

THE CONCLAVE ON RIVER BASIN MANAGEMENT
EQUITABLE USE OF RIVER BASIN WATER

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Foreword

India is a land of monsoons and rivers. The country has 12 mega-river basins. Despite being blessed with water resources, mismanagement of water resources has made India a water-stressed country. Our rivers are getting polluted. The underground water table is falling at an alarming rate. Per capita availability of water has reduced. The global warming is affecting weather patterns. Inter-state water disputes are becoming difficult to resolve. Water variability is also affecting agriculture productivity. There is an urgent need to improve water management in the country.



The Vivekananda International Foundation and the International Commission on Irrigation and Drainage organized a conclave on River Basin Management on 29-30 November 2017. The conclave was inaugurated by the Chief Minister of Uttarakhand Sh Trivendra Singh Rawat. Sh SK Pattanayak, Secretary, Ministry of Agriculture delivered the keynote address. Over two days and several sessions, the experts assessed the current situation of water resources available in India, the constitutional and institutional framework, the prospects of river basin management and other dimensions of water security. They came out with a number of practical suggestions and recommendations. One of the key recommendations is that development and management of river basin should be done in an integrated manner. A national water framework law needs to be finalized. It was also felt that political will is needed to deal with the different issue of water management.

I am delighted to present the report of the Conclave. It is hoped that the report and its recommendations will enhance awareness and trigger a public debate on an issue of crucial importance for the nation and society.

I would like to thank ShDhirendra Singh, former Home Secretary, and Member Advisory Council, Vivekananda International Foundation as well as Sh AB Pandya, Secretary General, ICID for organizing the conclave. Our thanks are to all the experts who contributed to the discussion.

May 2018

Arvind Gupta
Director
Vivekananda International Foundation

The Conclave on River Basin Management Equitable Use of River Basin Water

1.0 Introduction

Water Management in India has always been a challenge because of large temporal and spatial variations in its availability. The task is becoming more challenging due to global warming having significant impact on water availability both in space and time. The challenge is accentuated by the increasing population pressure and uses, resulting in water scarcity in many areas. Moreover, the challenge is further compounded due to matters concerning environmental degradation and the deleterious effects of climate change in the minds of both individuals and governments. The individual is concerned with health issues of polluted water and air as well as water scarcity for daily needs while the agriculturist suffers crop losses and industrialist from power deficiency and absenteeism as a result of environment related diseases. The concentration of natural resources like water, coal, iron, and other minerals and their exploitation cause local environmental degradation. But export and use of these resources elsewhere with jobs and value addition taking place far away have also given rise to local resentment.

Sustainable and equitable use of the natural resources, especially water is vital for the well-being of individuals and the community. Number of initiatives have been launched by the Government such as doubling farmers' income, rural drinking water to all, smart cities, Swatch Bharat Mission, Make in India, development of inland waterways, rural health programme, etc. The success of these initiatives will depend on sustainable and efficient use of scarce

water resources and integrated and holistic management, preferably at river basin levels. As a first step to equitable allocation it is necessary to identify a hierarchical set of requirements, with basic needs of drinking, washing and cooking as first priority, as stipulated in the National Water Policy 2012, and then proceeding to uses for agriculture and industry, and leisure and sporting requirements etc. In addition, use of water in producing electric power is another significant area which needs attention and is required to be factored in the overall development of the Basin. Apart from the needs of humans, the environment too needs water to preserve aquatic eco system and its rejuvenation; the scope to include recycling of natural resources as far as possible in all such cases assume significance.

A core challenge before India is, thus, about proper management and use of water in all major river systems which can come about only by proper and effective governance and undertaking associated institutional reforms.

Based on a high level conclave organized by Vivekananda International Foundation and International Commission on Irrigation and Drainage on the subject, this report presents an analysis of the present situation of water resources development in India and propose some of the immediate desirable steps required to be taken.

2.0 Water Resources in India and their Development

Broadly, the Water Resources Atlas of India had identified 23 river basins, out of which 13 are major river basins, namely Indus, Ganga-Brahmaputra-Barak, Subernarekha, Brahmani-Baitarni, Mahanadi, Godavari, Krishna, Pennar, Cauvery, Tapi, Narmada, Mahi, and Sabarmati. These cover about 2.6 million sq km out of total area of about 3.18 million sq km. Out of the total estimated 1869 BCM of annual average flows, these major basins carry about 85% (1583 BCM) of water. It is also seen that out of the total utilizable water available (690 BCM) in the the country, 88% (609 BCM) is available in these basins. In addition, total annual replenishable ground water potential of the country is 433 BCM. Thus the total utilizable annual water availability of the country is assessed at 1123 BCM.

