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**INSTITUTIONAL FRAMEWORK OF RIVER BASIN  
MANAGEMENT IN NORTHEAST INDIA:  
HISTORY, EXPERIENCE AND THE WAY FORWARD**

**BY**

**M. K. SHARMA**

**CONSULTANT**

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# 1. Background: Physical, economic, and social features

India's Northeastern Region consists of a land area of 255,083 square kilometers (8.74 percent of the total area of the country), jutting out eastward between Bhutan and West Bengal and connected to the rest of India by a land corridor that, at its narrowest, is 20 kilometers in width. The states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura, collectively known as the Seven Sisters, fall within this region, as does Sikkim, a recent addition to the North East Council (the body of chief ministers of the northeastern states).

Northeast India is home to a unique kaleidoscope of races, castes, creeds, religions, cultures, and languages. Approximately 200 indigenous communities (almost 50 percent of the indigenous population of the country) reside in the region, ranging from 13 percent of the population in Assam to 95 percent in Mizoram. It is also the richest part of India in terms of natural resources and biodiversity, with vast forests, perennial rivers and streams, minerals, and oil and natural gas. Each state has its own identity and a unique set of issues that affect it, which are often vastly different from the other states in the area.

The Northeastern Region is highly rich in water resources that can be exploited for the benefit of the community, the region, and the nation. The region receives an average annual rainfall of 2,300 millimeters with a maximum of 4,100 millimeters in certain areas. This drains into one of the great river systems of the country, that of the Brahmaputra and Barak rivers. The Brahmaputra is one of the largest river systems in the world, with 52 major tributaries. The system has a total catchment area of 580,000 square kilometers, 33.6 percent of which (195,000 square kilometers) lies within India; other parts of the system occupy China (50.5 percent), Bangladesh (8.1 percent), and Bhutan (7.8 percent). It has an average annual flow of about 537 billion cubic meters at Jogighopa, which is almost 30 percent of the total water resources of country.

The estimated 66,000 megawatts of hydropower potential which is about 44 percent of the national potential of 149,000 megawatts, has been harnessed only to the extent of about 1,095 megawatts, 1.6 percent of the estimated potential, against the development of 27,365 megawatts at the national level, about 18.4 percent of the total available potential. Similarly, the development of water resources in other sectors, such as irrigation and navigation, is well below the national average.

The region has major recurrent problems of floods, soil and bank erosion, and drainage congestion due to the abundance of water, particularly in the monsoon season. Though the problems can appear to be insurmountable, a holistic view of the available opportunities can lead to the conclusion that, with a coordinated approach and given the required resources (including finance, multidisciplinary human resources, and cooperation within the community), the economic and social structure of the region can be transformed with benefits to all stakeholders. Presently the constituent states and the Centre do have their respective institutions for planning and executing developmental works but the existing arrangements lack coordination, finance, a basin-level approach, human resource management, and the confidence of the community, resulting in poor service delivery and small-scale, piecemeal, and inadequate approaches to the bigger problems. There is a pressing need, therefore, to devise innovative solutions that strengthen or augment the institutional framework and equip it with the required resources to bring sustainable and acceptable change at a faster pace.

## 2. Brief summary of the key issues

Contrary to the scenario in the rest of the country, where the demand for water exceeds availability, in the Northeastern Region there is an abundance of water. A key issue, therefore, is the optimal exploitation of these water resources with least disturbance to the ecological balance and environment, along with equitable socioeconomic development and a shared balance of benefits. The following sections expand on this issue.

### 2.1 Flood management and erosion control

Flooding is an enormous problem affecting a large number of people, especially in the plains areas of Assam and other states. The problem has been a focal point since independence, and a number of commissions and committees have been constituted as part of the considerable efforts to address the issue. These measures have generally been inadequate, and the ongoing enormity of the problem is indicated by the data presented in table 1.

**Table 1. Flood damage trends in the Brahmaputra valley of Assam**

Period	Average annual area flooded (million hectares)		% of crop area flooded	Average annual damage (million rupees) <sup>a</sup>		Value of crop lost as % of total damage	Average annual population affected (million)
	Total	Cropped		Total	Crops		
1953–1959	1.13	0.12	10.6	59	39	66.0	0.86
1960–1969	0.75	0.16	21.0	76	70	92.4	1.52
1970–1979	0.87	0.21	24.5	152	136	89.3	2.00
1980–1989	1.16	0.40	34.2	1,755	754	43.0	4.02
1990–1999	0.70	0.22	31.3	1,117	843	75.5	3.38
2000–2004	1.18	0.43	36.0	15,956	2,150	13.5	5.91

<sup>a</sup> Unadjusted for inflation.

Source: Assam Water Resources Department.

### 2.2 Irrigation development

Efforts to develop irrigation facilities were started in earnest in the 1970s and 1980s. However, momentum was lost in the 1990s despite the introduction of the Accelerated Irrigation Benefit program by the central government in 1996. The region still lags far behind the national average for irrigation development. Besides the routine reasons, such as paucity of funds and institutional deficiencies, there are definite socioeconomic and cultural reasons for this lack of development. Traditionally, multiple cropping and irrigation has not been practiced in the region. However, irrigation is slowly becoming important with the rise in population and economic development.

### 2.3 Development of hydropower

As observed in section 1, the development of hydropower has been very slow in the region (only 1.6 percent of estimated potential) despite the large potential available. This situation is likely to improve as the region is a major component of the central government's initiative to

generate an additional 50,000 megawatts of hydroelectricity by the year 2012. Geographic reasons have been the main reason for the slow growth in the past, but in the future hydropower may become the most important growth engine for the region.

## **2.4 Supply of safe drinking water**

Drinking water is a sensitive issue as it directly affects the entire population. In most of the Northeastern Region the groundwater has a high iron content and a high fluoride content. In recent decades the problem of arsenic in groundwater has affected many areas of the region. As groundwater constitutes a major part of the drinking water supply, this problem requires urgent attention from the concerned authorities. The issue of water quality has gained nationwide importance during the last decade and a national authority, the Water Quality Assessment Authority, has been constituted by the Government of India, chaired by the Secretary, Ministry of Environment and Forests. The Water Quality Assessment Authority has constituted state-level water quality review committees chaired by the secretaries or commissioners of the concerned state departments. The main objectives of Water Quality Assessment Authority are:

- Bringing uniformity in data collection and compilation by the various agencies involved, and creating a common database
- Identification of problem areas
- Promoting research and development schemes
- Promoting and aiding appropriate technology, transfer of technology, and development of necessary human resources.

In the hill states of the region the small hilltop villages largely depend upon rooftop rainwater harvesting for meeting their drinking water requirements. Development of community rainwater harvesting schemes with disinfection measures can improve the situation.

## **2.5 Inland water transport**

The waterways provide a cheap mode of transport for people and cargoes. The Northeastern Region is crisscrossed by a number of perennial rivers and streams and the use of ferries is widespread as well as necessary in many parts. Efforts are being made to develop certain sections on the Brahmaputra and Barak as waterways for mass transport.

# **3. Regulatory and policy framework of water resource management**

## **3.1 Constitutional provisions**

The Constitution of India clearly demarcates the division of legislative, executive, and financial powers between the Union of India and the states. The constitutional provisions in respect of allocation of responsibilities between the states and the Centre fall into three categories:

- The Union List (List I)
- The State List (List II)

- The Concurrent List (List III)

In the Constitution, water is a matter included in Entry 17 of List II (State List). The entry is subject to the provisions of Entry 56 of List I (Union List). The relevant provisions in regards to water are as follows:

Entry in List II (State List in Schedule VII of the Constitution):

“Water, that is to say, water supplies, irrigation, and canals, drainage and embankments, water storage and water power subject to the provisions of entry 56 of List I.”

Entry 56 of List I (Union List):

“Regulation of land development of interstate river valleys to the extent of which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest.”

In view of the above, the central government is empowered to enact a law for creating the desired institution or body entrusted with integrated development and regulation of water resources at national or regional level.

### **3.2 National Water Policy, 2002**

The National Water Policy of 2002 provides guidelines for water resource management and development. It also prescribes the priorities that are to be accorded to various kinds of water uses. Drinking water has top priority. The policy identifies river basins as the geographic units for water resource management. Establishment of appropriate river basin organizations is advocated in the policy for overall planning, development, and management of water resources. The importance of a multidisciplinary and participatory approach is emphasized in the policy. Relevant provisions of the policy are as follows:

Paragraph 3.3, Section 3, Water Resources Planning:

“Water resources development and management will have to be planned for a hydrological unit such as a drainage basin as a whole or for a sub-basin, multi-sectorally, taking into account surface and ground water for sustainable use incorporating quantity and quality aspects as well as environmental considerations. All individual developmental projects and proposals should be formulated and considered within the framework of such an overall plan keeping in view the existing agreements/awards for a basin or a sub-basin so that the best possible combination of options can be selected and sustained.”

Paragraph 4.1, Section 4, Institutional Mechanism:

“With a view to giving effect to the planning, development and management of the water resources on a hydrological unit basis, along with a multi-sectoral, multi-disciplinary and participatory approach as well as integrating quality, quantity and the environmental aspects, the existing institutions at various levels under the water resources sector will have to be appropriately reoriented/reorganised and even created, wherever necessary. As maintenance of water resource schemes is under non-plan budget, it is generally being neglected. The institutional arrangements should be such that this vital aspect is given importance equal to or even more than that of new constructions.”

Paragraph 4.2, Section 4:

“Appropriate river basin organisations should be established for the planned development and management of a river basin as a whole or sub-basins, wherever necessary. Special multi-disciplinary units should be set up to prepare comprehensive plans taking into account not only the needs of irrigation but also harmonising various other water uses, so that the available water resources are determined and put to optimum use having regard to existing agreements or awards of Tribunals under the relevant laws. The scope and powers of the river basin organisations shall be decided by the basin States themselves.”

Paragraph 6.4, Section 6, Project Planning:

“There should be an integrated and multi-disciplinary approach to the planning, formulation, clearance and implementation of projects, including catchment area treatment and management, environmental and ecological aspects, the rehabilitation of affected people and command area development.”

Paragraph 6.6, Section 6:

“The drainage system should form an integral part of any irrigation project right from the planning stage.”

