and also keep restraint is using the pesticides and insecticides to the barest minimum required.

Siltation: The meandering nature of Kosi river is the main reason of carrying heavy silt loads, rocks pieces and depositing it while changing the course. In order to overcome the silt problem in EKMC, Government of Bihar is constructing a settling basin in the initial reach of the canal. The same will also work for the link project.

9.5.2.2 Ground water hydrology

The occurrence and behaviour of the ground water depends upon the climatology, geology structure and hydrogeological factors. The Kosi-Mechi river system, which forms the part of Ganga basin varies in its geological settings. Since the proposed canal is fully lined, the ground water hydrology is not supposed to differ much and shall not have any negative effect on the drainage or ground water hydrology.

The study area is mainly alluvial with good ground water potentialities having considerable granulose zone with effective porosity. Recharge of aquifer is very quick due to pervious nature of soil.

In the project area, ground water quality is good. But the iron content is more than permissible limit. Ground water is charged with high iron content because of ferrogeneous material deposited by river along with sand. Hence, iron removal measure should be taken before use of water that with high content of iron.

Chemical analysis of phreatic aquifer is found suitable for irrigation and drinking purpose. The ground water is mildly alkaline in nature having pH 8.0. The electrical conductivity is in range of 250-450 micro seimens/cm. All parameters are within permissible limits of 10 ppm (BIS 1991).

9.5.3 Land and environment

9.5.3.1 Land use and land cover

The major land cover, apart from the roads, buildings and other developmental infrastructure is agriculture, vegetables and orchards. The existing land use pattern of Bihar state is grouped under the following heads:

9.5.3.2 Mineral resources

As per the district authorities, there is no mining activity in the project area. Hence the proposed project is not supposed to make any difference.

9.5.3.3 Impact due to transportation of fluorides, nitrates, toxic chemicals, heavy metals

As the concentration of fluorides, nitrates and other toxic chemicals in the water to be carried through link canal is within permissible limit, transportation of fluorides, nitrates and heavy metals etc. is not anticipated.

9.5.3.4 Spread of contamination due to agro-chemicals

At present, quality of surface water to be carried has no evidence of contamination with the agro-chemicals. However, with adoption of more intensive agriculture, the problem of water contamination with agro-chemicals may arise in future which will need steps to contain this problem.

9.5.3.5 Waste (muck) generation and disposal

The proposed project envisages construction of link canal and various CD/CM structures. The construction of the project is expected to lead to generation of huge muck causing environmental degradation. Appropriate action therefore shall have to be taken for safe muck disposal to avoid hazards and mitigate adverse impact on the environment.

9.5.3.6 Soil erosion

Soil erosion is definitely a problem mainly in high flood period. The soil is highly erodible due to less cohesiveness of the soil of deep alluvial plains. The river linking project shall have a positive impact on this problem.

9.5.4 Biological / terrestrial environment

9.5.4.1 Forest cover and protected area

Since there is no forest area or protected zone in the project area, the question of any effect does not arise. The nearest lake which is also quite far from the project area, witness with no rare or endangered plant or animal species. No species of any economic significance, special interest to local population or tourists, flora or aquatic fauna of commercial/recreational value and migratory fish species or their spawning ground, corridor or migratory path for wildlife, access of animals to food and shelter, habitat including breeding ground and access corridor for food and shelter is noticed in the project area. Hence no adverse impact on biodiversity is anticipated.

9.5.4.2 Aquatic environment

There is no potential impact on aquatic ecology including fisheries and endangered species. The ecosystem of the study area is not sensitive hence there is no possibility of any impact due to bio-accumulation and bio-magnification in aquatic life and biota of the area. Impact due to change in ecological functioning of river system, if any, shall be on the positive side. The aquatic vegetation and fish spawning and migration including impact on their breeding ground shall not be remarkable since the river regime shall either be the same or shall be prolonged.

The Kosi-Mechi canal both at head as well as tail regions would be more live during the non- flood season. Hence the issues on wildlife and breeding places are likely to be strengthened. Common fish here are the Rohu, Katla and many others in and around the Kosi river, but none of them is endemic to the river. Concentration of Mallah cast along the river is the indication of their activity. Few pockets are identified as the main fish based activity.