So far out of 690 BCM utilizable surface water, storage capacity of about 255 BCM has been created and another 51 BCM is under construction through major and medium projects. Maximum storage probabilities lie in Himalayas; these include quite a few in the Ganga basin in Nepal, and in Brhmaputra basin (in India and Bhutan); the peninsular rivers like Mahanadi, Godavari and Narmada too offer some scope for harnessing available flows during floods.

Out of ultimate irrigation potential of about 140 million hectare (Mha), about 109 Mha (Major and medium irrigation-45 Mha and minor irrigation both from surface and ground water-64 Mha) has been created of which about 87 Mha has been utilized . As per an assessment by the Central Electricity Authority, the economically exploitable and viable hydro potential of India is estimated to be about 1,48,701 MW, which is about 84,044 MW at 60% load factor out of which about 44960MW (only 53%) has been harnessed so far. In addition, 56 sites for Pumped Storage Schemes with probable total installation of about 94,000 MW have also been identified of which about 4800 MW have been developed and about 1080 MW is under development.

In terms of water supply, as per census of 2011, 43.5% of households (HHs) (i.e., 70.6% HHs in urban and 30.8 % HHs in rural) have access to piped water sources whereas 53.0% HHs (i.e., 26.9 % HHs in urban and 65.2 % HHs in rural) depend upon non-piped improved sources such as well, hand pump, tube well/bore well while the remaining 3.50% of households (HHs) (i.e., 2.5% HHs in urban and 4.00 % HHs in rural) depend upon unimproved sources such as spring, river/canal, tank/pond/lake and other sources.

On the other hand, in respect of sanitation 44.0 % of households (HHs) (i.e., 79 % HHs in urban and 27.6 % HHs in rural) have a sanitary toilet whereas 2.9% HHs (i.e., 2.4 % HHs in urban and 3.10 % HHs in rural) have insanitary latrines while remaining 53.10 % of households (HHs) (i.e., 18.6% HHs in urban and 69.30% HHs in rural) do not have toilets.

It is estimated that almost 80% of water supply for these uses get back into the ecosystem as wastewater. An estimated 38,354 million litres per day (MLD)

sewage is generated in major cities, but the sewage treatment capacity is only of 11,786 MLD (about 31%). Similarly, only 60% of industrial waste water, mostly large scale industries, is treated. Currently, about 37% of the wastewater (22,963 million liters per day out of daily sewage generation of about 61754 million litres) is treated as per the 2015 report of Central Pollution Control Board.

International best practice suggests that a better management of water resources and a more rational allocation of water to those sectors that add most value to GDP is best pursued through River Basin Organizations (RBOs). A River Basin, considered as the geographical area determined by the watershed limits, is recognized as an appropriate unit of water development due to its hydrologic characteristics of upstream - downstream influences. Any land-use change in the watershed has its impact on the characteristics of its flows. However, its management is difficult and many a time leads to problems besides conflicts, as political boundaries cut across those mandated by nature. These organizations have as a mandate to safeguard the finite and vulnerable nature of water, pursue water development and management in a participatory fashion at the river basin level. RBOs promote the role of women in the provision, management and safeguarding of water, and promote the fact that water has an economic value. RBOs also help serve as the custodians of water resources that ensures the best possible allocation of water across sectors in an impartial and judicious manner. Dynamic master plans for the River Basin Management are often prepared to guide RBOs and these are implemented by consensus amongst the stakeholders at River Basin Level. Integrated Water Resources Management (IWRM) is kept in view in all such decisions by the RBOs.

Majority of the water resources development planning in India is carried out in isolation for specific sites. No doubt, there are multipurpose projects but even in case of such individual projects, the concept of integrated plan for utilization of available resources is missing. It is a common scenario that most of the river basins in India are experiencing moderate to severe water shortages, brought on by the simultaneous effects of agricultural growth, industrialization

and urbanization all of which had placed a growing demand on fresh water steadily.