Paragraph 6.8, Section 6:

“The involvement and participation of beneficiaries and other stakeholders should be encouraged right from the project planning stage itself.”

Section 12, Participatory Approaches to Water Resources Management:

“Management of the water resources for diverse uses should incorporate a participatory approach; by involving not only the various governmental agencies but also the users and other stakeholders, in an effective and decisive manner, in various aspects of planning, design, development and management of the water resources schemes. Necessary legal and institutional changes should be made at various levels for the purpose, duly ensuring appropriate role for women. Water Users' Associations and the local bodies such as municipalities and gram panchayats should particularly be involved in the operation, maintenance and management of water infrastructures/facilities at appropriate levels progressively, with a view to eventually transferring the management of such facilities to the user groups/local bodies.”

The above policy provisions can be effectively implemented through integrated development and management of the water resources of a basin or subbasin through an appropriate institutional arrangement.

### **3.3 River Boards Act, 1956**

The Government of India, in 1956, just six years after the adoption of the Constitution, enacted the River Boards Act, which made provision for the establishment of river boards for the regulation and development of interstate rivers and river valleys. No river board has been constituted so far under this act. Clause 4(1) of the act provides for the setting up of river boards by the central government itself or at the request of state governments. However, the power to do so has been limited due to the following provision: “Provided that no such notification shall

be issued except after consultation with the Governments interested with respect to the proposal to establish the Board, the persons to be appointed as members thereof and the functions which the Board may be empowered to perform.”

### **3.4 Resettlement and rehabilitation issues**

Resettlement and rehabilitation issues have recently gained prominence, with public interest heightened by the activities of courts of law, nongovernmental organizations, and human rights organizations. The Ministry of Rural Development, Government of India, formulated in 2003 a National Policy on Resettlement and Rehabilitation for Project-Affected Families. The policy gives due recognition and importance to the weaker sections of society, including women and tribal communities. The policy also lays down guidelines for implementation and monitoring mechanisms. The objectives of the policy are:

- To minimize displacement and to identify nondisplacing or least-displacing alternatives
- To plan the resettlement and rehabilitation of project-affected families, including consideration of the special needs of tribal communities and vulnerable sections of society
- To provide a better standard of living for project-affected families
- To facilitate a harmonious relationship between the requiring body and project-affected families through mutual cooperation.

The policy essentially addresses the need to provide succor to the assetless rural poor and to support rehabilitation efforts for the displaced resource-poor sections of society, including small-scale and marginal farmers, scheduled castes and tribes, and women. It also seeks to provide a broad canvas for effective dialogue between project-affected families and the administration responsible for resettlement and rehabilitation. Such a dialogue is expected to enable timely completion of projects, with predictable costing, and with adequate attention paid to the needs of displaced persons, especially those who are resource poor. The intention is to impart greater flexibility for interaction and negotiation so that the resultant package gains all-round acceptability and becomes a workable instrument providing satisfaction to all stakeholders, including the requiring bodies.

The rehabilitation grants and other monetary benefits proposed in the policy would be minimum and applicable to all project-affected families, whether below the poverty line or not. States are free to adopt their own resettlement and rehabilitation packages, which may be higher than proposed in the policy. The policy also lays down guidelines for redressing grievances and dispute resolution.

### **3.5 Environmental and forest considerations**

All water resource development projects require clearance from environmental and forest perspectives by the Ministry of Environment and Forests, Government of India. The ministry has framed detailed guidelines and regulations for clearance depending upon the nature and size of the schemes. This has been a complex matter and many projects have suffered on account of delays caused by nonclearance.

The main issue as regards clearance for forestland is compensatory afforestation and the availability of land for this purpose. For environmental clearance, the cornerstone of the policy

is the environmental impact assessment study, which has to be carried out by a multidisciplinary committee of experts constituted by the Ministry of Environment and Forests for each project. Efforts have been made to simplify the process for expediting the clearances and many modifications have been issued in this regard from time to time.

## **4. Central government initiatives for river basin organizations**

As explained in section 3 above, though water is a state matter according to the Constitution of India, the central government is fully aware that equitable, efficient, optimal, and sustainable development of the water resources of a basin or subbasin is only possible through effective planning, regulation, coordination, and implementation by specific basin- or subbasin-level organizations, and has accordingly over the last 50 years continuously advocated constitution of river basin organizations, as envisaged by the River Boards Act of 1956 and the National Water Policy of 1987, revised in 2002. Several of the committees set up during this period have made recommendations regarding the constitution of river basin organizations and their probable models, jurisdictions, functions, powers, and setups. The briefs and recommendations of some of these committees are given in the following sections.

### **4.1 Subcommittee of the Parliamentary Consultative Committee of the Ministry of Water Resources, 1988**

A subcommittee of the Parliamentary Consultative Committee of the Ministry of Water Resources considered the matter in 1988 and recommended formation of river basin organizations and suggested what their composition might be. The setting up of river basin organizations was recommended in seven river basins, including the Brahmaputra, where reconstitution of the existing organization was suggested. The organizations would be established under Article 246 of the Constitution by enactment of a suitable law. Under the proposed model, a river basin organization would work directly under the overall guidance of the central government and would be charged with the authority for storage apportionment, regulation, and control at various points in the river basin. The decision of the river basin organization on matters within its purview was to be final and binding, with provision for review by a committee. The review committee was to be headed by the Union Minister of Water Resources and its membership would include union ministers from concerned party states or ministries representing the state governments.

### **4.2 Subcommittee of the National Water Board, 1991**

The Ministry of Water Resources in February 1991 constituted a subcommittee of the National Water Board chaired by the Chief Secretary, Government of Gujarat, and comprising the irrigation secretaries of Madhya Pradesh, Maharashtra, Arunachal Pradesh, and Karnataka; member of the Water Planning and Projects Wing, Central Water Commission; and adviser to the Irrigation and Command Area Development Department, Planning Commission. The Chief Engineer, Business Process Management Office, Central Water Commission, was member secretary. The terms of reference of the subcommittee included (a) examining the administrative, technical, and legal aspects of setting up river basin organizations; (b) determining the powers and functions of the organizations; and (c) considering the setting up of

the organizations in phases, starting with organizational build-up in the concerned state governments and preparation of a policy note on the subject.

The subcommittee reviewed the earlier proposal of the subcommittee of the Parliamentary Consultative Committee and recommended in 1992 that river basin organizations need not be set up under an act of Parliament, but can be set up through an administrative order. In the proposed institutional arrangements, a river basin organization would be chaired by a person of proven competence in water resource development, assisted by a member secretary and supported by an interdisciplinary organization for coordination of work related to water resource planning, development, and management. Representatives from each basin state would be among the other members of the organization.

The subcommittee opined that the river basin organization should be given oversight of storage apportionment, regulation, and control at various points in the river basin according to the awards of tribunals or interstate agreements. The organization would be a coordinating agency, rather than a controlling authority.

The recommendations were considered by the National Water Board in its various meetings. However, a consensus did not emerge.

### **4.3 National Commission for Integrated Water Resources Development Plan, 1999**

The National Commission for Integrated Water Resources Development Plan (1999) considered the need for setting up river basin organizations and was strongly of the view that they were an essential institutional mechanism for integrated development. The commission observed that earlier proposals had not been received with enthusiasm by the states because river basin organizations had been perceived as nominated technical bodies of the central government that constituted a threat to state autonomy. The commission recommended setting up river basin organizations as bodies on which the concerned state governments, local governments, and water users would have representation and that would provide a forum for mutual discussions and agreement. The commission, considering the need for wide representation, general acceptance, and effective functioning, suggested an indicative structure for a river basin organization, which would consist of a general council and a standing committee with a permanent secretariat. It should be a multidisciplinary professional body. The cost of funding the river basin organization may be shared equally by the Government of India and the participating states. A suggestion was made that such an organization could execute projects, but only if the state governments concerned requested the organization to take up the responsibility.

### **4.4 Committee on River Basin Organizations, Ministry of Water Resources, 2003**

On the recommendation of the National Water Board, the Ministry of Water Resources set up a Committee on River Basin Organizations in February 2003, chaired by the Additional Secretary, Ministry of Water Resources, Government of India, and with a membership comprising the water resource and irrigation secretaries of the governments of Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh, and West Bengal. The Commissioner, Policy and Planning, Ministry of Water Resources, Government of India, was

member secretary. The terms of reference of the subcommittee included (a) deliberating upon various models of river basin organization and recommending the most suitable for meeting the objectives of sustainable and optimal development of water resources of the country in accordance with the intentions of the National Water Policy; and (b) recommending the most suitable model, including its structure, functions, and powers.

The committee suggested a three-tier structure for such a river basin organization, consisting of a council, board, and secretariat.

#### **4.5 Task force on recurrent flooding, 2004**

A task force was set up by the Ministry of Water Resources to look into the problem of recurring floods in Assam and neighboring states, Bihar, West Bengal, and eastern Uttar Pradesh, chaired by the chair of the Central Water Commission. In its report, submitted in December 2004, the task force cited inadequate organizational arrangements for flood management as one of the reasons for the slow progress in achieving the desired degree of protection against floods. It recommended a review of existing institutional arrangements and that the central government play a greater role in flood management by enacting appropriate acts under existing constitutional provisions. It recommended that the Brahmaputra Board be upgraded, strengthened, and empowered appropriately, and that existing related organizations be integrated into one authority.