9.5.4.3 General environmental issues

The major environmental hurdle faced by the village households surveyed, is the availability of fuel and fodder. Due to degradation and division of common property resources in the villages, access to these essential resources has reduced considerably. In addition to these the intermittent flood situations and deficiency of grass and fodder has compelled villagers to reduce their livestock. Ground water availability is better, it is not sufficient for irrigation purpose. There have been no efforts for Environment Conservation in the study area.

This soil is deficient in phosphoric acid, nitrogen and humus, but potash and lime are usually present in sufficient quantity. The most common soil in study area is Gangetic alluvium of Indo-Gangetic plain region, Piedmont Swamp Soil and Terai Soil which is mainly found in north western part of study area. The clay soil, sandy soil and loamy soil are common. The top soils of study area are continuously under alluviation along flood plains through annual flooding and deposition. Thus the top soil characteristics perpetually changes and descriptions have to be viewed through temporal change.

9.5.4.4 Weather and climatic conditions

The rainfall, monsoon and weather conditions in targeted districts are as follows.

Table 9.1
Statement showing districtwise annual average
rainy days and actual rainfall in mm

Name of districts	Average number of rainy days	Actual Rainfall
Purnea	61.2	1844.5
Araria	59.5	1640.3
Kishanganj	60.2	1952.5
Katihar	58.7	1264
Bihar	1129.4	1081.6

Source: Bihar Statistical Hand Book, 2012; Directorate of Economics and Statistics, Department of Planning and Development, Bihar, Patna

The actual rainfall during the year 2011 is higher in Kishanganj, followed by Purnea and Araria; the lowest rainfall seen is in the district Katihar. In a situation of lower rainfall, availability of water is a big problem in villages to grow crops.

It rains 241-371 mm in Purnea while 276- 575 mm during this season in Araria. South west monsoon October-December again is the period of scanty rain 3 mm in Purnea and 2-5 mm in Araria district.

The cool season period is October to February, when temperature fluctuates between 7⁰ C to 16⁰ C with little rain, clear sky and relatively low humidity. The hot season period is March to Mid June, when temperature fluctuates between 44⁰C to 45⁰C with low humidity. Further, the warm and wet season period is mid June to September, when temperature fluctuates between 24⁰C to 35⁰C with cloudy sky and high humidity.

9.6 Environmental Management Plan

Environmental Management Plan (EMP) is a tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and commissioning of a project can be prevented and that the positive benefits of the projects are enhanced. In such plan mitigation /

enhancement measures need to be specified based on environmental impact assessment. Kosi and its tributaries exhibit dichotomy drainage pattern. The drainage pattern in the project area is sub-parallel in general.

During construction activities, the environmental safeguards are to be borne in mind. The regime of the river should not be altered or changed and any practice detrimental to the ecology, environment, flora and fauna should not be allowed during construction phase. Transport of construction material should be in such a manner that it does not harm environment. The care should be taken during construction of barrage or digging of the main canal lesser number of trees are cut and if it is unavoidable and there are no alternatives, the provision of compensatory plantation should be made in the DPR itself; and the implementation should be ensured.

9.6.1 Air environment

The air quality should be kept clean as it is; and lesser noise be allowed. The activities that will cause the air pollution are the vehicular movement, excavation and other similar construction activities at a far flung area than habitation. The air pollution shall also be generated by human settlements of labourers and working staff. The cooking and other activities shall have an adverse impact on air quality.

The ambient air quality monitoring may be carried out during construction phase by an external agency approved by the Pollution Control Board, at all the major construction sites. The monitoring frequency could be twice a week for consecutive weeks at each station for each season. There can be three monitoring periods in a year namely pre-monsoon, winter season and post-monsoon. The parameters to be monitored could be RPM and SPM, Sulphur dioxide and oxides of Nitrogen. A meteorological laboratory could be set up at one of the ambient air quality monitoring stations for barrage on Kosi-Mechi for recording meteorological data such as temperature, humidity, wind velocity etc. automatically.

The above activities will also induce noise in the environment, which may cause loss of sleep, psychological disturbance in speech reception, diminished concentration and in extreme cases cardiovascular, respiratory and neurological disorder. Since this project involves construction works which are spread over about 30-35 kms distance, so the impact on the noise status shall be meagre.

The noise level can be kept with delineating the specified and lesser routes for vehicular movement and prescribing the working hours for the machinery to produce lesser pollution and noise. Better maintenance of the machines will also keep the noise level under bearable limits. Noise emission from vehicular movement, operation of various construction equipments and machines should be monitored at various sites during construction phase by an external agency approved by the Pollution Control Board. The frequency of monitoring can be once in a month.

