Government of the People's Republic of Bangladesh
Bangladesh Water Development Board
Flood Plan Coordination Organisation

FLOOD ACTION PLAN

NORTHEAST REGIONAL WATER MANAGEMENT PROJECT (FAP 6)

KANGSHA BASIN WATER MANAGEMENT PLAN

SUMMARY PRESENTATION
December 1996

SNC ♦ Lavalin International
Northwest Hydraulic Consultants

in association with

Engineering and Planning Consultants Ltd.
Bangladesh Engineering and Technological Services

Canadian International Development Agency

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Kangsha Basin Water Management Plan

1. Introduction

The Kangsha Basin covers an area of 2,300 sq.km and lies at the foot of Indian Meghalaya Hills on the northern border of Bangladesh, about 150 km north of Dhaka City. Its population is approximately 1.6 million (1991 census) of which 86% live in rural areas. The basin is easily accessed by road from Mymensingh.

Agriculture is the main source of income. with more than 76% of the population depending on on it for their main source of income. This includes 24% as agricultural labour. Fishing is the next source of income with more than 4% of the population depending solely on it for employment. Other major sources of income are non-agricultural/fisheries labour 3%, business 8%, and various employment 3%.

Most people have access to safe water for drinking but a large percentage uses polluted water from ponds and rivers for other domestic purposes. Sanitation conditions are very poor. Only forty percent of the urban population and three percent of the rural population use sanitary latrines.

There are more than 600 km of motorable roads and 295,000 homesteads in the area. Most of the rivers are navigable only four months of the year. Water transportation, the most economical mode of transportation, is declining with the development of road networks. There are 120 ha of perennial wetland.

In the Kangsha Basin, like elsewhere in most of Bangladesh, water plays a central role in the people's life. Indeed, the orderly development and exploitation of the available water resources holds the key for the basin's socio-economic development. The Kangsha Basin Water Management Plan provides the framework for this to happen in an integrated manner, based on the exhaustive appraisal of the water resources available, the characterization of the constraints on their exploitation, and the assessment of the prospects for development through their better management.

2. Water Management Problems

Broadly speaking, the Kangsha Basin suffers from two water related problems - excess of water during the monsoon season and acute shortage of water during the dry season. More than 60% of the basin's area is flooded once or more annually. Floods are flashy, and may occur with little warning at any time during the monsoon. The risk of flooding and the related uncertainty affect the local population in every aspect of their daily lives.

Flooding damages homesteads, road infrastructure and monsoon season rice crops. T. aman crops which are one of the major crops of the area are re-transplanted after flooding, sometimes twice or even more. The result is extra cost and lower yields. Risk of loss and uncertainty discourage farmers from planting higher yield varieties of t. aman and also from making other investments in their farms, thus limiting the potential for economic growth within the basin.

Monsoon crop losses force farmers to cultivate in the lower areas during the dry season. This practice destroys the seed beds of wetland vegetation and inhibits the regeneration process.

Conversely, there is scarcity of surface water during the dry season. Groundwater is also not available everywhere at economic depth, especially in the northern part of the basin. Due to this water shortage, only fifty percent of the cultivated land is presently under irrigation during the dry season.

Because surface water is in short supply groundwater, wherever available, is abstracted for irrigation. This abstraction causes a lowering of the water table which in turn impacts on domestic water supply as the presently used suction mode hand tube wells cannot lift water by more than 7.0 m. People then resort to using polluted surface water even for drinking, thus resulting in high incidence of water borne diseases.

During the dry period, farmers use all surface water available in rivers and *beels* for irrigation, leaving no overwintering grounds for fish. As a result, broodstock cannot survive for recruitment during the monsoon, thus depleting fisheries resources. With little or no water in rivers and channels, water transportation ceases at a time of maximum economic activity. To meet the needs, the road infrastructure is being developed while water transport is in decline, even though it is the most economical mode of transportation and it involves little maintenance.

3. Prospects

Agriculture

The area with a net cultivated land of 150,000 ha (65% of the gross area) produces annually 150,000 tons of boro rice, 130,000 tons of aman rice, 38,000 tons of aus rice and 35,000 tons of vegetables. Production could be increased by more than 20% by:

- protecting monsoon crops from flood damage and increasing HYV monsoon crop cultivation by providing flood protection;

- increasing irrigation coverage in the dry season by proper utilization and management of both surface water and groundwater.