#### **4.6 Other past efforts to formulate water policy**

Over the last fifty years various committees, task forces, and other bodies have reviewed water and flood-related problems and have suggested remedial measures. The important ones are as follows:

1954: Policy statement

1957: High-Level Committee on Floods

1958: Policy statement

1964: Ministerial Committee on Flood Control

1972: Minister's Committee on Floods and Flood Relief

1970s: Working groups on flood control for five-year plans

1980: Rashtriya Barh Ayog

1980: Parliament of India passes the Brahmaputra Board Act; Brahmaputra Board established

1987: National Water Policy

1988: Committee on Flood Management in the North Eastern States (Naresh Chandra Committee)

1996: National Commission for Integrated Water Resource Development Plan (S. R. Hashim Commission)

1996: Regional task forces

2002: Report of the Committee on Silting of Rivers in India (Dr B. K. Mittal Committee)

2003: Report of the Experts Committee to Review the Implementation of Recommendations of Rashtriya Barh Ayog (R. Rangachari Committee)

2004, July: Report of the Technical Group on Flood and Erosion Problems of North Bengal (M. K. Sharma Report)

2004, December: Task force report on the problem of recurring floods in Assam and neighboring states as well as Bihar, West Bengal, and eastern Uttar Pradesh, under the chair of the Central Water Commission

## **5. Organizations with responsibilities for water resource management in the Northeast**

As elaborated in section 3 above, the development of water resources is under the jurisdiction of state governments while the central government acts as a coordinator, promoter, and adviser. The state governments formulate the projects, obtain the necessary administrative and financial approvals from state government and central government departments, execute the schemes, and maintain them. Central government agencies, with the consent or at the request of the state government departments, provide technical assistance and consultancy services and prepare detailed project reports. Clearance from the central government depends upon the nature of the project, taking into account, for example, whether it is an interstate or single state project, and the size of the project. There are elaborate guidelines and procedures for preparation of project reports and their clearance from respective agencies for all kinds of schemes. Details of the functions of various agencies are described in the following sections.

### **5.1 Central agencies**

#### **5.1.1 Ministry of Development of North Eastern Region**

The Department of Development of North Eastern Region (DONER) was created in September 2001 by an amendment to the Government of India's Allocation of Business Rule. The department was formally inaugurated on 1 November 2001. The department was accorded the status of a ministry (Ministry of Development of North Eastern Region; MoDONER) via a gazette notification of the government on 27 May 2004. The responsibilities allocated to the ministry include:

- Matters related to the planning, execution, and monitoring of developmental schemes and projects in the Northeastern Region, including those in the power, irrigation, roads, and communications sectors
- Nonlapsable central pool of resources for the Northeastern Region
- North Eastern Council
- Roadworks financed in whole or in part by the central government in the region
- Planning of road and inland waterway transport in the region.

#### **5.1.2 Central Water Commission**

The Central Water Commission is an apex national organization in the field of water resource planning and development. The main functions of the organization are:

- National-level planning and policymaking regarding water resource development
- Preparation of guidelines and manuals for preparation of project reports and other technical matters
- Provision of technical assistance and consultancy to state governments and public sector undertakings in execution of the projects
- Assessment of water resources of the country and flood forecasting, which is an important nonstructural measure of flood management
- Technoeconomic appraisal of major and medium irrigation and multipurpose projects and monitoring, including command area development works
- Investigation and preparation of project reports at the request of state governments or other agencies.

The regional office of the Central Water Commission at Shillong has jurisdiction over the entire Northeast and performs the following functions:

- Hydrometeorological data collection in the Brahmaputra and Barak basins
- Flood forecasting in the Brahmaputra and Barak basins
- Survey, investigation, and preparation of detailed project reports for river valley projects in the region
- Monitoring of major, medium, and minor irrigation schemes receiving Central Loan Assistance under the Accelerated Irrigation Benefit program
- Monitoring of command area development schemes receiving Central Loan Assistance
- Liaison with the state governments, the North Eastern Council, and other organizations working in the Northeast regarding various issues and schemes of the Ministry of Water Resources

### **5.1.3 Brahmaputra Board**

The Government of India set up an autonomous body, the Brahmaputra Board, under the Brahmaputra Board Act, 1980, to carry out surveys and investigations and prepare a master plan for the control of floods and bank erosion in the Brahmaputra valley.

A high-level Review Board was constituted by the Government of India in 1982 to oversee the work of the Brahmaputra Board with the Union Minister of Water Resources as its chair and 14 members, including the Chief Ministers, Union Cabinet Ministers, or Ministers of State for Finance, Energy, Agriculture, Surface Transport, and Water Resources, the Secretary, Water Resources, and the chair of the Central Water Commission. The chair of the Brahmaputra Board is the member secretary.

The Brahmaputra Board also has representatives from the Governments of Assam, Meghalaya, Nagaland, Manipur, Tripura, Mizoram, and Arunachal Pradesh, the North Eastern Council, the central Ministries of Agriculture, Irrigation, Finance, and Transport, the Central Water Commission, the Central Electricity Authority, the Geological Survey of India, and the Indian Meteorological Department. Originally, the chair had the rank of secretary to the Government of India, but in 2000 the rank was downgraded to additional secretary.

### **5.1.3.1 Functions of the Brahmaputra Board**

The objectives and functions of the Brahmaputra Board were defined by the Brahmaputra Board Act, Clauses 12 and 13. Clause 14 provides certain conditions under which the board has to function.

#### **“Clause 12**

- (1) Subject to the other provisions of this Act and the rules, the Board shall carry out surveys and investigations in the Brahmaputra Valley and prepare a Master Plan for the control of floods and bank erosion and improvement of drainage in the Brahmaputra Valley: provided that the Board may prepare the Master Plan in part with reference to different areas of the Brahmaputra Valley or with reference to different matters relating to such areas and may as often as it considers necessary so to do, revise the Master Plan or any part thereof.
- (2) In preparing the Master Plan, the Board shall have regard to the development and utilization of water resources of the Brahmaputra Valley for irrigation, hydro power, navigation and other beneficial purposes and shall, as far as possible, indicate in such plan the works and other measures which may be undertaken for such development.
- (3) The Master Plan shall be submitted to the Central Government as soon as may be after it has been prepared or, as the case may be revised and the Central Government shall, after consultation with the State Governments concerned, approve the same subject to such modifications as it may deem fit.

#### **Clause 13(1)**

- (a) To prepare detailed project reports and estimates for dams and other projects proposed in Master Plans;
- (b) To draw up standards and specifications for the construction, operation and maintenance of such dams and other projects;
- (c) To construct, with the approval of Central Government, multipurpose dams and works connected therewith proposed in Master Plans as approved by Central Government and maintain and operate such dams and works;
- (d) To prepare, in consultation with the State Government concerned, a phased programme for the construction by the State Government of all dams and other projects proposed in the Master Plans as approved by the Central Government other than those referred in (c);
- (e) Perform any other function which may be prescribed for the proper implementation of this Act;
- (f) To perform such other functions as supplemental, incidental or consequential to functions specified above.

#### **Clause 13(2)**

Notwithstanding anything contained in Clause (d) sub-section (1), the Board may, with the prior approval of the Central Government, construct any dam or project referred to in that clause if it is satisfied, having regard to the cost of construction, and the expertise required for the construction, of any such dam or project, that it is expedient so to do.

### **Clause 13(3)**

The Board may maintain and operate any dam or project referred to in sub-section (2) for so long as it deems it necessary so to do.

### **Clause 14**

Conditions subject to which Board may function:

- (a) No multipurpose dam as referred to in Clause 13(1)(c) shall be constructed by the Board unless the State Governments make available the required land.
- (b) No dam or project referred to in Clause 13(1)(d) shall be constructed unless the State Governments concerned make available free of cost land required for its execution and also undertake to take over its maintenance.
- (c) No dam or other works shall be undertaken by the Board unless the State Governments concerned agree to provide all such assistance as may be required for the construction, operation and maintenance thereof.
- (d) Central Government to specify such other conditions including conditions relating to sharing by the State Government concerned of the whole or part of cost of dam or other works constructed by the Board by a general or special order published in the Official Gazette.

Provided that before undertaking the construction of any dam or other works, the Board shall apprise the State Government concerned of the cost of construction of, and the benefits likely to accrue from such dam or other works and the proportion in which the State Government shall share such cost and benefits.

In the case of disagreement, the Board shall refer the matter to the Central Government for decision and the Central Government shall decide such matter after consulting the State Governments and the decision of the Central Government shall be final."

#### ***5.1.3.2 Activities of the Brahmaputra Board***

The Brahmaputra Board has undertaken the following works in line with its mandate:

- River basin planning and preparation of master plans for the Brahmaputra, the Barak, and their tributaries
- Survey, investigation, and preparation of detailed project reports for drainage development schemes for the drainage-congested areas identified in the master plan
- Survey, investigation, and preparation of detailed project reports for multipurpose river valley projects
- Survey, investigation, and preparation of detailed project reports for antierosion schemes
- Hydrometeorological data collection
- Construction of drainage development schemes and multipurpose river valley projects
- Construction of antierosion works
- Physical model studies of river-related problems

- Soil, rock, and concrete testing and foundation studies
- Monitoring of the works executed by the Government of Assam under Central Loan Assistance

#### **5.1.4 Central Groundwater Board**

The Central Groundwater Board is a national apex organization with responsibilities to carry out scientific surveys, exploration, monitoring of development, and management and regulation of the country's vast groundwater resources for irrigation, drinking, domestic, and industrial needs. Established in 1954, The Central Groundwater Board functions under the Ministry of Water Resources, Government of India. The board is headed by a chair and has four members. It has offices in Delhi and Faridabad, under which 16 regional offices function in different states headed by regional directors. The board carries out the following activities:

- Hydrogeological surveys
- Exploratory drilling
- Groundwater monitoring
- Hydrochemical studies
- Hydrometeorological studies
- Geophysical studies
- Remote sensing
- Water supply investigations
- Groundwater resource estimation
- Special project studies
- Assistance to user agencies
- Preparation of groundwater user maps
- Mass awareness and training programs
- Rainwater harvesting schemes

#### **5.1.5 National Institute of Hydrology**

The National Institute of Hydrology was established in 1978 as a research organization under a project of the United Nations Development Programme with its headquarters at Roorkee (Uttaranchal). The institute was established as an autonomous society under the Ministry of Water Resources, Government of India, with the following main objectives:

- To undertake, aid, promote, and coordinate systematic and scientific work in all aspects of hydrology
- To cooperate and collaborate with other national and international organizations in the field of hydrology
- To establish and maintain a research and reference library

Demand-driven basic and applied research (including field- and laboratory-oriented action research) and technology transfer form the major activities of the institute. It is the endeavor of

the institute to apply hydrological principles to solving the water resource problems of the country.