9.6.2 Water

Besides, the quality of the water, the other adverse impacts that are frequently encountered during developmental activities are likely changes in the regime of the river, change in the hydrological cycle, acidification/salinization of the chauras and water bodies nearby and adverse effect on drainage system.

The huge number of labour strength is likely to be deployed for construction activities. The major source of water pollution during construction phase shall be the sewage from the settlement of the labourers deployed for construction activities and effluent from the crushers and other machines. The construction phase is likely to last for 7 or more years.

The domestic water requirement norm is 70 lpcd of water. According to the number of labourers required and therefore the requirement of water shall be very high. It is assumed that 80% of the water used is generated as sewage.

During project operation phase sewage treatment plant should be established. The effluent from septic tanks of staff and labourers is proposed to be monitored before and after the treatment. One septic tank for 100 families could be provided. The effluent from these tanks could be disposed off through soak pits. The effluent from the septic tanks of staff and labourers would be analysed once in a month. The parameters to be analysed include pH, BOD, COD, total suspended solids, and total dissolved solids. The drinking water facility and the waste water disposal site should be located at a distance from each other. The sewage disposal can also be linked with the 'Total Sanitation Programme' of the Government.

9.6.2.1 Surface water quality

Looking to the situation the no significant impact is anticipated on river water quality because of the disposal of the sewage; because, firstly the

river system has its own recovery mechanism and secondly no sewage of affected city is disposed off into the river. So the surface water quality is not likely to get affected adversely.

Maintaining aquatic ecology could be essential to make the aquatic fauna flourish. Regulation of flow to the command area should be planned so that it shall keep the water in flow most of the year. The surface water quality needs to be monitored thrice a year. The parameters to be analysed include pH, temperature, electrical conductivity, turbidity, total hardness, total dissolved solids, DO, BOD, COD, Ca, Mg, chlorides, sulphates, nitrates, iron and zinc.

9.6.2.2 Ground water quality

The water levels are not likely to rise significantly. There are no chances of any seepage loss of the water to the ground as the proposed shall be fully lined. Thus, the hazards of water logging and salinization are not anticipated due to the proposed project.

A number of piezometers at close spacing need to be established in entire study area to monitor the changes in water levels and quality. The data on water fluctuations would be collected for both pre and post project.

9.6.3 Land environment

Impacts on the land environment are both during the construction and post project activities. During the construction phase, secondary impacts relating to the pollution due to flying of dust and other construction materials, soil erosion due to digging and increased traffic inflow resulting in generation of aerosols and noise pollution due to machines and heavy earth movers. During the post project or operation phase, the aforesaid secondary impacts would gradually be reduced while impoundment sets in.

9.6.4 Forests, flora and fauna

No clearance of the forest area is involved in the proposed project. So the flora, whatever is there in form of trees planted and agriculture crops, will flourish even better the coming up of the project. Fauna also shall have better habitat after commissioning of the proposed project. Of course during construction phase, disturbances are likely.

Though the fauna easily adopt and/or migrate temporarily during the harsh conditions or disturbances and again rehabilitates back when the conditions become favourable. But, care should be taken that the water is

available in the river even during construction phase, for small wildlife forms drinking and aquatic avifauna's perching; so that fauna can survive during the crisis period of construction activities. Monitoring may be done twice in the year, winter and summer seasons, and may be entrusted to the local forest and wildlife department with the consent of the authorities.

9.6.5 Silting

The upper reach of flow of water is augmented by number of hilly tributaries coming from foothills of Himalayas in Nepal. These hilly rivers bring heavy silt load from Nepal. The Kosi river is known for its oscillatory character, which changes its course very soon.

To overcome the silt problem in EKMC, the Government of Bihar is constructing a settling basin in initial reach at RD 1.067. The aim of the basin is to arrest the silt particles having size larger than 0.071 mm. Every year during the closure period of canal construction, the deposited silt would have to be removed from the bed of the canal in order to avoid growth of weeds. The desilting can be easily done in the fully lined canal.

9.6.6 Catchment area treatment to check soil erosion in the fragile patches of the catchment area and minimise siltation

The banks of the river may be treated with vegetative checks and barriers to stop bank cutting due to meandering nature of the Kosi river. The Table 9.2 below provides the Catchment Area Treatment Plan.