Thus we have a complex system dealing with a scarce but vital national resource involving a large number of stakeholders. The management of this complex eco system is one of the major challenges for India to transform into a New India. And this can come about only by proper and effective governance of water and undertaking associated institutional reforms, in which legal processes can play a crucial role which can be accomplished within the concept of basins and catchment areas.

3.0 Constitutional and Institutional Framework in India

A brief yet adequate indication of constitutional provisions (and other related policies related to planning, development and management of water resources) is dealt with in what follows:

3.1 Specific provisions

Three most often referred to provisions related to water in Constitution are: (a) Entry 17 of the List II (State List) of the Seventh Schedule; (b) Entry 56 of the List I (Union List) of the Seventh Schedule; and the Article 262 of the Constitution. These provisions are as under.

i. Entry 17 of List II (State List) of the 7th Schedule

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

ii. Entry 56 of List I (Union List) of the 7th Schedule

Regulation and development of inter-state rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest

iii. Article 262

Disputes relating to Water - Adjudication of disputes relating to waters of inter-State rivers or river valleys

- a. Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-State river or river valley.
- b. Notwithstanding anything in this Constitution, Parliament may by law provide that neither the Supreme Court nor any other court shall exercise jurisdiction in respect of any such dispute or complaint as is referred to in clause (1)

3.2 *Other related provisions*

Apart from above mentioned provisions in Constitution about water resources, the issues related to water and water uses also appear in several Articles and / or Schedules of the Constitution as under.

- i. Article 243ZD in respect of Committee for district planning which inter-alia provides that every District Planning Committee shall, in preparing the draft development plan, have regard to matters of common interest between the Panchayats and Municipalities including spatial planning, sharing of water and other physical and natural resources, the integrated development of infrastructure and environmental conservation and the extent and type of available resources, both financial or otherwise.
- ii. Similar provision exist in respect of Committee for Metropolitan planning under Article 243ZE.
- iii. Additional powers of the Bodoland Territorial Council to make laws Article 244(2) – Sixth Schedule – Entry 3B (vii) flood control for protection of village, paddy fields, markets and towns (not of technical nature) and Entry 3B (xiii) irrigation.
- iv. Following Entries of List I (Union List) of Seventh Schedule

- Entry 24. Shipping and navigation on inland waterways, declared by Parliament by law to be national waterways, as regards mechanically propelled vessels; the rule of the road on such waterways,
 - Entry 25. Maritime shipping and navigation, including shipping and navigation on tidal waters; provision of education and training for the mercantile marine and regulation of such education and training provided by States and other agencies,
 - Entry 30. Carriage of passengers and goods by railway, sea or air, or by national waterways in mechanically propelled vessels, and
 - Entry 57. Fishing and fisheries beyond territorial waters.
- v. Following Entries of List III (Concurrent List) of Seventh Schedule
- Entry 20. Economic and Social Planning, and
 - Entry 32. Shipping and navigation on inland waterways as regards mechanically propelled vessels, and the rule of the road on such waterways, and the carriage of passengers and goods on inland waterways subject to the provisions of List I with respect to national waterways.
- vi. Following Entries of Eleventh Schedule
- Entry 3. Minor irrigation, water management and watershed development,
 - Drinking water, and
 - Roads, culverts, bridges, ferries, waterways and other means of communication.

Although there is no specific mention of “water”, in the Entry 20 of the List III (Concurrent List) of Seventh Schedule, this entry undoubtedly covers the matter related to planning of water resources – a resource which is not only lifeline of the social system but also an essential input for economic development.

3.3 Other administrative instruments

Apart from legislation, administrative action like formulating a Water Policy or setting coordinating Councils have been taking place from time to time in the Centre and States. Many States have enacted legislation to regulate surface and ground water. However, most such legislations are biased towards the use and exploitation of surface water. A welcome development has been emphasis on people oriented and managed water management systems. The National Water Policy also encourages participation of the private sector which is expected to bring in innovative ideas, financial resources, service efficiency and better management on corporate lines.

Thus, we have a complex system dealing with a scarce but vital national resource involving a large number of parties. The management of this eco system is one of the major challenges for governance.