The North Eastern Regional Centre covering seven northeastern states, Sikkim, and the hilly regions of West Bengal, was established at Guwahati in August 1988. Since its inception, the center has been actively interacting with the various water resource organizations in the states while carrying out its studies and activities within the framework of the recommendations of the Regional Coordination Committee in the areas of representative basin studies, remote sensing applications, water quality studies, floods, and watershed management.

The Regional Centre has created a number of facilities, including a water quality laboratory, soil laboratory, and a remote sensing applications laboratory. For basic research, it has also established one representative basin at Dudhnoi and various items of hydrometeorological equipment have been installed in a meteorological observatory. An automated weather station capable of continuously recording 10 weather parameters has also been installed at Guwahati (to be eventually shifted to the representative basin).

As floods are a major problem in the region, the Ministry of Water Resources, Government of India, decided to focus the activities of the center towards the problems of floods in Brahmaputra and renamed it the Centre for Flood Management Studies for the Brahmaputra Basin. The center was formally opened on 27 September 2001. According to its five-year action plan, the center is now working on the following areas:

- Flood estimation and routing
- Structural and nonstructural measures for flood management
- Integrated watershed management for flood control
- Hydrological database management system
- Drainage congestion and erosion problems
- Water quality problems
- Socioeconomic aspects of flood disaster
- Technology transfer

### **5.1.6 Inland Waterways Authority of India**

The Inland Waterways Authority of India was set up in October 1986 under the Inland Waterways Authority of India Act, 1985. In accordance with the act the authority consists of a chair, vice-chair, not more than three full-time members, and not more than three part-time members. The headquarters of the authority is located at Noida, Uttar Pradesh, and it has field offices at Kolkata, Farakka, Bhagalpur, Patna, Ballia, and Allahabad on National Waterway 1, Guwahati on National Waterway 2, and Kochi and Kollam on National Waterway 3. The authority has also identified the Barak River as a waterway in further need of development.

### **5.1.7 Ministry of Agriculture, Government of India**

The Ministry of Agriculture is involved in watershed development programs and river valley projects in flood-prone river and rain-fed areas through its implementation of the National Watershed Development Project for Rain-Fed Areas and the Integrated Watershed Development Project in the country, including in the northeastern states. The project reports are

prepared, supervised, and implemented by a multidisciplinary group of technical officers of the state agriculture departments, for which funds are provided by the Ministry of Agriculture.

The ministry also operates a scheme known as the Watershed Development Project in Shifting Cultivation Areas in the Northeastern Region. The objective of the scheme is the overall development of *jhum* (shifting cultivation) areas on a watershed basis, reclaiming the land affected by shifting cultivation and encouraging socioeconomic upgradation of *jhumia* families to encourage them to practice settled agriculture. The scheme provides 100 percent central assistance to the state plan for the following components of watershed management:

- Administration cost
- Community organization
- Training program and rehabilitation components for households in land-based production systems

The scheme has been taken up through governmental and nongovernmental organizations and scientific and technical institutions in the northeastern states in watersheds where a minimum of 25 percent of the area is under shifting cultivation and 50 percent and above of families are engaged in shifting cultivation as their only means of livelihood and are living below the poverty line.

### **5.1.8 Geological Survey of India**

The Geological Survey of India has its regional office at Shillong. It plays an important role in planning projects by providing the necessary geological inputs.

### **5.1.9 Survey of India**

The Survey of India also has its regional office at Shillong, which carries out topographical surveys of project sites and other areas at the request of project authorities.

## **5.2 Regional-level agencies**

### **5.2.1 North Eastern Council**

The North Eastern Council was created by the North Eastern Council Act, 1971, as an advisory body on balanced socioeconomic development in the northeastern areas consisting of the present states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. The council started functioning in 1972. The North Eastern Council Amendment Act came into force in December 2002, as a consequence of which Sikkim became a member of the North Eastern Council. At present the council acts as an arm of MoDONER.

The membership of the North Eastern Council consists of the governors and the chief ministers of the eight member states, in addition to the chair and the three members nominated by the president of India. The council was constituted to performing the following functions:

- To discuss any matter in which some or all of the states represented in the council have a common interest and advise the central government and the governments of the states concerned as to the action to be taken on any such matter, particularly with regard to:
  - Any matter of common interest in the field of economic and social planning
  - Any matter concerning interstate transport and communication

- Any matter relating to power or flood control projects of common interest
- To formulate and forward proposals for securing the balanced development of the northeastern areas, particularly with regard to:
  - A unified and coordinated regional plan, which will be in addition to the state plans, in regard to matters of common importance to that area
  - Prioritization of the projects and schemes included in the regional plan and recommendation of the stages in which the regional plan may be implemented
  - Communication of the location of the projects and schemes included in the regional plan to the central government for its consideration
- Where a project or a scheme is intended to benefit two or more states, to recommend the manner in which such a project or scheme may be implemented and managed, how the benefits therefrom may be shared, and the expenditure that may be incurred
- To review, from time to time, the implementation of the projects and schemes included in the regional plan and recommend measures for effecting coordination among the governments of the concerned states in the matter of implementation
- To review progress of expenditure and recommend to the central government the amount of financial assistance to be given to the states entrusted with implementation of any project included in the regional plan
- To recommend to the governments of the states concerned or to the central government the undertaking of necessary surveys and investigations of projects to facilitate inclusion of new projects in the regional plan for consideration
- To review, from time to time, the measures taken by the states represented in the council for the maintenance of security and public order and recommend to the concerned state governments further measures necessary in this regard.

An 11-member committee was constituted by the government for revitalization of the North Eastern Council in October 2003. The committee held consultations with the governors and chief ministers of the northeastern states, members of Parliament of the region, state government officials, intellectuals, academicians, civil society groups, and other stakeholders. The committee's final report was formally submitted to the government on 30 August 2004. Some of the recommendations in the report relate to:

- Composition of the council
- Strengthening the organizational setup of the North Eastern Council secretariat at Shillong
- Regional planning for the sustainable growth and development of the Northeastern Region
- Financing and implementation of the regional plan
- Monitoring and evaluation of development projects
- Establishing synergies with development partners.

The government's Common Minimum Program envisages revitalization of the North Eastern Council as a priority, and provides for strengthening of the council with adequate professional support.

## **5.2.2 Northeastern Regional Institute of Water and Land Management**

The Northeastern Regional Institute of Water and Land Management was set up at Tezpur in December 1989 by the North Eastern Council for imparting in-service training to professionals, nongovernmental organizations, and farmers in the Northeastern Region. It is being further developed as a research and consultancy institute on all matters relating to water and land management.

## **5.3 State-level agencies and organizations**

Water essentially being a state matter, various schemes are planned and executed by the different departments of the states. A brief description of these departments is given in the following subsections. Appendix A tabulates the relevant organizations by state and by sector.

### **5.3.1 State water resource, irrigation, and flood control departments**

In the Northeastern Region, irrigation and flood control projects are executed through the respective state departments for water resources, irrigation, flood control, or public works. In Assam, where flood and erosion problems are the greatest, the Water Resources Department is responsible for the projects relating to flood and erosion control, while irrigation is the responsibility of the Irrigation Department.

The mandates of these departments are principally to formulate schemes, to obtain necessary approval from the appropriate agencies and authorities, to execute the schemes, and then to maintain them.

### **5.3.2 State electricity boards**

The development of hydropower falls under the purview of the state electricity boards. They are responsible for executing and maintaining the various hydropower projects owned by the state.

### **5.3.3 State agriculture departments**

The state agriculture departments are responsible for formulation and implementation of watershed management schemes.

## **5.4 Public sector undertakings**

### **5.4.1 National Hydroelectric Power Corporation**

The National Hydroelectric Power Corporation (NHPC) is a public sector undertaking that has been functioning in the region since 1976. Its activities include:

- Survey, investigation, and preparation of detailed project reports for hydroelectric power projects
- Construction of hydroelectric power projects.

In the Northeast, the NHPC has taken up preparation of detailed project reports and construction of projects in the Subansiri, Siang, and Dibang valleys.

### **5.4.2 North Eastern Electric Power Corporation**

The North Eastern Electric Power Corporation (NEEPCO) is a public sector undertaking, incorporated on 2 April 1976. It has functioned since for the exploitation, utilization, and development of the power generation capabilities in the Northeast, for the benefit of the region and the country as a whole. It started with an authorized share capital of Rs.750 million in 1976, which has grown over the years (commensurate with the growth of its activities) to Rs. 25 billion in February 2004. Its activities in the region include:

- Collection of project-specific data
- Survey, investigation, and preparation of detailed project reports for hydroelectric power projects
- Construction, operation, and maintenance of hydel and thermal power projects.

The corporation has so far constructed three hydel and two gas-based thermal power projects with a total generating capacity of 1,105 megawatts (730 megawatts hydel and 375 megawatts thermal power).

### **5.4.3 National Thermal Power Corporation**

The National Thermal Power Corporation was created for the development of thermal power in the country. However, it has become very active in the field of hydropower and has shown interest in a number of projects in the Northeastern Region.

## **5.5 Other agencies**

The Indian Institute of Technology at Guwahati is a premier institute in the country. It has a Civil Engineering Wing, which also deals with water resources. The institute can take up research and development works such as numerical modeling of flood- and pollution-related issues, environmental impact assessment, disaster management, and use of remote sensing techniques.

Other organizations, such as the Indian Council of Agricultural Research and the National Remote Sensing Agency, work in fields related to the water resource sector.

## **5.6 Private participation**

Projects for flood and erosion control and irrigation are either nonrevenue generating or financially unviable for private parties. A number of private parties have, however, shown interest in these areas, and a few are executing hydropower projects in the Northeastern Region, especially in Sikkim and Arunachal Pradesh.

# **6. Budget allocation**

## **6.1 Central agencies**

Central agencies are funded directly by the central government through the consolidated fund of India or various plan and nonplan schemes. For certain activities they may charge the client for services on a noncommercial basis, following the guidelines fixed by the central government. The Central Water Commission, for example, charges clients, who are usually state

governments or public sector undertakings, for the salary of staff plus other actuals and overhead charges for surveys and investigations and technical consultancy.

## **6.2 Regional agencies**

Regional agencies obtain their budgetary support from MoDONER, which uses the funds available from the Non-Lapsable Central Pool of Resources. Funds to the pool accrue from the 10 percent gross budgetary support that each Government of India ministry and its departments is mandated to spend in the region. Project-specific support is provided from this fund for developmental infrastructure in the Northeast.

