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Integrated Water Resources Management for Lower Kopili River Basin

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Abstract:
IWRM can add a substantial value to any development planning that involves water. It promotes a holistic approach by spanning across disciplines, sectors and agencies. It does not replace sector planning; rather, it provides a context, highlighting synergies and dependencies. Its orientation towards stakeholder involvement and gender mainstreaming enhances the relevance and usefulness of the planning and the prospects for implementation. IWRM contributes to water security.

Keywords: Domestic water supply, Irrigation, Fisheries, Environmental Flows, Ground Water, Flood Issues, Flood Hazard Zones, Water quality, Navigation.

I. INTRODUCTION

Integrated water resource management is an essential process for promoting long term protection and sustainable use of water resources, built on a foundation of active stakeholder engagement and responsible economic and social development policies. The implementation of a policy of integrated management of water resources is now a universally recognized goal. It is in this context that the Governments of India and Assam have in their water policies recognized adaptation of the IWRM approach. IWRM is a tool for achieving the Millennium Development Goals (MDGs) which recognizes the role of water to achieve development goals. The Plan of Implementation adopted at the World Summit on Sustainable Development in Johannesburg in 2002 called for countries to "develop Integrated Water Resources Management and Water Efficiency Plans by 2005". These "plans" are milestones in recurring and long-term national water strategy processes

II. LITERATURE REVIEW

Jordi Gallego-Ayala (2013) the integrated water resources management (IWRM) paradigm has emerged as the main guiding framework for water resources development and management. Since the IWRM approach started to gain prominence with the 1992 Rio de Janeiro Summit and the Dublin Conference, developing and developed countries worldwide have adopted and transposed the tools and principles embodied in this holistic approach into their national policies as well as their regulatory and institutional frameworks. The scientific community has performed extensive studies within the IWRM field. In fact, there is a growing literature analyzing multi-dimensional functions to pursue an IWRM approach in water resources management. The main objective of this study is to perform a literature review of the scientific knowledge in the IWRM field published between the years 2000 and 2011. A total of 353 papers published in scientific journals were carefully reviewed and extracted from the ISI Web of Science database. The main results show that: (a) the dominant research topics in IWRM analysis focus on its institutional framework, on equitable water allocation (sustainable management of water resources), and on IWRM implementation and stakeholder participation; and (b) the leading countries in scientific research into IWRM.

III. ABOUT STUDY AREA

The coordinates of the site are 25°39'57.39"N and 92°46'53.62"E, Kopili River near kala Nala is selected as the study area of this research project and surrounding area is where the experiment is performed. The description of kopili briefly elaborated mentioning about its infrastructure multiple purposes including hydropower, irrigation, drinking water supply, etc. So, since there is a hydro project is coming in lower kopili river, it is decided to choose Kopili River as the study area of this project.

IV. INTEGRATED WATER RESOURCES MANAGEMENT

The Integrated water resources management for the lower kopili river basin detailed of the process is as follow:

A)DOMESTIC WATER SUPPLY: Domestic water demand in the basin is estimated based on per capita water consumption and population residing in various villages and towns. The basin population has been calculated by the proportionate areas of the districts within the basin.

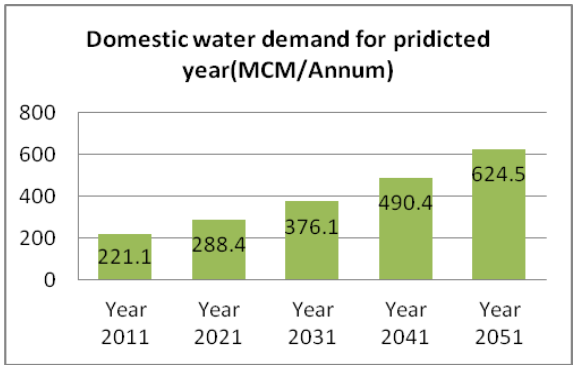

Figure.1. Domestic Water Demand for Sub- Basin

It has also been assumed that per capita daily water requirement of people residing in the basin is approximately 135 liters. Using the same norms, domestic water supply demand in million cubic meters (MCM) has been worked out for the basin area.

b) IRREGATION: The need for any sizable and planned irrigation system was hardly felt. The condition now has radically changed. The population in the plain areas in the basin has been growing at very fast rate, which has more than doubled in last few decades. Also with the improved standard of living per capita requirement of food and fibre has risen. The demand for food has also increase a with setting of some industrial ventures in the basin. Therefore, the need for producing more food to meet the ever-increasing demand is obvious. The traditional cropping pattern is totally inadequate to meet this growing food demand. The cultivators living in the basin, especially in the plain areas of Nagaon and Morigaon districts, are very hard working and endeavouring. On the Kopili basin as a whole, major irrigation area in the plains is 716 sq. km, while that in the hills it is 310 sq.km. Since rice is the main irrigated crop and it is grown during the monsoon season, there is enough surface water available for expanding irrigation areas in the plains.

Table.1. Irrigation Potential in the Kopili Basin

District undivided	Irrigation potential created by Govt. Schemes		Total (Ha)
	Minor	Major/Medium	
Nagaon	16953	-	16953
Morigaon	18893	85842	104735
Kamrup	25076	-	25076
Kamrup Metro	5407	-	5407
Karbi Anglong	60910	9637	70547
NC Hills	7290	-	7290

c) FISHERIES: Fisheries in the basin are commonly seen in the beels and along rivers. While adequate water is available in the river channels in the plains, river fisheries in the hilly region suffer from lack of water during the dry season. Traditional fishery is a livelihood for many tribal people in the hills of Assam. Assuming an average width of the Kopili River at 70 m along its plain reach of 50 km, the total river area comes out to be 927.50 ha for fisheries. Therefore, the total water area for fisheries is computes as 27,713 ha. It is estimated that total annual fish production is about 254 million tones in this area.