- i. **National Water Policy of India (2012)** inter-alia provides planning, development and management of water resources be based considering river basin / sub-basin as a unit.
- ii. **The National Environmental Policy 2006** promotes integrated approach to management of river basins by considering upstream and downstream inflows and withdrawals by season, interface between land and water, pollution loads and natural regeneration capacities, to ensure maintenance of adequate flows, in particular for maintenance of in-stream ecological values, and adherence to water quality standards throughout their course in all seasons.
- iii. **Guidelines for Preparation of River Basin Master Plan issued by CWC** stipulate that even though river basin organisations are proposed for integrated planning and development of river basins, States need to prepare master plans for portion of river basin falling in their State, which could later be consolidated by the Central Agency. The National Water Mission is actively engaged in obtaining the

State Master Plans under the ‘Climate Change Adaptation Strategy’, presently with some guidelines for the purpose.

4.0 Challenges in Implementing IWRM

As indicated above, IWRM and river basin management approach is need of the hour for equitable and efficient management and sustainable use of scarce water resources to meet the challenge of water and food security, recognising that water is an integral part of the ecosystem. IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. Thus, IWRM is about integrating all sources of water, all water using sectors, temporal and spatial integration, all stakeholders, relevant policy frame work, legal and institutional framework, human and environmental needs, etc.

As most of the river basins in India encompass areas from more than one State, the Union Government has to play an important role of coordination to ensure that the practices are sustainable. However, given the existing constitutional provisions and cross cutting nature of water management as per the Constitutional provision, the Union Government is finding itself in a fix to ensure a sound integrated holistic basin plan on its own and ensure the implementation without taking the concerned States into confidence. It also remains a fact that the idea of establishment of effective River basin entities for the holistic development of water resources has indeed not materialized in real tremes - despite the existence of a River Board Act since 1956. This is because of the fact that the states are generally not interested to bring in other players like the Centre, perceiving some loss of power as a consequence.

The above has led to a situation wherein the River basin management in India has confined to solutions of very specific problems till date. All the river basin organizations established as of now, function as an Advisory Committee/Board with the exceptions of Cauvery River Authority and Narmada Control Authority

which are formed under the directions of Tribunals. The only example where the objective was integrated planning was in the establishment of Damodar Valley Corporation which resulted in the preparation of 'Preliminary Memorandum on Unified Development of Damodar River' by M. L. Voorduin¹ (August 1944). Based on that plan, the basin development works were taken up after independence. However, all the components included in the Plan have not yet been fully implemented because of various reasons.

The Bhakra Management Board, often cited as a successful example, was constituted under the Punjab Reorganisation Act, 1966 under which a master plan was drawn to harness the potential of three eastern rivers namely the Sutlej, the Beas and the Ravi, under the Indus Water Treaty provisions. The Bhakra and Beas Projects form a major part of the plan, and were established as a joint-venture of the erstwhile States of Punjab and Rajasthan. Pursuant to this Bhakra Management Board was renamed as Bhakra Beas Management Board (BBMB) with effect from 15th May 1976. Since then, the Bhakra Beas Management Board is engaged in regulation of the supply of Water and Power from Bhakra Nangal and Beas Projects to the States of Punjab, Haryana, Rajasthan, Himachal Pradesh, Delhi and Chandigarh.

Similarly, Tungbhadra Board, Brahmaputra Board, Bansagar Board, Rajghat Board, Narmad Control Authority, Godavari River Management Board, Krishna River Basin Management Board, National Ganga River Basin Authority etc. have been set up with specific purpose or issues in mind. As such they are also not catering to integrated and holistic planning, development and management at basin level. It is now essential to move forward without any further delay wherein the management of the river Basins could be taken up based truly on the principles of equity and justice, working in a participative, consultative and collaborative manner for sustainable development of the basin resources.

1 Damodar Valley Corporation, Web Site, Preliminary Memorandum on Unified Development of the Damodar River submitted by Mr. M. L. Voorduin in August 1944

Invoking the Constitutional provision under entry 20 of List-III (concurrent list) of the Seventh Schedule which provides for social and economic planning could also be considered. Undoubtedly, a question whether such exercise will be acceptable to the concerned parties i.e., the State Governments is quite pertinent. However, a professional approach will definitely help the stakeholders in appreciating the issues and selecting a better option, thus achieving the objective of improved management of the resource.