## **6.3 State agencies**

State agencies are funded through the plan and nonplan budgets of the state governments. They also obtain full or partial budgetary support from the central government and from MoDONER for various schemes. This budgetary support is provided in the form of grants and loans, following the guidelines of the lending authority in respect of various schemes, such as the Accelerated Irrigation Benefit program (introduced in 1995–1996) for major, medium, and minor irrigation projects, and for command area development and water management schemes. For example, for irrigation projects, the central government provides funds through the Ministry of Water Resources under the Accelerated Irrigation Benefit program. The mode of support is broadly as follows:

Total state plan = 25 percent state fund + 75 percent Central Loan Assistance

Central Loan Assistance = 10 percent loan + 90 percent grant

Central Loan Assistance is given in two equal installments against the utilization certificates submitted by the state governments after physical completion of the works and financial expenditure. Besides this, state agencies may arrange assistance from other sources, such as financial institutions and external agencies.

## **6.4 Other agencies**

Other agencies are funded through the central government through different means depending upon the nature of the agency, as boards, authorities, autonomous bodies, and other agencies are governed by different business rules.

## **6.5 Public sector undertakings**

Public sector undertakings are corporations with a majority or controlling number of stocks held by the central government. The conduct of their financial matters follows corporation business rules. They can raise funds through financial institutions and by divesting the stock holding.

# **7. Overlaps and gaps in the mandates of various agencies**

Water resource development is a multifaceted and multidisciplinary activity, as is clear from the mandates of the various agencies that are involved in the activities, many of which are overlapping.

Most of the overlaps and gaps are because of the outdated approach and framework under which government agencies typically function. The approach often revolves around the engineering aspect, with all agencies carrying out similar works in a similar fashion, while other aspects, such as social impacts and environmental issues, often do not find their due place in the working of these organizations. Some examples of the overlaps that may result are as follows:

- **Project formulation and preparation of project reports.** The state government departments, Central Water Commission, Brahmaputra Board, and public sector undertakings (for power projects) are all involved in the preparation of project reports for irrigation, power, and flood control projects.
- **Execution of the projects.** The Brahmaputra Board and state government agencies both execute flood control, erosion control, and drainage improvement projects. Similarly, public sector undertakings and state government departments are involved in the execution of hydropower projects.
- **Funding of projects.** Projects are funded by central government departments and ministries, departments of the Northeastern Council, and financial institutions such as the National Bank for Agricultural and Rural Development, and in some cases also by external agencies.

While there are many overlaps in the roles and responsibilities of various agencies there are serious gaps that have resulted in only partial success of the various projects and schemes executed by them. These gaps have also resulted in a loss of credibility, public discontent, delays in completion, and time and cost overruns. Examples are as follows:

- **Lack of overall regional and basin planning.** Though the Brahmaputra Board has prepared master plans for the river basins and subbasins of the Northeastern Region, so far there has been a lack of the integrated regional and basin-level planning necessary for the optimal economic development of water resources and the tackling of other problems related to water. Schemes are formulated, appraised, and executed in an isolated manner by different agencies without concern for a whole basin approach.
- **Lack of proper socioeconomic and environmental impact assessment.** Projects and schemes are often formulated on an engineering basis, and their cost-benefit ratios therefore fail to take into account socioeconomic factors and impacts, which are very difficult to quantify in a realistic manner. Water resource development has now become a multidisciplinary activity with huge socioeconomic and environmental impacts and none of the agencies are properly equipped to take this aspect of the projects into consideration in a justifiable manner.
- **Lack of a holistic approach.** Projects are often formulated in a departmentalized and compartmentalized manner. Some aspects that affect the realization of project objectives are often not included while formulating a project; for example, for full realization of irrigation benefits, it is essential that the program for Command Area Development and Mass Awareness through Agriculture Extension Workers should be considered during project formulation. Failure to do so will mean that the full irrigation potential cannot be utilized or the benefits of multiple cropping and optimal use of water obtained, essential components of the calculation of the cost-benefit ratio for a project.

- **Lack of monitoring.** Executing agencies and departments carry out the nominal monitoring of the projects. This aspect requires attention and effort during actual project formulation to reduce time and cost overruns and to achieve better interdepartmental and intradepartmental coordination.
- **Performance appraisal.** The concept of performance appraisal is almost nonexistent among agencies involved in the work of water resource development. Though this work is taken up sporadically by other agencies, they find it difficult to collect the correct data from the concerned departments. It would be desirable if this aspect was also included in the actual formulation of the project. In addition, the executing agencies or external agencies should carry out realistic performance assessments of schemes at periodical intervals after completion. This is necessary to identify reasons for failure to fulfill objectives in order that corrective measures may be taken in future.

## 8. Licensing of different water uses

In the Northeastern Region water is available in abundance, so few disputes or conflicts have arisen over the various uses or distribution of water between the states. In addition, water use is governed by the National Water Policy, which gives first priority to drinking water.

Except for hydropower, water-related issues are generally of a nonrevenue-generating nature and are carried out largely through government agencies, aid, and support. Therefore no particular process of licensing for these purposes exists.

In the case of hydropower development, if the state organizations are not executing or owning the schemes, the concerned agency (public sector undertaking or private operator) has to enter into an agreement with the concerned state, and the state may claim part of the benefits as royalty. Other conditions of the memorandum of understanding, for example those regarding land acquisition and human resources, tend to be project specific.

## 9. Stakeholders' roles, responsibilities, and incentives

Except for hydropower, where various corporations and even private parties are taking an interest because of its revenue-generating capacities, there are virtually no stakeholders other than beneficiaries in other types of schemes, for example flood protection or irrigation. Usually the state governments construct the schemes and take responsibility for their maintenance. The beneficiaries remain wholly uninvolved, though they do demand such schemes in their area and make their voices heard through public representatives and political leaders.

There has been effort on the part of the state governments to involve the beneficiaries in at least operating and maintaining the schemes, especially in the field of minor irrigation and command area development, which has localized and clearly identified beneficiaries. Certain incentives are offered to beneficiaries to encourage their involvement in the formation of water user associations and participatory irrigation management.

The central government also offers incentives in the shape of liberalized funding to the states for enacting necessary acts related to participatory irrigation management, formation and registration of water user associations, and signing of memoranda of understanding with those associations to take over the completed schemes or end use components, including distributaries, for operation and maintenance. The incentive of liberalized funding (through the

Accelerated Irrigation Benefit program) is also offered to the states to encourage introduction or revision of water levies in a phased manner in order to meet the full operation and maintenance charges from these levies after five years. Those states who agree to this condition are termed reforming states and gain 100 percent (as opposed to 75 percent) assistance for ongoing projects in the state.

But these efforts have not been as successful as desired. Water user associations, village councils, and beneficiary associations have been formed for many schemes, especially minor irrigation schemes, but their contribution remains minimal in terms of labor for activities such as cleaning of debris and clearing of weeds from the channels at the time of water requirement. The cost of human resources and materials for operation and maintenance is yet to be borne by the state departments and agencies.

No northeastern state has come forward as a reforming state and a large number of schemes remain defunct or underutilized for want of repairs and maintenance. The reasons behind the failure of incentives are:

- The various schemes, such as command area development and participatory irrigation management, have an in-built factor of water deficiency, which is not the case in the Northeastern Region.
- Due to the apparent abundance of water in the Northeastern Region it has traditionally never been considered a commercial commodity. Beneficiaries are used to obtaining water free and consider it the duty of the government to provide as much free water as they require.

In the field of hydropower there have been policy changes to attract private capital for executing and operating hydropower projects. Concerned states can permit any government, public sector, or private agency to execute the hydropower projects in the state. The states may claim their right to a share in the produced power free of cost. The other arrangements and conditions may be agreed upon between the state governments and the executing agency on a project-specific basis.

## **10. Role of nongovernmental organizations**

A large number of nongovernmental organizations (NGOs) are active in the Northeastern Region but there are virtually none in the field of development of water resources. Most NGOs are working in such areas as public health and drug abuse, often in a localized manner. The ethnic diversity and strong tribal identities are factors that make it difficult for NGOs to operate on a regional basis.

Water resource development, by its very nature (barring water supply for small villages and similar local initiatives) requires a concerted approach and wide-scale vision. However, governments largely promote the participation of NGOs in developmental activities of a localized nature. Recently the Ministry of Water Resources, Government of India, has introduced a pilot scheme for rainwater harvesting in girls' schools for drinking water purposes, and to enable construction of toilets with water supply. The scheme was introduced through Global Rainwater Harvesting Systems, a Rajasthan-based NGO. The work was executed through local NGOs, with the participation of local people. The schemes were appreciated by the recipients.

Though there are hardly any NGOs who are active in development of water resources, there are many instances of local bodies or NGOs involved in opposing developmental projects, especially dams. The proposed dams in Arunachal Pradesh and Tipaimukh dam in Manipur are facing resistance from many NGOs.

Because of delays, lack of transparency, and other problems, government organizations do not generally have a good public image. Large communication and information gaps exist between government agencies and the public. This is one area where NGOs can play a very effective role.

The situation can be reversed if governments themselves first educate and then commission NGOs for educating the public about various benefits and consequences of the projects. This will save considerable public disquiet and time and money lost due to the poor quality of information available to the people and the media.

## **11. Assessment of impact of laws, regulations, and informal agreements**

As explained above, according to the provisions of the Constitution, responsibility for water resource development lies primarily with state governments. The role of the central government is mainly advisory and facilitatory, though it can create organizations to help the state governments in formulating, funding, executing, or maintaining projects where the interest of more than one state is involved.

It is a fact that rivers know no boundaries and most of the major rivers cross several states. This has led to many disputes and complications throughout the country. Fortunately there have been few disputes so far in the Northeastern Region due to the abundance of water. But many projects have suffered or had to be shelved because concerned states did not agree to them. Recently the Government of Arunachal Pradesh passed a resolution in its state cabinet prohibiting the construction of storage dams in the state. But storage projects will have to be constructed in Arunachal Pradesh for mitigating the problem of floods in Assam. This has been the recommendation of many committees.