Table 9.2
Catchment area treatment

Activities / impacts	Mitigation measures	Management actions	Executive responsibilities
<ul style="list-style-type: none"> • Water logging and soil salinity at sensitive places of the command area • Siltation and sedimentation of reservoir 	<ul style="list-style-type: none"> • Catchment area treatment for the fragile locations of the catchment area by planting soil stabilizer species of grasses and plants.(like vetivera grass miscellaneous tree species) 	WRD through the owners of the land in catchment	Water Resource Department, Bihar (WRDB).
River bank erosion and canals erosion	<ul style="list-style-type: none"> • River erosion measures should be taken. • Though the canal is proposed 	Supervision Engineer	WRDB and WUA

Activities / impacts	Mitigation measures	Management actions	Executive responsibilities
may take place that will create social displacement.	<p>to be lined but still special consideration should be given on slopes of the canals and should be taken appropriate technology to mitigate the erosion problem of the slope of the canal.</p> <ul style="list-style-type: none"> ● Various types of trees like Eucalyptus, Prosopis, Acacia and Jatropha can be planted along both banks of the canal route and both banks of the river. 		

9.6.7 Earthquake management

As a part of minimisation of damages and protection of life and property in the area, the following two management points are suggested:

- (i) To establish the nature of risk if the planned structure is built in the given area. It further incorporates two considerations
 - (a) Seismicity of the region in terms of their intensity and magnitude.
 - (b) The possible nature and consequences of earthquake damage to the particular structure.
- (ii) To establish certain bases of structural design in seismic regions.

These suggestions are from theoretical studies and actual observations of the ground motion and damage during earthquakes. However, there is a cause of worry as north Bihar is an earthquake prone area.

9.6.8 Plan for restoration of quarry areas/ borrow areas and areas for dumping excavated material

Almost all the excavated material shall be used in the banks of the canal as this is proposed to be in partially cutting and partially in fillings.

9.6.9 Management to arrest salinity/ alkalinity in the wake of recharge of water through the canal

Though, problem of salinity or alkalinity is not reported in the study area, but the ground water possesses excess Iron, Arsenic and Fluoride. However right now there seems to be no potential or persisting problem of salinity/alkalinity, but the measures for arresting salinity/alkalinity in the wake of water recharge through the canal should be provided in the project document, as the problem may persist in future.

9.6.10 Compensatory afforestation along with cost benefits analysis and creation of green belt

There is no forest clearing involved in the proposed project so there is no necessity of large scale compensatory afforestation. But if any trees are sacrificed during the construction activities, compensatory plantation should be done. The trees may be planted on either side of the canal which shall stabilize the banks and also act as green belt.

9.6.11 Command area development with respect to irrigation potential

An integrated command area development plan shall be prepared and implemented by WRD, Bihar in respect of agriculture and allied fields taking into account other related needs of the command area development so as to result in optimal use of irrigation potential and agriculture development.

9.6.12 Management of flora and fauna

Since no clearance of the forest area is involved in the proposed project, hence no management of the flora and fauna along the link canal including action plan for alternate breeding grounds is needed.

9.6.13 Alien flora and aquatic weeds management

No alien flora or fauna is allowed to invade and flourish in the project area. The staff, workers and labourers are normally source of this type introduction. So the check and balances should be observed to stop such activity.

9.6.14 Protection of sensitive and archaeological monument sites

There is no reported sensitive and archaeological monument site in the project area.

The assumed impacts, measures to mitigate them and the process of monitoring have been summed up in nutshell as in Table 9.3 given below:

Table 9.3
Impact management and monitoring

Impact	Mitigation Measure	Monitoring
Air Environment		
Air quality	Designate routes of vehicular movement to minimize the air pollution	Ambient air quality monitoring for RPM and SPM, Sulphur dioxide and oxides of Nitrogen (Thrice in a year- twice a week)
Noise	Designate routes of vehicular movement and optimal use of machines to minimize the air pollution	Monitoring of noise status (once in a month)
Water Environment		
Surface water quality	Maintaining of water flow. Installing Sewage Water Treatment Plant	Impounded water: Monitoring of pH, temperature, electrical conductivity, turbidity, total hardness, total dissolved solids, DO, BOD, COD, Ca, Mg, chlorides, sulphates, nitrates, iron and zinc. (thrice a year) Sewage water: Before and after treatment- pH, BOD, COD, total suspended solids, and total dissolved solids.
Ground water quality	Lining of the link canal seepage proof barrage	Monitoring water level and quality by piezometers.
Water logging	Lining of the link canal Seepage proof barrage	Monitoring water level and quality by piezometers.
Command area	Command area development for optimum use of water	Monitoring the water courses and Irrigated area
Land environment		
Silting	Provision of Silt excluders and Silt escapes, Removal of silt, Catchment Area Treatment	Monitoring of silt level in link canal
Quarry areas/ borrow areas	No problem will persist since Link canal is proposed to be in cutting and filling both	Post project inspections