In contrast, China adopted “Water Law of the People’s Republic of China” in January 1988 which was subsequently revised in August 2002 and further revised recently in July 2016². The law was formulated in order to rationally develop, utilize, conserve and protect water resources, prevent and control water damage, realize the sustainable utilization of water resources and meet the needs of the national economy and social development. The Water Law is China’s key water legislation that provides a comprehensive framework for integrated water management. The law includes provisions on water resources ownership, water abstraction rights, water resource planning, water resources development and utilization, the conservation of water resources and dispute settlement. It defines river basin commissions and their responsibilities, and strengthens the administrative authority of those bodies. Between the planning systems, the water abstraction permit system, and the system of water function zones, the framework comprehensively addresses the key aspects of water resources management. As a result of efforts undertaken for implementation of water law, while the annual GDP has grown at an annual rate of about 10% over the last 30 years, water utilization has only increased by 1% annually. The national crop output has increased by 50% while agricultural water usage has remained the same³.

2 http://szy.mwr.gov.cn/zcfg/fl/201405/t20140526_563987.html

3 Water Resources Management in the People’s Republic of China, Bin Liu & Robert Speed, *International Journal of Water Resources Development*, ISSN: 0790-0627 (Print) 1360-0648 (Online), (<http://www.tandfonline.com/doi/pdf/10.1080/07900620902868596>)

The planning, development and management of water resources on IWRM principles with basin/sub-basin as a unit is yet to gain momentum in our country as most of the river basins are inter-state and there is lack of collaborative spirit between them. Key areas of concern and challenge in implementing IWRM in our country are as follows:

- **Constitutional Provisions and Limitations:** The Centre has exercised its jurisdiction in the matter of inter-State rivers by enacting the River Boards Act of 1956. Constitution provides for management of an inter-State river basin by legislation or by setting up of a Board under the Act. However, till now no effective Board has been set up by the Centre taking recourse to this legislation.
- **Political Will:** In effective management of River Basins one of the major issues has been the equitable distribution and optimum use of surface water resources as generally river basins involve more than one State as well as number of stakeholders. Inter-State water disputes have turned out to be a vexing issue in respect of water sharing. And this has resulted in the conflicts amongst States who are neighbours to each other. It is a volatile mixture of politics, law and rights affecting livelihood and peaceful coexistence.
- **Project Oriented Approach:** Basins are not being developed in an integrated manner for the optimum utilisation of resources. The existing projects are getting adversely affected by harnessing of the water in the upstream reaches through many programs like the watershed programs, unforeseen when water was getting allocated earlier by judicial interventions like Tribunals for water allocations with identified projects at that time.
- **Complexities of the system:** Due to growing economy and an accelated GDP, the 'per capita income' is increasing fast; this has led to fast changing life style and dietary patterns resulting into greater water demands, which, in turn, had enhanced the competition among sectors

for water use. Further demand from large number of stakeholders for scarce but vital national resource adds strain to the eco-system.

In the past greater stress has been laid on use of those provisions of the Constitution which deal with dispute resolution through setting up of Water Dispute Tribunals (WDT). These were not true to the spirit of participative and collaborative approach and invoking available provisions in RBA 1956. This is in contrast with other international experience of river basin management and settlement of differences through negotiations and cooperative and collaborative efforts, as indicated in section 5 below.

Appreciation of these areas and resulting equitable distribution between consumers would provide satisfaction to large members and yet return adequate quantities back to the ecosystem. Such an attitude of give and take towards the problem would eliminate the adversarial relations which have now become the norm between basin States and induce them to work together for the benefit of all and will be win-win situation to all. And amongst these efforts the most important is the setting up of River Basin Organisation (RBO) comprising representatives of all the riparian States, Central agencies, and all other stakeholders, which will be the most effective instrument for equitable exploitation of the resource. No dispute should be entertained till the matter has been taken up for resolution at the level of RBO.

Although there are number of very good examples and successful pilots of integrated management of water resources at micro-watershed level, both with Government taking lead as well as initiated by the NGOs and the communities, but their scaling up at wider scale has been very sluggish and difficult because others are not in sync with the development leading to sub-optimal utilisation of the natural resource. Accordingly, focused attention will be needed to scaling up successful models.