Due to such conflicts in the interests and demands of the states, the central government has had to use its statutory power to constitute boards, authorities, and corporations for managing the water resources of interstate rivers, of which the Bhakra Beas Management Board and the Damodar Valley Corporation are examples. The formation of these board or authorities takes a long time as they have to be formed with the consent of the states, and their mandates must also have the consent of all concerned states.

## **12. Performance assessment of agencies**

As mentioned in section 1, the development of water resources has been very sluggish in the Northeastern Region. Most agencies are governmental and in most cases their performances have been below par. This has been realized at various levels and there has been a redistribution of works and strengthening of the organizations from time to time in an attempt to enhance their performance.

In Assam the Water Resources Department was bifurcated to create a separate Irrigation Department. A few central government agencies have strengthened their regional offices in an

effort to decentralize to meet regional requirements locally. But the changes have not been very effective as the overall framework within which these organizations work has remained the same.

The central and regional agencies, which have the roles of adviser, promoter, and fund provider, have largely been performing in a satisfactory manner, though they also suffer from the problems typical of government organizations. The agencies directly involved with the execution of works, which are generally state government agencies, except for the Brahmaputra Board, have not been able to perform in a satisfactory manner. The reasons for the Brahmaputra Board's inability to perform are intrinsic to the mandate itself, which requires the coordination and consent of so many agencies that it cannot perform at the desired pace. Its mandate is also very limited and even ambiguous as far as execution of the schemes is concerned. An insight into its functioning reveals that the board has been grappling more with administrative and often trivial financial matters than with developmental and technical issues. Since its inception, in the 42 board meetings that have been held, on average only about 25 percent of agenda items pertained to development issues. Other factors contributing to its relative inactivity can be identified as:

- Lack of authority
- Lack of autonomy
- Lack of budgetary support or absence of powers in the Brahmaputra Board Act for raising public or private funds
- Absence of regulatory powers
- The problem of top posts remaining perpetually vacant.

In the wake of emergent situations such as floods, when people look to the board for help, it has been unable to identify its role, either for relief or in terms of immediate flood control measures. In the view of stakeholders, including the state governments of the Northeast and the beneficiaries, namely the people of the region, the Brahmaputra Board has failed to deliver according to their expectations.

The performance evaluation of any agency or institution cannot be complete unless and until the reasons behind its success or failure are looked into. It is to be emphasized here that it is not only water resource development that has been undertaken at a sluggish rate; other sectors of socioeconomic development have also suffered in the same manner in the region. Thus it is clear that, in addition to factors that are specific to the water resource sector, there are other general factors that have hampered the pace of overall development. These can be characterized as:

- Administrative factors
- Financial factors
- Physical factors
- Socioeconomic and cultural factors.

## **12.1 Administrative factors**

Clearance and execution of projects involves lengthy procedures and the consent of various organizations. This often takes a very long time, with the organizations involved often blaming others (within as well as outside their organizations) for the delays. There have been efforts to bring better coordination and synergy within and between the departments, and even the concept of single-window clearance has been mooted, but much still needs to be done in this aspect.

Land ownership patterns differ between states, making land acquisition for projects complicated and causing severe delays in completion of works.

## **12.2 Financial factors**

The financial position of state governments is very poor. On their own, state government agencies find it very difficult to tackle schemes and are dependent on funding from the various central and regional agencies. This involves lengthy procedures that result in occasional funding shortfalls, halts in the execution of work, delays, and cost overruns while carrying out projects.

For many schemes the states have to contribute a part of the cost, for example in the Accelerated Irrigation Benefit program, For command area development, central aid is available in a fixed ratio commensurate with the state's own contribution. Since the fiscal condition of the states is poor they are not able to take full benefit of these schemes and the funds earmarked by the central government for such schemes remain unutilized.

## **12.3 Physical factors**

The Northeastern Region is a vast area with very little infrastructural development. The monsoon is prolonged and heavy, restricting the working season to a few months. Construction materials need to be transported long distances. All these factors lead to very slow progress of works and result in delays.

## **12.4 Socioeconomic and cultural factors**

Much of the Northeastern Region has a self-contained tribal economy. The tribal societies remain largely demonetized, producing just enough for their own requirements, and the commercial aspect of surplus production is not prominent. Thus the practice of multiple cropping is very limited even if irrigation is available. This causes lack of surplus capital and entrepreneurship.

Tribal identities are generally more prominent than state, regional, and national identities, causing a lack of the wider vision that is necessary for the development of the region as a whole. In many parts of the region tribal ethics and practices are sanctioned and even take precedence over state government rules and regulations.

All these conditions have created situations where lack of economic development has been a factor in the disaffection felt by many people, especially young people, giving rise to movements that have caused disruption and an unfavorable law and order situation, which has further hampered the development of the region. Thus lack of development and the dissatisfaction of the people have become complementary and feed off each other, creating a vicious circle.

The above reasons may not be directly connected with the development of water resources but need to be understood if a viable, practical, and efficient institutional framework is to be developed for water resources in particular and for other sectors in general.

## **12.5 Accountability, rewards, and sanctions**

Most of the executing agencies are government agencies or departments. Within government departments the power to make decisions is limited from level to level, with execution, decisionmaking, and provision of funds treated as three distinct processes, among which coordination is usually poor. Such compartmentalization and multitier decisionmaking reduces the accountability of individuals and intradepartmental units.

## **13. River basin organization case studies**

### **13.1 Tennessee Valley Authority, United States**

The Tennessee Valley Authority (TVA) has been a federal corporation since 1933 and is the United States' largest public power company. The chair and two members are appointed by the president, by and with the advice and consent of the Senate, for a fixed term of nine years. As a regional development agency, the TVA supplies affordable, reliable power, supports a thriving river system, and stimulates sustainable economic development in the public interest. The TVA operates fossil fuel, nuclear, and hydropower plants, and also produces energy from renewable sources. It manages the United States' fifth-largest river system to minimize flood risk, maintain navigation, provide recreational opportunities, and protect water quality within the 106,000-square-kilometer basin.

#### **13.1.1 Tennessee valley before 1933**

The World Bank brought out a Technical Paper - Comprehensive River Basin Development: The Tennessee Valley Authority - in November 1998, wherein it stated that "There were dire social and economic conditions in the Tennessee Valley in the 1930s. Although rich in natural resources, the region was largely rural and undeveloped, poverty-stricken, and characterized by degraded environmental conditions." The situation in the Northeastern Region of India is very similar today.

#### **13.1.2 Functions and jurisdiction**

The main functions of the TVA are "To improve the navigability and to provide for the flood control of the Tennessee River; to provide for reforestation and the proper use of marginal lands in the Tennessee Valley; to provide for the agricultural and industrial development of said valley; to provide for the national defense by the creation of a corporation for the operation of Government properties at and near Muscle Shoals in the State of Alabama, and for other purposes."

#### **13.1.3 Funding and financing**

The TVA originally received appropriations from the federal government to fund the construction of certain portions of its power system. In 1959 The United States Congress made the TVA's power system self-financing. At that time approximately \$1.4 billion of the government's original investment in the power system was outstanding. The TVA repays a portion of this original balance each year plus a dividend-like return payment at a market rate

of interest. In 2004, these combined payments equaled \$38 million. Through 2004, the TVA has made payments totaling more than \$3.5 billion on this original obligation.

The TVA received federal appropriations for its nonpower functions until 2000. In 2001, the TVA began funding its nonpower operations from power system revenues. It is currently self-funded and receives no appropriations from the federal government for either its power or nonpower operations.

#### **13.1.4 Performance and contribution**

The TVA's dams are part of a resource management system that is totally integrated, each dam operating in relationship to the others. The dams are managed for multiple purposes and public benefits: navigation, flood control, power supply, land use, water quality and supply, and recreation. The integrated management approach ensures that water and land resources will be used in ways that sustain the watershed for future generations.

The TVA's most important contribution is keeping power rates competitive. This helps attract industries that bring employment to the region. Low power rates also give valley residents more money to spend on other goods and services.

## **13.2 Damodar Valley Corporation**

### **13.2.1 Constitution and functions**

The Damodar Valley Corporation (DVC) was set up under the Damodar Valley Corporation Act, 1948, with the following functions:

- Promotion and operation of schemes for irrigation, water supply, and drainage
- Promotion and operation of schemes for the generation, transmission, and distribution of electrical energy, both hydroelectric and thermal
- Promotion and operation of schemes for flood control in the Damodar River and its tributaries and channels, if excavated by the corporation in connection with the scheme and for the improvement of flood conditions in the Hooghly River
- Promotion and control of navigation in the Damodar River and its tributaries and channels
- Promotion of afforestation and control of soil erosion in the Damodar valley
- Promotion of public health and agricultural, industrial, economic, and general well-being in the Damodar valley

### **13.2.2 Organizational setup**

The Rashtriya Barh Ayog in its report made a case study of the DVC and elaborated on various aspects of the authority. The report says that Subsection (1) of Section 5 of the original DVC Act provided that every member shall be a whole-time servant of the corporation, but this was reviewed in September 1957 and provisions made for part-time members. Again, in 1959, it was considered sufficient to have only a part-time board. Accordingly, the board was constituted on a part-time basis and the Secretary of the Ministry of Irrigation and Power was appointed as the chair in addition to duties in the ministry. This arrangement caused several administrative problems, including nonimplementation of decisions taken after consultation with the state

governments, and was thus again reviewed in 1963, with a reversion to a full-time chair, though still with two part-time members, one each from Bihar and West Bengal (now Jharkhand), an arrangement that continues today.

