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Interconnected Waters: Strategies for River Basin Management and River Interlinking in India

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Abstract

Climate change, population growth, and erratic rainfall patterns have intensified water stress in India, necessitating a paradigm shift in water governance through holistic River Basin Management (RBM) and Interlinking of Rivers (ILR). This paper explores the evolving role of RBM as an integrative framework to manage, conserve, and equitably distribute water resources across states and sectors. We also critically analyze India's ILR program as a large-scale hydrological engineering intervention aimed at flood mitigation and drought management. Through a review of case studies, data on water imbalances, and the effectiveness of basin-level coordination, this paper presents a synthesis of ecological, technical, and socio-political factors. Recommendations focus on enhancing stakeholder participation, institutional governance, and integrated water policies that are resilient to future uncertainties.

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Keywords: *River basin management, Interlinking of rivers, Integrated water resources management, Watershed hydrology, Water governance, Flood and drought mitigation, Climate resilience*

1. INTRODUCTION

India's freshwater systems, comprising over 20 major river basins, are under mounting pressure from climate change, urbanization, industrialization, and increasing agricultural demands. River Basin Management (RBM) and the Interlinking of Rivers (ILR) are two complementary strategies being discussed to address the spatiotemporal distribution of water resources.

RBM promotes integrated planning across upstream and downstream regions considering ecological sustainability. In contrast, ILR proposes transferring water from surplus basins to deficit ones through artificial canal networks and reservoirs. While promising, these approaches require careful planning to avoid ecological disruption and ensure interstate cooperation.

2. NEED FOR RIVER BASIN MANAGEMENT IN INDIA

RBM considers an entire river basin as a unit for managing water resources, as opposed to fragmented administrative boundaries. It integrates land use, water conservation, forest cover, and agricultural practices to ensure sustainability.

2.1 Challenges in River Basin Governance

- Institutional fragmentation
- Conflicting water rights between states
- Deforestation and land degradation
- Insufficient data-sharing frameworks

2.2 Role of Integrated Water Resources Management (IWRM)

IWRM under RBM ensures that groundwater, surface water, and ecosystem services are treated as interdependent resources. It provides a balanced framework involving hydrological, ecological, and socio-political perspectives.

3. INTERLINKING OF RIVERS: VISION AND DEBATE

India's ILR project, led by the National Water Development Agency (NWDA), envisions linking 30 rivers through 14 Himalayan and 16 Peninsular components. The main objectives include:

- Redistributing excess water from surplus basins like Brahmaputra or Mahanadi
- Reducing flooding in the east and northeast

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- Providing drought relief to western and southern states

3.1 Major ILR Projects

Some prominent links under planning/execution include:

- Ken-Betwa Link (Madhya Pradesh–Uttar Pradesh)
- Godavari–Krishna–Cauvery link
- Par-Tapi–Narmada Link

4. ECOLOGICAL AND SOCIO-POLITICAL CONCERNS

Although ILR offers potential benefits, it also poses challenges:

- **Ecological Disruption**: Alteration of river flow regimes, submergence of forests, and threat to aquatic ecosystems.
- **Displacement and Land Acquisition**: Thousands may lose land and livelihood.
- **Interstate Disputes**: Conflicts over water ownership and downstream impacts.
- **Cost and Energy Requirements**: Estimated to exceed ₹5.6 lakh crore with massive pumping and canal construction.

5. CASE STUDIES IN RIVER BASIN MANAGEMENT

5.1 Narmada River Basin

RBM practices include afforestation, reservoir operations (Sardar Sarovar), and stakeholder committees. However, governance issues persist between Madhya Pradesh, Gujarat, and Maharashtra regarding water allocations.

5.2 Cauvery Basin Conflict

Despite the Cauvery Water Dispute Tribunal (CWDT), Karnataka and Tamil Nadu face annual water tensions, highlighting the urgent need for participatory basin-level frameworks.

6. TECHNOLOGICAL INTEGRATION IN BASIN MANAGEMENT

Digital tools like Geographic Information Systems (GIS), Decision Support Systems (DSS), and remote sensing enhance planning and monitoring in RBM. The National Hydrology Project (NHP) and Water Resources Information System (WRIS) provide critical data repositories.

7. TABLE: COMPARISON BETWEEN RIVER BASIN MANAGEMENT AND INTERLINKING OF RIVERS

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Parameter	River Basin Management (RBM)	Interlinking of Rivers (ILR)
Scale of Implementation	Basin-wide (natural hydrological boundaries)	National (across multiple basins and states)
Focus	Sustainability, conservation, stakeholder participation	Engineering-driven redistribution of water
Cost Implications	Low to moderate (soft infrastructure)	Very high (hard infrastructure and land acquisition)
Ecological Impact	Minimal if managed well	Significant ecological alteration and risk of displacement
Time Frame	Medium term (5–10 years)	Long term (20+ years for full execution)
Community Involvement	High	Low to moderate
Conflict Potential	Promotes resolution through dialogue	Can exacerbate interstate disputes

Table 1: Comparative analysis of RBM and ILR approaches highlighting ecological, economic, and governance dimensions (Table height: 0.9 cm).

8. STRATEGIES FOR SUSTAINABLE IMPLEMENTATION

- **Establish River Basin Organizations (RBOs)** under a national water law with autonomy for basin-level planning.
- **Incentivize Water Use Efficiency (WUE)** via modern irrigation, crop planning, and wastewater recycling.
- **Public Participation**: Use Participatory Rural Appraisal (PRA), stakeholder hearings, and grievance redressal.
- **Climate Resilience**: Integrate future rainfall models and groundwater recharge in basin and ILR designs.
- **Environmental Flow (E-flow) Policies**: Mandate minimum river flows to sustain biodiversity and livelihoods.

9. CONCLUSION

India’s quest for water security must reconcile the ecological vision of River Basin Management with the engineering potential of the Interlinking of Rivers. While ILR may alleviate regional imbalances, it must not compromise ecological integrity or social equity. A hybrid approach—where ILR projects are subject to basin-level planning, robust environmental assessment, and institutional collaboration—is essential. Empowering local communities, improving data transparency, and ensuring interstate coordination will shape a water-secure future grounded in sustainability and equity.

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