Salinity/alkalinity	No problem will persist since link canal is proposed to be lined fully but still cropping cycle and cropping pattern be planned to mitigate the problem in future.	Agriculture department may help in monitoring.
Forest		
Vegetation	No forest clearance is involved so no compensatory afforestation is proposed.	
Flora-Fauna	Not much impact is anticipated, But Water be available during construction phase too.	Monitoring be done for local fauna twice a year, in winter and summer

9.6.15 Cost of environment management plan

A provision of Rs.197.25 crore is kept in the cost estimate under the component W, X towards the environment and ecology including drainage consideration. Details are furnished in Annexure 10.1.15 and 10.1.16.

9.6.16 Updating of environmental management plan

The EMP will have specific targets for each year that will be evaluated by the annual environmental audit. The audit can make recommendations which will necessitate changes in the Environmental Management Plan.

The environmental management plan will be reviewed on an ongoing basis as new environmental challenges arise or targets/objectives are achieved. The operations manager will ensure that this review occurs in a timely manner. Targets for the first year of operation will be set six months after the start-up period and baseline conditions have been established.

9.7 Findings

The meandering nature of the river and non-cohesiveness of the deep alluvial soil in the study area results in heavy erodability of the soil.

No Forest clearance is involved in the proposed Kosi-Mechi Link Canal project.

9.8 Socio-economic aspects and preparation of R&R

The development of water resources projects is always a boon for the people of command area but at the same time, there are some problems associated with displacement of people due to the construction of the

project. A detailed resettlement and rehabilitation plan has to be evolved to ameliorate the ill effects of displacement of people if takes place. The Ministry of Environment and Forest being the nodal agency for clearing development projects, has to oversee that adverse impacts of any development project be minimum and appropriate ameliorative measures are adopted to mitigate the adverse impacts.

9.8.1 Socio-economic survey

Detailed socio-economic analyses of project affected/benefitted peoples in the districts namely Purnea, Araria, Kishanganj and Katihar have been carried out. On site socio-economic surveys have been conducted covering socio-economic profile of residents of the region.

The socio-economic situation from secondary sources on subjects like agriculture, livestock, pisciculture, health and infrastructure in the concerned regions elaborated in subsequent paragraphs.

(i) Agriculture

Most of the area in Purnea district is rich and loamy soil of alluvial formation. In the west, the soil is thickly covered with sand deposited by changes in course of the river Kosi. Rice (HYV crop) is grown in maximum in area in Purnea, followed by Araria, Katihar and Kishanganj. Maize is grown maximum in Purnea, followed by Katihar, Araria and Kishanganj. Agricultural products in the Purnea district include paddy, maize, pulses and wheat and oilseeds. Roughly one third of the area sown is under rice. Cash crops such as vegetables and watermelons are also grown. Major agricultural products in Purnea district are jute and banana.

Milk and milk based activities are important in entire north Bihar. An agro-processing unit appears to be not an attractive economic activity in the region.

(ii) Livestock

The numbers according to the census conducted of livestock during the period 2007 indicate cattle in Purnea, Araria, Kishanganj and Katihar are 743621, 526184, 512218 and 653928 respectively. Likewise the number of buffaloes in Purnea, Araria, Kishanganj and Katihar are 215851, 201334, 62901 and 143636 respectively. Further, the number of poultry as per 2007 census in Purnea, Araria, Kishanganj and Katihar are 880693, 711904, 915756 and 707096 respectively.

(iii) Pisciculture

Important rivers in north Bihar districts are Mahananda, Ganga, Kosi and Righa, provide abundant opportunities for piscicultural activities in the project region. There are 1295 reservoirs in Purnea and producing 12.35 H.M.T. fish from all sources. Likewise, in Araria, there are 4652 number of reservoirs and producing 5.37 H.M.T. fish from all sources. Number of reservoirs in Kishanganj and Katihar districts are 506 and 7645 and produce fish 6.60 and 12.60 H.M.T. fish from all sources.