The Rashtriya Barh Ayog dwelt upon the various aspects of the corporation. Parts of its conclusive chapter are summarized below as lessons for the future:

- There is a conflict not only between flood control and irrigation but also between flood control and power. This conflict becomes aggravated if the project is undertaken by more than one agency. In such cases, this can be resolved only by having a unified authority.
- To increase the flood absorption capacity of the DVC dams, several committees have recommended acquisition of land up to the designed levels. The DVC feels helpless, as the land has to be acquired by the states concerned, which may not be inclined to displace their population. Since an agreement has now been reached between the state governments, this difficulty may be overcome.
- In the initial stages the DVC, in the exercise of its powers, undertook certain developmental activities in the valley, but later these were discontinued due to introduction of the Community Development program. This prevented the corporation from obtaining the cooperation of the states. Had the developmental activities continued to be undertaken by the DVC, there might have been better rapport with the state governments and the people.
- The efficient working of any organization depends, among other things, upon the nature of its internal organization and the professionalization of its management. The organizational system for a big multipurpose undertaking should recognize the role that can be played by multidisciplinary teams of officers. The DVC is still far from realizing this goal.
- Over the years, the control of the DVC over the river has been diluted. Though the DVC was intended to be an autonomous organization, in practice its autonomy is very much restricted.
- The procedure for financing has further helped to keep the DVC subject to the pressures and pulls of the participating governments.
- Given the difficulty of the task assigned to the DVC, involving, as it did, three main objectives that conflicted in several areas, the authority delegated to it was inadequate.

### **13.3 Comparison of DVC and TVA**

The Rashtriya Barh Ayog compared the DVC and TVA at several places in its report. The main issues are as follows:

#### **13.3.1 Structure and responsibilities of the board**

Section 4 of the DVC Act provides that the corporation shall consist of a chair and two other members appointed by the central government, in consultation with the state governments of West Bengal and Bihar. This is in sharp contrast to the TVA, where the board of directors consisting of a chair and two members is appointed directly by the president with the concurrence of the United States Senate, without the states having any say in the matter, for a

fixed tenure of nine years. The TVA has a reasonable degree of autonomy and the flexibility of a private corporation. The central government in drafting the constitution of the DVC had emphasized that “for efficient administration, the authority must be vested with a high degree of autonomy for conducting the undertaking”. However, this is not reflected in actual operation.

### **13.3.2 Lack of autonomy**

As already mentioned, the powers of the DVC are subject to directions issued by the central government from time to time. The state governments also have a hand in the management as they are providing their share of finances. In fact, the DVC is responsible to each of the three participating governments and submits its report to them. All these developments have tended to erode the authority of the DVC, and reduce its effectiveness as an organization for carrying out the functions assigned to it.

There is a difference of scale between the Damodar valley and the Northeastern Region on geophysical, political, and environmental levels, but still the lessons learnt from the DVC would be very helpful in conceiving a new entity for the Northeastern Region.

## **14. Recommendations**

The existing organizations engaged in water resource development in the Northeastern Region have lost the goodwill of the people of the region as they have not been able to deliver the services promised. While these organizations have the potential to break new ground, their pace and manner of implementation has not met the expectations of the region. The exploitation of resources at a faster pace, making a conducive environment for development and the support and participation of stakeholders, would not perhaps be possible through mere upgradation or amalgamation of these organizations. The existing organizations have developed a certain work culture and often carry a negative image, the legacy of which would not be conducive to meeting their objectives. In summary, there is a strong case for a new autonomous and empowered organization, manned by top-class professionals, which embarks on the mission of integrated development of the water resources in the region with a clearly spelt out mandate and having the authority and power to not only discharge smoothly the functions entrusted to it but also to facilitate other organizations engaged in the region in resolving the various adversities they face. The mechanisms associated with this process should be transparent to ensure that the benefits reach the poor and local communities.

It would be pertinent to mention here that the prime minister of India visited Assam on 21 and 22 November 2004 after very severe floods and emphasized the need for a new organization, stating that “The government will consider establishing a cohesive, autonomous, self-contained entity called the Brahmaputra Valley Authority or the North East Water Resources Authority to provide effective flood control, generate electricity, provide irrigation facilities, and develop infrastructure. Given managerial and financial autonomy, equipped with top-class manpower, and backed by Parliamentary sanction, such a body could be the instrument for transforming the region.”

Such an organization should take into account (a) available exploitable water resources; (b) available organizational setups at different levels; (c) existing legal and political scenarios; (d) the expectations of people and their representatives; (e) the recurring flood problem and resulting plight of people and the losses they incur; and (f) the poverty and low standard of

living of the people of the region. The structure and mandate of the new organization, as constituted by the central government, may reflect the following principles:

## **14.1 Jurisdiction**

The organization should be responsible for the regulation and development of water resources in the region. In respect of regulation the jurisdiction of the organization should be over the entire Northeastern Region. With regard to development, the jurisdiction of the organization should be decided in consultation with the states, but it should cover all major interstate rivers. On the smaller rivers and tributaries, concerned state governments should remain involved in water resource development in consultation with the organization. Hydropower development should be the responsibility of the organization for all the schemes other than mini- and micro-sized projects, which would continue to be taken up by the respective state governments. Activities such as investigation and preparation of prefeasibility reports in the hydropower and irrigation sector for projects taken up by the states or other central organizations should continue.

## **14.2 Structure**

It is proposed to have three-tier system, with a high-powered body at the top political level, a second body at the advisory level, and a third (the authority) at the executive level. The high-powered body should be at national level, headed by the prime minister and including Union Ministers for Water Resources, Finance, and Power, MoDONER, Shipping, Environment and Forests, and Agriculture; the deputy chair, Planning Commission; and chief ministers of the state governments of the region as members for deciding overall policy matters and directing the different governments, ministries, and organizations for facilitating expeditious progress of works.

The organization should include advisory bodies consisting of senior officers of the state governments dealing with the water and power resources sector, representatives of concerned central ministries and organizations, public representatives of various levels, stakeholders, and eminent professionals in specified sectors, which would advise the organization on matters associated with the implementation of the mission. One of the tasks of the advisory bodies would be to promote community participation for effective delivery of programs and projects.

The third tier, the authority, would be headed by a chair of top-ranking level in the Government of India, with members representing different areas, for example water, power, navigation, the environment, finance, and administration, all to be appointed by the central government for a fixed tenure of at least seven years. The rest of the structure would be decided by the authority, as required. The chief secretaries of the seven states; Secretary, MoDONER; designated representatives of the administrative central ministry, the Planning Commission, and the Ministry of Environment and Forests; and the Secretary, North Eastern Council, would be ex officio part-time members of the authority.

Thus there would be multitier participation of the concerned states in the decisionmaking process of the organization, as follows: at the top political level, chief minister as representative on the high-powered body headed by the prime minister; at the public and community level, representation in advisory bodies; and at the top bureaucratic level, state chief secretary as ex officio part-time member of the organization. The authority is the most important organ of the

whole proposed mechanism, as is discussed in detail in the following sections. The authority should have a lean but effective and efficient organizational setup to reduce the administrative costs as well as to minimize inertia.

### **14.3 Basic necessities for an effective organization**

To fulfill the objectives and to meet expectations, it is proposed that the authority be autonomous, empowered, and ultimately self-sustainable. The lessons learnt from the DVC and the Brahmaputra Board have been utilized in conceptualizing the authority so that it can function and deliver effectively.

#### **14.3.1 Autonomy**

Complete autonomy is essential for the effectiveness of the authority. The authority should be given a free hand in respect of appointment of officers, employees, consultants, experts, and committees, and deciding their service rules, remuneration, and other rewards according to merit. The authority should have freedom to set its short- and long-term goals, within the given mandate, and evolve a suitable mechanism to achieve them. In the discharge of its functions the authority should be able to act on business principles. The authority should devise methods for resolving problems being faced by other organizations working in the region with similar objectives.

#### **14.3.2 Empowerment**

For autonomy in the matters of administration, planning, execution, finance, and works, the statutory powers or the powers vested in different central organizations need to be fully or partially vested in the authority. The geographic positioning of the region warrants empowerment of the authority to reduce delays and to have better appreciation of the situation on the ground.

The authority should have regulatory powers in respect of the development of the water resource sector, including flood and erosion control, irrigation, navigation, and hydropower, to ensure integrated development of the resource. Accordingly, the water resource development projects in the region should be examined by the authority for their overall conformity with the master plan finalized by the organization.

The authority should have powers to accord techno-economic clearance to flood control schemes, antierosion schemes, drainage improvement schemes, and navigation schemes, which otherwise would be examined and cleared by various agencies of central government, including environmental clearance. If required, necessary statutory powers should also be vested in the authority.

The authority should have powers for land acquisition for discharging its functions, as available to other central organizations such as the National Highways Authority of India under the National Highways Act, 1956. The authority should also be empowered to formulate its own project-specific resettlement and rehabilitation package conforming to the national resettlement and rehabilitation policy and in consultation with the concerned states. All the financial assistance, grants, relief, and loans provided by the central government to the states pertaining to the water sector should be routed through the authority.

#### **14.3.3 Self-sustainability**

Self-sustenance will be the key to the success of the authority. The authority will be required to invest huge funds in the infrastructure development of nonrevenue-generating sectors, such as flood management and irrigation, for which it will have to depend on budgetary support from central government, which must reduce after a certain time, requiring the authority to simultaneously invest in revenue-generating sectors such as hydropower and navigation. For the development of hydropower, the authority should aim for partnership with existing agencies, including public sector undertakings such as the National Hydroelectric Power Corporation, the North Eastern Electric Power Corporation, the National Thermal Power Corporation, and private entrepreneurs on the basis of equity participation or execution on a cost plus basis. The governments of the states where projects are located should continue to receive a percentage of free power, as is existing practice, which may be decided on a project-specific basis according to financial viability.

Considering the requirement of funds for nonpower programs, for example flood and erosion control, developing irrigation potential, navigation, and fisheries, and assuming a 50 percent equity participation by the authority with other players in the field of hydropower generation, the authority would progressively become 100 percent self-reliant in an estimated foreseeable period of 20 years. Until such time as the authority achieves self-sustainability, it should be supported by central grants for its nonpower and power programs to the level of about Rs.15 billion per year until some of the hydropower projects start generating revenue, which may be about ten years, after which the grants can be reviewed. The region faces severe flood problems almost on an annual basis and to manage such natural disasters the authority should also be supported by a revolving corpus of Rs. 500 million to enable it to take up works of an urgent nature. For the debt component of the power projects, the authority would be empowered to raise funds from private and public financial institutions.