Presently only about 14% of the t.aman crop consists of high yielding varieties and 50% of the cultivated land is under winter irrigation. This indicates that there is potential for a substantial increase in rice production.

Fisheries

The basin yields approximately 5,000 tons of fish annually from its 140,000 ha of inundated floodplain, 3,000 ha of *beels* and 12,600 ha of channels. The average production is low compared to other parts of the Northeast Region. This is largely due to the lack of overwintering areas, compounded by the long migration routes from the Sylhet Basin. Production could be increased to more than 7000 tons in the open areas of the basin through the establishment of a small number of sanctuaries and overwintering grounds.

The annual yield from the area's 24,000 ponds and ditches is estimated at 2,000 tons. About 20% of fish ponds are located in flood prone areas. The pond owners do not invest because of risk of

loss and uncertainty. DANIDA data indicate that the production rate could be increased three to four folds in ponds through flood protection and investment for feed and fertilisers.

Wetland
Enhanced wetland production could be achieved through improved *beel* management and protection of the seed beds of wetland vegetation.

Water Transportation
Because of low upland flows, it is not possible to improve the river reaches in the upper basin to make them navigable in the dry season. However there is scope to improve dry season navigability of some of the river reaches in the lower basin utilizing backwater from the Baulai River. This improvement, resulting in better access to the basin, would require localised dredging.

Domestic Water Supply and Sanitation
Safe water and sanitation are vital for the improvement of health, productivity, efficiency and quality of the human environment. The access to safe water is essential not only for drinking but also for all other domestic purposes. A large proportion of the basin population does not have access to safe domestic water and there is scope for much improvement in this respect.

As 97% of the rural population and 60% of the urban population are not using sanitary facilities, there is also scope to improve sanitation by installing low cost hygienic facilities and couple this measure with social motivation.

4. Water Management Initiatives

The Upper Kangsha Water Management Plan has identified twenty seven potential initiatives to improve the socio-economic conditions of the basin population. Of these, eleven address the area's water management issues with the aim of increasing agricultural production and homestead and infrastructure protection. Seven projects focus on fisheries enhancement. Four projects are aimed at providing safe domestic water supply and hygienic sanitation facilities. Two projects target improving agriculture. One project would improve dry season navigation and another to conserve bio-diversity. Finally, one project, the Kangsha Basin Water Management Project, is intended to provide an overall coordinating role in water planning and management of the basin.

The identified initiatives, described later, are only the more obvious and important water management actions that would improve socio-economic conditions in the basin. Many others, of a smaller scale and having more limited repercussions will be necessary. All initiatives, regardless of their size, should be developed and implemented taking account of the framework provided by the Kangsha Basin Water Management Plan and responding to the set of water development principles stated below.

4.1 Water Development Principles

Social and Gender Equity
Whenever possible, resource development should target the poor and disadvantaged. Generally, water development programs tend to benefit more the higher-income strata of society. The plan proposes to deliver the benefits to the poor and disadvantaged people through:

- preferentially hiring poor and disadvantaged people, especially destitute women, in employment for project construction and operation;
- preserving and enhancing wetland and other natural areas wherever possible;
- developing programs and projects which target the poor and disadvantaged (for example, enhancement of open water fisheries);

Resolution of Conflicts
Many water related projects are affected by conflicts in that while one group may benefit, others may be disadvantaged. To overcome the potential for conflicts and insure project viability, the Plan proposes that each of the projects develop a mechanism for resolving conflicts, including a means for the "winners" to compensate the "losers".

Integration of Resource Development and Environmental Protection
It is explicitly recognized that environment conservation is an integral part of natural resource management and both are necessary and interdependent. Conservation cannot ignore the needs of human beings, while development that ignores the environmental limits is non-viable. The plan proposes to take into consideration environmental impacts in the project development process, to mitigate negative impacts and to enhance positive ones.

Maintenance
To ensure project sustainability, maintenance is essential. There is a tradition of relying on government agencies for maintenance. But government resources are limited and one cannot solely rely on these agencies to maintain the numerous small structures and embankments nominally under their care. The Plan proposes to organize communities in order to take responsibility and look after public facilities in their areas.