Table.2. Water Area for Fish Farming

State	Area of State	Area under the Kopili basin km2 (%)	Water area available for fisheries in ha	
			In State	In Kopili basin
Assam	78438 Km2	15671 km2(19.98%)	133690 ha	26708 ha

d) ENVIROMENTAL FLOW: Most of the hydropower projects built or under planning are expected to alter the hydro-graphy and hydrology of the river system and thus adversely affect and change the aquatic ecosystem, at least to short reaches immediately downstream of dams. , the Kopili River Basin, the dams and reservoirs limit the potential to restore the past habitat system, even if water quality issues are resolved. When considering that there are already two dams and reservoirs upstream supporting the KHP, the implementation and effectiveness of the environmental flow rates should be monitored and evaluated on a regular basis during project start-up and operation

E)GROUND WATER: According to the central Ground Water Board, there is abundance of ground water resources in Assam, with a large potential to utilize for domestic use as well as for irrigation. Ground water availability and utilization in the Kopili-Kallang basin

Table.3. Summary of Ground Water Availability and Utilization in the Kopili basin

District (State)	Utilizable Ground Water in million cubic meter (MCM)	Used volume (MCM)	Balance found water resource for future use (MCM)
Nagaon	1159.569	168.861	990.708
Dima Hasao	515.561	0.189	515.372
Kamrup	1565.916	118.307	1487.6
Karbi Anglong	933.885	0.441	933.444
Total (MCM)	4174.931	287.798	3927.124

F.FLOODING ISSUE: Flood is an annual feature in the areas of the lower Kopili river reaches. Severe floods have occurred in the past. According to Brahmaputra Board, the total flood prone area of the basin is 2,495 sq.km. Out of 3,969 total numbers of villages in the basin, 1,394 villages are located in the flood plains of Kopili and its tributaries, of which 781 numbers are always flooded. The duration of flood ranges from 5 to 63 days, while the depth of flood varies from 0.46 m to 2.28 m. The lower plain areas of Kopili around Kampur town and downstream experience regular floods.

G.FLOOD HAZARD ZONES: A detailed analysis of flooding in Assam has been carried out. These layers based on about 90 satellite data sets, were integrated to generate a flood hazard layer, which provides the details on how frequently a given area is subjected to floods. The frequency of is classified into five categories based on the frequency of flood indentation for a particular area. VERY LOW: for 1-2 times; LOW: for 3-4 times; MODERATE: for 5-6 times; HIGH: for 7-8 times; and VERY HIGH: for 9-10 times. The cropped areas in Nagaon, Morigaon, Karbi Anglong and Dima Hasao districts under different flood hazard zones as computed.

Table .4. District Flood Hazard Index

District	District Area (ha)	Flood Hazard Area (ha)	Hazard index
Morigaon	149300	107834	72.23
Nagaon	400002	191193	47.8
Dima Hasao	486293	462	0.1
Karbi Anglong	1042757	46337	4.44

h.NAVIGATION: The Kopili River is navigable along its lower reach of 81 km from its mouth at Kajalmukh to

Chapramukh. The average water depth is more than 2.50 m in this reach, which is adequate for reasonable size of cargo boats. Beyond Chapramukh, an average depth of 1.30 m available for navigation for a length of about 100 km up to Kheronighat. Only small boats can pass through in this route. In order to gain a year-round navigation (2.50 m depth), one way is to create storage in the upstream sub-basins to regulate the flow in dry season. However, such a scheme is not found feasible. Therefore, only limited navigation is possible in the river.

i)WATER QUALITY: Water quality of a river is a critical factor for determining its utility and ecological significance. The qualitative and quantitative data of various physic co-chemical and biological parameters are significant for characterization of river ecosystem and any changes and alterations due to any unsystematic developmental activities influence the river water quality. Water quality in the lower Kopili River is influenced predominately by low-pH surface water draining from mining areas in West Assam. Due to low pH, water quality of river Kopili is unfit for domestic, irrigation, bathing or industrial use.

J) HYDO POWER DEVELOPMENT: Power sector planning documents provide an adequate overview of other the hydropower development situation in Assam and in the Kopili basin.

K) FLOOD MITIGATION: The low lying areas of the Kopili basin suffer from floods for a long duration during monsoon period causing hindrance to the agricultural activities as people rely on mainly paddy and jute cultivation during the period. Large scale devastation also occurs by frequently during heavy floods.The Government of Assam has constructed embankments on both banks of Kopili River and its tributaries in the plains. However spills from these embankments as well as blockage of land side drainage have aggravated flooding in the low lying areas. On the other hand, the embankment system constructed long back in 60s and 70s is now in a dilapidated condition and become weak to resist the flood of twenty five years return period. Erosion of river banks and the embankments has also occurred at many locations both due to natural (meandering river) and man-made (lack of proper maintenance) factors. The reach of Kopili from Kheroni to Chaparmukh, which is nearly 100 km is affected by erosion.

V. CONCLUSION

Water resources Management for the purpose of domestic water supply, fisheries, navigation, water quality, maintenance of environmental flows in the river reaches, ground water and flooding issue are flood hazards zone. Flood mitigation should be water resources Department and irrigation Department. It has to have constructed embankments on both banks of Kopili River and its tributaries in the plains. However spills from these embankments as well as blockage of land side drainage have aggravated flooding in the low lying areas.

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