#### **14.3.4 Functions and powers**

The functions and powers of the organization should draw on the experience of an existing river basin organization, for example the DVC. These should be modified to accommodate modern technological developments, sociopolitical scenarios, increasing concerns about the protection of environment, biodiversity, and the ethnicity of the region. It is proposed that the existing state organizations should continue to function in their respective jurisdictions. It is proposed that the organization be modeled in such a way as to enable all existing organizations – state, central, and private agencies – to play a role in the development of natural resources in the region. The authority should be entrusted with the following main functions, objectives, and powers to ensure planned, optimal, and integrated development of water resources in the Northeastern Region for the purpose of effective flood management, erosion control, electricity generation, provision of irrigation facilities, and the development of infrastructure related to navigation, tourism, and pisciculture:

- Preparation of master plans for integrated water resource development, incorporating issues of irrigation, flood control, hydropower, navigation, and drainage improvement
- Promotion, execution, and maintenance of schemes for flood management, drainage improvement, and erosion control; generation (other than mini and micro), transmission, and distribution of electric energy, both hydroelectric and thermal; and interstate schemes or other schemes in consultation with the states for irrigation, water supply, and improvement of water quality on the rivers in its jurisdiction

- Promotion, development, and control of navigation on the rivers and channels; promotion of policies and activities for the enhancement of the environment of the region and preservation of its biodiversity; promotion of water resource-related infrastructure development schemes in such sectors as agriculture, fisheries, aqua sports, tourism, and industry, for the economic and general well-being of the region; and conservation and maintenance of wetlands associated with the rivers
- Coordination with the various central, state, and other organizations operating in the water resource and related sectors mentioned above
- Promotion of public and private investment in the water resource sector and community participation for effective delivery of programs and projects
- Development of modern technologies, including information technology, remote sensing, and Geographic Information Systems (GIS); maintenance of a georeferenced databank of all the water resource projects in the region; and morphological studies and other related research and development in the water resource sector
- Human resource development and awareness in the water resource sector, and related issues concerning disaster management
- Hydrometeorological data collection, acquisition, preservation, analysis, and dissemination

The authority should have the power to take any requisite action that may be necessary or expedient for the purpose of carrying out its above stated functions, as follows:

- Decide the number of officers and other employees for the purpose of discharging its functions, and be responsible for their appointment; select and appoint consultants, experts, and committees for offering advice and assisting the smooth functioning of the works of the authority; decide service conditions, and remunerations and other rewards
- Set goals, plan strategies, and evolve a suitable mechanism for their achievement
- Regulate and prioritize the construction, operation, and maintenance of water resource projects according to the functions of the authority; allocate water resource projects, including hydropower, to appropriate agencies in the private and public sectors, and make agreements with them; construct water resource projects, structures, and works
- Acquire land for discharging its functions
- Raise funds from private and public financial institutions and make investments
- Decide resettlement and rehabilitation packages for different projects in consultation with the concerned states.
- Issue statutory, mandatory clearances to water resource projects, including technoeconomic, environmental, and forest clearances

#### **14.4 Benefits to the states of the region**

The main focus of the organization is on unified regional development with multiple objectives by which all the northeastern states will benefit, both tangibly and intangibly. Some of the tangible benefits would be:

- The proposal envisages that the revenue generated by the authority would be utilized in infrastructural development in a number of areas, including hydropower generation, flood management, irrigation, navigation, pisciculture, and tourism. More benefits would be retained within the region than is possible under the present system of development, particularly in the hydropower sector, where the revenue earned by public sector undertakings or private entrepreneurs would not necessarily be deployed for the development of the region.
- There would be multitier active involvement of states in the decisionmaking of the organization
- The present envisaged fund infusion from central government through the organization of Rs. 15 billion per year is likely to change the face of the Northeastern Region, bringing improvements in employment generation, capacity building, law and order, education, and the general well-being of the people of the region.
- The organization would envisage equitable development of the water resources of the region.
- The organization would be responsible for mobilization of huge amounts of funds needed for the development of water resources at a faster pace on an equity basis from central government and on a loan basis from public and private sources.
- Optimal development and utilization of the human resources of the region would be made possible.
- The states would continue to get a percentage of power from the hydropower projects, as is the current practice, though this may be negotiable on a project-specific basis.
- Faster clearances of water resource projects will be possible.

## **15. How to go about it?**

It is said that well begun is half done. Creation of the proposed organization with the intended authority, empowerment, and multifaceted functions, successfully implemented in letter and spirit, would undoubtedly help the organization to achieve its objectives in times to come. There are bound to be serious hurdles and opposition from some corners at state as well as at the central level, but strong political will, transparency in imparting information to other parties, continuous dialogue and negotiations amongst the stakeholders, and putting national interests above local issues can see the proposal through. The proposal will have to have the sanction of Parliament and concurrence from the constituent states. As the functions of the present Brahmaputra Board would be a small subset of those of the proposed authority it would be prudent to propose that the board be subsumed into the authority. Other central and state organizations with overlapping functions could be continued until the time the authority is fully operational.

## Appendix A. Brief description of state government departments involved in water resource development

State	Irrigation	Hydropower	Flood management	Navigation	Basin management
<b>Arunachal Pradesh</b>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, and construction of minor irrigation schemes. Due to hilly terrain scope is for only minor irrigation schemes</p> <p>Present status: Potential: 18,000 ha Created: 3,200 ha Utilized: 3,000 ha</p>	<p>Organization: State Power Department</p> <p>Functions: Development of hydropower capacity</p> <p>Status: Constructed only mini and micro hydel schemes for local use.</p> <p>Scope available for mega reservoir projects</p>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Works executed so far: Embankments: 7 km Drainage channels: 9 km Town/village protection works: 18 Area benefited: 3,000 ha</p>	<p>Organization: No organization for this purpose. Since the terrain is hilly, scope for navigation is nil</p>	<p>Organization: State Agriculture Department</p> <p>Functions: Formulation, implementation of schemes under National Watershed Development Project for Rain-Fed Areas and Integrated Watershed Development Project of Government of India. Implementation is also proposed to be carried out through NGOs and community organizations</p>

State	Irrigation	Hydropower	Flood management	Navigation	Basin management
<b>Assam</b>	<p>Organization: Irrigation Department bifurcated from Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, and construction of major, medium, and minor irrigation schemes</p> <p>Present status: Potential: 900,000 ha Created: 213,500 ha Utilized: 158,600 ha</p>	<p>Organization: Assam State Electricity Board, under State Power Department</p> <p>Functions: Survey, investigation, planning, and construction of embankments and drains and construction of antierosion and town protection works</p>	<p>Organization: Water Resources Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Works executed so far: Embankments: 4,459 km Drainage channels: 851 km Town/village protection works: 681 Area benefited: 1.636 million ha</p>	<p>Organization: Inland Water Transport Department</p> <p>Functions: Running and maintenance of ferry ghats at important places along Brahmaputra, Barak, and major tributaries. Function confined to ferry passengers and goods across rivers</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>
<b>Manipur</b>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, and construction of minor irrigation schemes</p> <p>Present status: Potential: 359,000 ha Created: 600 ha Utilized: 500 ha</p>	<p>Organization: State Power Department</p> <p>Functions: Development of hydropower</p> <p>Capacity status: Constructed only mini and micro hydel schemes for local use</p>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Works executed so far: Embankments: 500 km Drainage channels: 126 km Town protection work: 1 Area benefited: 130,000 ha</p>	<p>Organization: No organization for this purpose. Since the terrain is hilly, scope for navigation is nil</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>

State	Irrigation	Hydropower	Flood management	Navigation	Basin management
<b>Meghalaya</b>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, and construction of minor irrigation schemes</p> <p>Present status: Potential: 63,000 ha Created: 10,200 ha Utilized: 9,900 ha</p>	<p>Organization: Meghalaya State Electricity Board, under State Power Department</p> <p>Functions: Development of hydropower</p> <p>Capacity status: Constructed medium and mini hydel schemes</p>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Works executed so far: Embankments: 116 km Drainage channels: nil Town/village protection works: 8 Area benefited: 4,000 ha</p>	<p>Organization: No organization for this purpose. Since the terrain is hilly, scope for navigation is nil</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>
<b>Mizoram</b>	<p>Organization: No separate organization for this purpose. A number of minor irrigation schemes are under implementation by Department of Agriculture and Minor Irrigation</p> <p>Present status: Potential: 96,000 ha Utilized: 16,464 ha</p>	<p>Organization: State Power Department</p> <p>Functions: Development of hydropower</p> <p>Capacity status: Constructed only mini and micro hydel schemes for local use</p>	<p>Organization: No organization for this purpose. Being a hill state there are hardly any floodplains</p>	<p>Organization: No organization for this purpose. Since the terrain is hilly, scope for navigation is nil</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>

<b>State</b>	<b>Irrigation</b>	<b>Hydropower</b>	<b>Flood management</b>	<b>Navigation</b>	<b>Basin management</b>
<b>Nagaland</b>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: survey, investigation, planning, and construction of minor irrigation schemes</p> <p>Present status: Potential: Unassessed Created: 900 ha Utilized: 700 ha</p>	<p>Organization: State Power Department</p> <p>Functions: Development of hydropower</p> <p>Capacity status: Constructed mini and micro hydel schemes for local use</p>	<p>Organization: Irrigation and Flood Control Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Being a hill state the problem of floods and erosion is limited to vicinity of major town of Dimapur</p>	<p>Organization: No organization for this purpose. Since the terrain is hilly, scope for navigation is nil</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>
<b>Tripura</b>	<p>Organization: Public Works (Water Resources) Department</p> <p>Functions: Survey, investigation, planning, and construction of medium and minor irrigation schemes</p> <p>Present status: Potential: 81,000 ha Created: 21,000 ha Utilized: 21,000 ha</p>	<p>Organization: State Power Department</p> <p>Functions: Development of hydropower</p> <p>Capacity status: Constructed only mini and micro hydel schemes for local use</p>	<p>Organization: Public Works (Water Resources) Department</p> <p>Functions: Survey, investigation, planning, construction of embankments, drains; construction of antierosion and town protection works</p> <p>Works executed so far: Embankments: 140 km Drainage channels: 11 km Town/village protection works: 11 Area benefited: 45,000 ha</p>	<p>Organization: No organization for this purpose. There is no scope for navigation in the state</p>	<p>Organization: State Agriculture Department</p> <p>Functions: As above</p>