Sustainability
Development should be sustainable. To accomplish sustainability the Plan recommends that the project development should be technically sound, socially acceptable, economically feasible, environmentally sound, costs/benefits and environmental impacts evenly distributed, and equitable over the long term.

4.2 Initiatives

4.2.1 Water Management Initiatives

Malijhee River Diversion
The Sherpur depression (area: 35,000 ha) located between Sherpur and Nalitabari towns is flooded regularly by cross-boundary inflows coming from the Meghalaya Hills into the Malijhee, Chillakhali and Bhogai rivers together with local rainfall induced floods. Flooding occur once or more times annually, damaging monsoon crops, homesteads and infrastructures.

In order to reduce the flood depth in the Sherpur depression, one proposal put forward is to divert the Malijhee River flow from upstream to the Old Brahmaputra River through Mrigi River. This intervention will increase production of *t.aman* and protect both infrastructure and homesteads. The estimated cost of the interventions is about US$ 11.0 million.

Bhogai River Bypass
A second proposal to reduce flooding in the Sherpur depression is to divert a large volume of flood flow from the Bhogai River at Nakuagaon to Kangsha River at Goatala. The estimated cost of this proposal is about US$ 20.0 million.

Malijhee/Bhogai/Kangsha River Channel Improvement
A third proposal to reduce flooding in the Sherpur depression is to straighten the Malijhee, Bhogai and Kangsha channels with loopcuts. This measure will increase the outflow and reduces the flood depth in the depression. The estimated cost of this proposal is US$ 4.0 million.

Rehabilitation of Chillakhali River Embankment
Embankments have been constructed by Water Development Board on both banks of the Chillakhali River under the food for works programme. The embankments were constructed directly on the river banks without a setback as there was no fund for land acquisition. As a result the embankment is breached every year at several locations due to toe erosion.

This project proposes to reconstruct the embankments with adequate setback distance. The estimated cost is about US$ 2.5 million.

Extension of Konapara Embankment
The Konapara embankment has been constructed by Water Development Board from Bahirshimul to Putkai. There is presently no embankment in the upstream area, between Bahirshimul and Urpha. Flood waters spill through this opening in the 20,000 ha area located between Nalitabari and Goatala area, damaging monsoon crops, infrastructures and homesteads and flooding fish ponds.

This project proposes to extend the Konapara Embankment to Urpha. The cost is US$ 1.5 million.

Dampara Water Management Project
The Kangsha River spill to the southern floodplain in the Jaria-Meda reach causes extensive damage to monsoon crops, homesteads and infrastructure and floods fish ponds in an area of 15,000 ha. The *boro* crops also suffer from drainage congestion created by pre-monsoon rainfall-runoff.

The purpose of the project is to increase food production, protect fish ponds, infrastructures and homesteads through the construction of embankment along Kangsha River and re-excavation of the area's major drainage channels. The estimated cost is about US$ 2.0 million. Its feasibility study has been completed and CIDA has indicated its interest to finance the implementation of the project.

Someswari River Hazard Management
Flooding, siltation of floodplains, and river avulsion are the characteristics of the Someswari River. This project proposes to control flooding and channel avulsion in the area above Durgapur by constructing embankments along both banks of the river, protecting Durgapur by a spur dyke, and protecting the important Durgapur-Netrokona road by strengthening the existing dyke around Birisiri with revetment. Protection of the road will also reduce agricultural damage in the area

on the east side of the road. The project also proposes a long term strategy to cope with the future conditions of the river. Estimated cost for the short term strategy is about US$ 2.0 million.

Rubber Dam for Irrigation
The purpose of the project is to impound dry season river flow in the upper reaches of the Malijhee, Bhogai and Lengura Rivers. Rubber dams are to be installed on the rivers to provide impoundment. The estimated cost is US$ 5.0 million.

Groundwater Monitoring Program
The purpose of the project is to maintain and expand the area's groundwater monitoring network which will facilitate exploitation of groundwater for domestic, industrial, and agricultural use in a sustainable manner. The estimated cost is US$ 2.0 million.