(iv) Health

As per information published in the Bihar Statistical Hand Book, 2012; Directorate of Economics and Statistics, Department of Planning and Development, Bihar, there is no medical college in the project area. However, the number of hospital in Purnea, Araria, Kishanganj and Katihar are 18, 6, 11 and 20 while number of beds in the region are 414, 340, 262 and 286 respectively to cater the requirements of patients in the district.

(v) Infrastructure

There are two bus terminals in Araria town; one at zero mile and the other in city. The town is well connected with railways and road network. Katihar is an important junction having good connectivity to all over India. Barsoi is headquarter of a subdivision in Katihar district. It is an important railway junction under Katihar division Northeast Frontier Railway zone of Indian Railways. Barsoi Junction connects four routes viz. North Siliguri Junction, New Jalpaiguri Junction, east Radhikapur (near Bangladesh border) and South Kumedpur Junction. Jogbani town is the last point of Indian railway near to Nepal border.

Kishanganj district is surrounded by Araria district in the west, Purnea district in the south-west, Uttar Dinajpur district of West Bengal on the east and Darjeeling district of West Bengal and Nepal on the north. A narrow strip of West Bengal, about 20 km wide separates it from Bangladesh.

9.8.2 Resettlement and rehabilitation aspect

While studying Resettlement and Rehabilitation aspects techniques such as Rapid Rural Appraisal (RRA)/Participatory Rural Appraisal (PRA) and focus group discussion have been organised to identify the present situation in the area.

9.8.2.1 Information on following aspects collected

No resettlement and rehabilitation aspect is involved in the proposed Kosi-Mechi link canal. However, considering the total canal way during construction phase some area may get acquired/affected and for which a package need to be devised to disburse compensation to affected population in the concerned villages.

(a) The villagers are generally supportive and found in a constructive mood.

(b) It has been gathered that compensation package for land being acquired during canal construction, has been offered in cash by the government of Bihar. No discontentment on amount of cash as compensation being offered by the local authorities has been noticed.

(c) On location preference for settlement, the affected population want to be settled closer to their existing place of residence. No R&R is involved in the canal construction as canal site passes at a distance from the village location.

(d) Participation of affected people in construction of canals/ reservoirs is found to be on positive side. Local people have agreed to co-operate the government.

9.8.2.2 Cost of resettlement and rehabilitation

The Land Acquisition, Rehabilitation and Resettlement Act, 2013 has provisions to provide fair amount of compensation to those whose land is being taken away, brings transparency to the process of acquisition of land to set up factories or buildings, infrastructural projects and assures rehabilitation of those affected.

9.8.2.3 Compensation on land acquisition

The Clause 26 of Land Acquisition, Rehabilitation and Resettlement Act, 2013 defines the method by which market value of the land shall be computed under the proposed law.

According to LARR the bill proposes that minimum amount of compensation has to be multiple of total of ascertained market value plus a solatium. Specifically, the current version of the bill proposes the total minimum compensation to be at least four times the market value for land acquired in rural areas. It becomes the responsibility of the District Collector to decide Minimum Value Rate, taking into account the prevailing

market rate. Market rate of the existing land at the current price level is given in Table 9.5 below.

Table 9.5
Land Price

Districts	Market rate at the current price level in Rs. per decimal of land *
Purnea	5,000 - 15,000
Kishanganj	5,000 – 14,000
Araria	5,400 – 15,000
Katihar	5,500 – 14,000

** Figures are based on discussion with local Land Acquisition Officer (LAO) and local village people of the concerned district.*

Higher side of price is taken into account because of time gestation between data generation, land acquired and price to be paid to the beneficiary. The cost of land acquisition per decimal on higher side is about Rs. 15,000/- in Purnea and Araria, Rs. 14,000/- in Kishanganj and Katihar districts. The price, therefore needs to be calculated based on the total amount of land acquired and price of the land to be given, plus a solatium to farmers. The solatium to farmers can be in terms of employment opportunities. The locking period for price fixation may be for three years at current price level as per Government of Bihar. Hopefully, during the given period the land will be acquired and canal will be constructed.

A provision of Rs. 273 crores has been kept in the cost estimate under the component B-Land towards acquisition of land, crop compensation and rehabilitation measures. The details are furnished in Annexure 10.1.2 and 10.1.2.1.