Improved Management of Irrigation Water
The purpose of the project is to develop efficient irrigation management in upper reaches surface water through a pilot project whose objective is to increase irrigation coverage and yield of high value crops while addressing technical, agricultural, environmental, socio-economic, and institutional aspects. The estimated cost is US$ 450,000.

Raising of Homestead Platforms
Preliminary analysis indicates that about 16,000 homesteads of the basin are affected by floods, particularly those of poor families whose homesteads are generally located in low lying areas. The purpose of this project is to flood proof these homesteads by raising them, in order to provide greater security. This measure will also improve income generation since a major source of income of the poor families comes from household economic activities. The project is presently conceived as a pilot project intended for a limited number of villages in a single geographical area. The estimated cost is US$ 500,000.

4.2.2 Fisheries Improvement

Re-excavation of Beels and Creation of Fish Sanctuaries
The purpose of the project is to enhance open water fisheries through the establishment of overwintering grounds and the creation of fish sanctuaries by re-excavating 30 *beels* at different locations of the basin. The estimated cost is US$ 1.0 million.

Fish Pass Structure in Kangsha Project
Fish migration to and from the existing Kangsha Project is obstructed by the project's full flood embankment. The proposed initiative aims to increase fish production by facilitating fish migration and natural recruitment in the project area through construction of a fish pass structure similar to one now in operation at the Manu River Project. The estimated cost is US$ 200,000.

Rehabilitation of Malijhee Water Retention Structure for Fisheries Development
The purpose of the project is to enhance fisheries production through the establishment of overwintering grounds and the creation of a fish sanctuary by impounding water behind the existing Malijhee water retention structure during the dry season (October-May). The existing structure which has been damaged will require major rehabilitation works. The estimated cost is US$ 600,000.

Open Water Fry Release Scheme
The purpose of the proposed scheme is to achieve immediate enhancement of open water fishery resources through the release of fish fry. The project will supplement existing programs of the Directorate of Fisheries. Under the project, fry will be released annually at the rate of 25 kg/ha in the basin's important floodplain totalling about 1000 ha. The scheme will continue for three years. The estimated cost is US$ 2.0 million.

Kharia River Fisheries Development
Kharia River which was once a spill channel of the Old Brahmaputra River is now an isolated channel, some 35.0 km long and 150 m wide. There is little fish in this channel. The purpose of this initiative is to enhance fish production in this water body through management of culture fisheries management with full participation of the fishing community. The estimated cost is US$ 300,000.

Shallow Floodplain Aquaculture
Although the basin's shallow floodplains are rich in plankton and benthos, their fish yield is poor, at less than 10 kg/ha, because they are cut-off from the river network by roads and sedimentation of connecting channels.

The purpose of this project is to monitor the problems and identify prospects for increasing the productivity of these shallow floodplains through application of culture practice in five selected areas. The initiative may be treated as a pilot scheme. Its estimated cost is US$ 200,000.

Support to Diversified Fisheries
The purpose of this initiative is to reduce dependency on open water fishery resources by employing the fishermen in diversified fisheries activities. The project task is to provide training and arrange credit for the interested parties to establish and manage fish hatcheries, pond aquaculture, cage culture, and pearl culture in ponds and paddy fields. The estimated cost is US$ 1.0 million for project work plus US$ 2.0 million for a revolving loan fund.

4.2.3 Domestic Water Supply and Sanitation

Piped Water Supply in Urban Areas
Though most residents of the basin's 11 urban centres use safe water for drinking, few of them use it for other domestic purposes. To ensure the use of safe water for all domestic purposes, running water is essential. In the basin, piped water supply is available only in Netrokona and Sherpur, the two district towns within the basin. The ongoing water supply and sanitation expansion programmes in these two towns are expected to provide 50% of the population with piped water supply by year 2000.

This project intends to raise the piped water supply coverage to 60% of the population of Netrokona and Sherpur towns by year 2015 and also to introduce the system in the other nine *thana* urban centres to cover 20% of their population. The estimated cost is US$ 4.0 million.

Rural Water Supply
In rural areas of the basin, suction mode hand tube wells (HTW) are widely used for lifting groundwater for domestic water supply. Though most of the rural population of the basin use tube well water for drinking, a large percentage of them use polluted surface water for other

domestic purposes. Moreover, many tube wells become inoperative in the dry months as the groundwater table goes down below the tube well's suction limit due to large scale abstraction of groundwater for irrigation.

This project intends to ensure the use of tube well water for all domestic purposes by increasing the density of tube wells and replacing the inoperative ones by force-mode TARA pumps which can lift groundwater from greater depths than the HTW.

By 2015, about 24,000 new HTWs and 15,000 TARA pumps will be required to achieve this objective and the corresponding cost is estimated at US$ 5.5 million.

Urban Sanitation
As of 1991, only 40% of the population of Netrokona and Sherpur and 18% of the population of the nine *thana* urban centres had access to sanitary latrines. The ongoing water supply and sanitation expansion programmes in Netrokona and Sherpur are expected to provide 75% of the population by year 2000 with hygienic sanitation facilities. There is no piped sewer lines in any of the other urban centres and the ongoing project has also no programme to provide any of these centres with such facilities.

The project proposed in the Plan intends to raise the percentage of the population of Netrokona and Sherpur which will have access to hygienic sanitary facilities from 75% to 90% by year 2015. This would include the introduction of piped sewer system to serve 10% of the population. This proposed project also plans to serve 80% of the population of the *thana* centres with hygienic sanitation by 2015. The estimated cost is US$ 500,000.

Rural Sanitation
According to 1991 BBS statistics, less than 3% of the basin rural households have sanitary latrines. The main reasons are poverty and people's apathy towards hygienic practices. This project aims to educate traditional latrine users to change to hygienic facilities, motivate those who are not using latrines now, and to provide a low cost hygienic latrine in every household. The project cost is approximately US$ 1.4 million over the next 20 years.

4.2.4 Agricultural Improvement

Farming System Development
Implementation of a flood control project changes the hydrologic regime of the protected area and as a result eventually alters the area's cropping practices. Observations in the basin's existing flood control projects indicate that farmers react slowly to the change in the hydrologic conditions. This affects to a considerable extent the economics of projects and their viability.

The objectives of this initiative are to develop a farm production system taking into account the changing hydrologic regimes introduced by flood protection projects and to assist and enable farmers to apply the improved farm production system on their own farms. The estimated cost is US$ 1.0 million.

Pilot Studies for Buried Land
Every year large areas of cultivated land are laden with sandy sediments deposited by floods. The fertility of these sediments is poor because of their low organic content and moisture retention

capacity. They are generally unsuitable to grow traditional crops and are often abandoned as a result.

The proposed project is a pilot study to test various techniques which would permit cultivation of those sandy areas and would identify appropriate plant species and crops that can survive the low moisture and nutrient contents. The project cost is estimated at US$ 300,000.

4.2.5 Improve Water transportation

Dredging in Lower Kangsha Basin
Due to little or no upland flow, water transportation in the dry season is not possible in the river reaches of the Upper Kangsha Basin. It is, however, possible to provide a year-round water transportation at least in the Lower Updakhali and Ghulamkhali River reaches lying in the Lower Kangsha Basin by utilizing the backwater of the Baulai River. At present, the lower reaches of these two channels have been silted up at some locations and do not provide adequate draught.

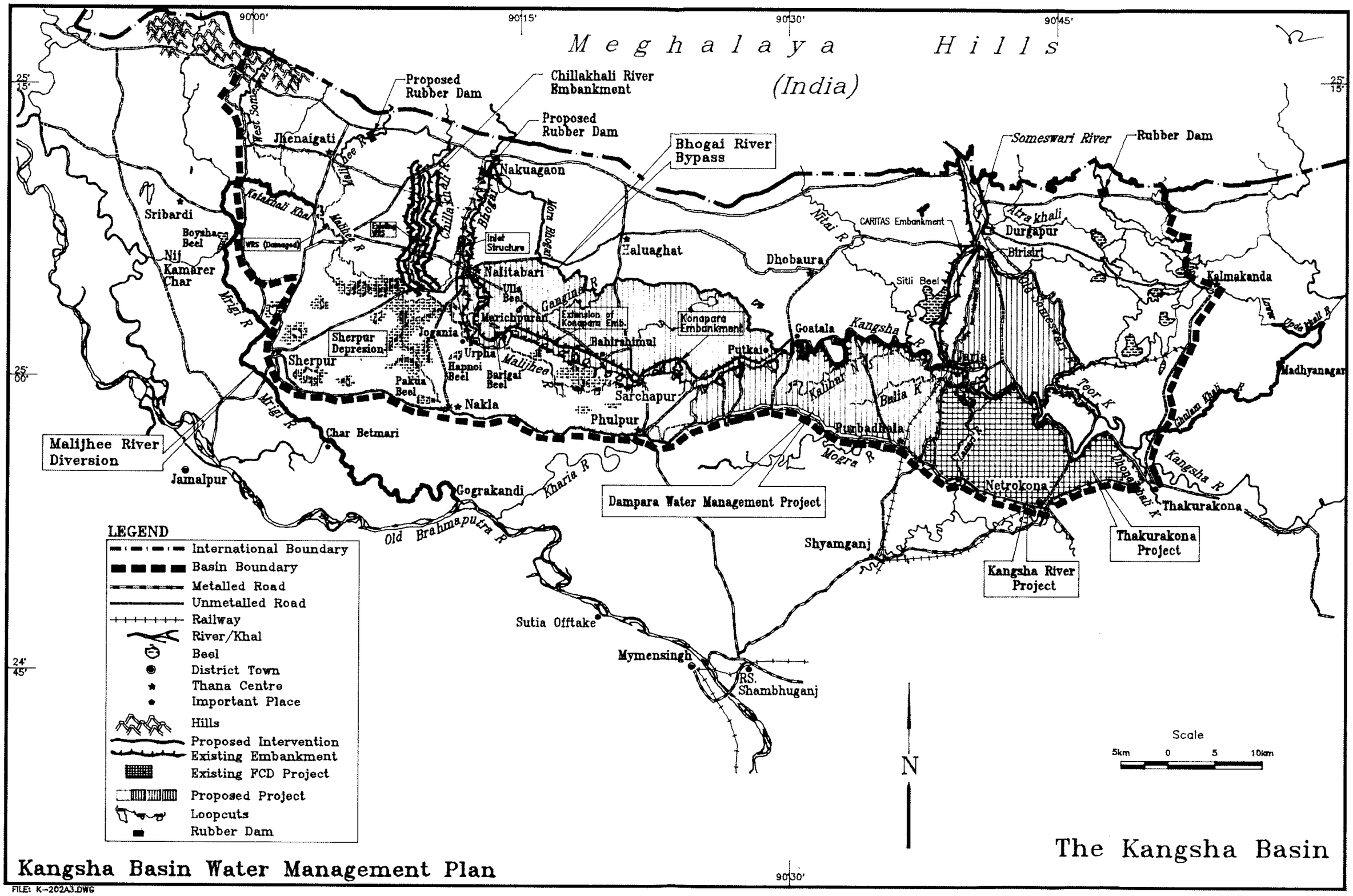
The project would dredge the Lower Updakhali River and the Ghulamkhali branch of the Kangsha River and provide a year-round waterway connection between Jaria and Kalmakanda and the rest of the country. The estimated cost of the project is US$ 5.0 million.

4.2.6 Protect and Enhance Natural Area

Conservation of Biodiversity
The project aims to protect and enhance the biodiversity of the Kangsha Basin. The activities necessary to accomplish these objectives include the identification and selection of areas with important biodiversity, their protection within the framework of existing legislation, the identification of degraded areas, appropriate measures to either restore them or to arrest further degradation, and finally training of the local people in the field of conservation. The estimated cost of this project is US$ 5.0 million.

4.2.7 Support to Project Planning and Implementation

Kangsha Basin Water Management Project
This project would coordinate the planning and implementation of water management projects in the Kangsha Basin using an integrated basin approach. Its primary responsibilities would be to coordinate the efforts of various line ministries in preparing pre-feasibility and feasibility studies for the identified projects, and to organize and mobilize community participation in project planning and implementation. This project would be the custodian of information on the basin and its water resources. It would also continue the work started with the establishment of the Plan. The estimated cost of this project is US$ 1.7 million.



Kangsha Basin Water Management Plan

The Kangsha Basin

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