5.0 River Basin Organizations: Some Examples

There are many international examples of different river basin management models/ approaches/ organisations around the world with river basins facing

different challenges and are at varying stages of development with different learnings and experiences. Some of these, such as the Murray-Darling basin Authority (Australia), Tennessee Valley Authority (TVA), Nigerian River Basin Development Authorities (RBDA), the Orange-Senqu River Commission (ORASECOM), the International Commission for the Protection of the Danube River (ICPDR), the Mekong River Commission (MRC), the Nile Basin Initiative (NBI), Senegal River Basin Development Organization (OMVS) to name a few, are briefly mentioned. Brief details of the river basin management approach adopted is given below.

- i. **Tennessee Valley Authority (TVA)**⁴: TVA was created by U S Congress in 1933 and charged with a unique mission – to improve the quality of life in the Valley through the integrated management of the region’s resources. TVA mandate include for a comprehensive approach to natural resource utilisation and watershed management with objectives ranging from reclamation of land, conservation of soil, improvement in productivity of the crop, promotion of crop cooperatives, flood-control, generation of Hydroelectric power supply, controlling malarial mosquitoes and improving navigation. TVA was viewed as a model for integrated watershed management in economic development and is known as “Temple of Development”.

- ii. **Murray- Darling Basin Authority**⁵: The process of evolution of Murray Darling Basin, food bowl of Australia, consists of three phases namely, (a) Pioneering Phase 1900-1920, (b) Development Phase 1920-1967 and (c) Management Phase 1968 onwards. The RBO management approach has been evolving for over 100 years with 3 different institutional models: (a) River Murray Commission, 1917 (b) Murray Darling Basin Commission, 1989 and (c) Murray Darling Basin Authority, 2004. With the enactment of the Water Act

4 <https://www.tva.gov/>

5 <https://www.mdba.gov.au/>

- 2007, the Murray–Darling Basin Authority (MDBA) was established as an independent expertise-based statutory agency. The basin plan was introduced in 2012 to provide coordinated approach to water use across four States with an objective to achieve a balance between environmental, economic and social objectives. The sustainable management of the Murray–Darling Basin river system is a collective endeavour of Basin states and the Australian government, with river dependent industries and communities.
- iii. **International Commission for the Protection of the Danube River (ICPDR)**⁶ : The International Commission for the Protection of the Danube River (ICPDR) is a transnational body, which has been established to implement the Danube River Protection Convention, the major legal instrument for cooperation and trans-boundary water management in the Danube River Basin flowing across 19 countries in Europe. ICPDR works to ensure the sustainable and equitable use of waters and freshwater resources in the Danube River Basin. The ICPDR is formally comprised by the Delegations of all Contracting Parties to the Danube River Protection Convention, but has also established a framework for other organisations to join. Since its creation in 1998 the ICPDR has promoted policy agreements and the setting of joint priorities and strategies for improving the state of the Danube and its tributaries.
- iv. **Nigerian River Basin Development Authorities (RBDA)**⁷: Eleven River Basin Development Authorities were set up through River Basin Development Authorities Act (1976) as a strategy for Nigerian rural development to develop and manage surface and ground water resources within the basin, and provide access to safe and adequate water for domestic, industrial, flood control and agricultural purposes

6 <http://www.icpdr.org>

7 <http://www.waterresources.gov.ng/river-basin-operation-inspectorate/>

to enhance quality of life of the people and promote the socio-economic development of the country. These were of multi-disciplinary in nature and were governed by a two tiered administration involving the political set up as well as an Executive limb in each one of the Authorities. The numbers of RBA stood enhanced to 12 during the turn of the Century but later reverted back to 11 and has successfully remained in existence for water governance involving Stakeholders notwithstanding certain identified drawbacks in achieving as much as was conceived during its inception. The country is reconciled to continue with the RBOs and aiming IWRM through the available set up, that encompasses the State, Federal and local agencies.

- v. **Orange-Senqu River Commission (ORASECOM)**⁸:The Orange-Senqu River Commission (ORASECOM) was established by the Governments of Botswana, Lesotho, Namibia and South Africa in November 2000 to promote the equitable and sustainable development of the resources of the Orange-Senqu River. ORASECOM provides a forum for consultation and coordination between the riparian states to promote integrated water resources management and development within the basin.
- vi. **Nile Basin Initiative (NBI)**⁹–The Nile Basin Initiative, established in February 1999, is an intergovernmental partnership of 10 Nile Basin countries, namely Burundi, DR Congo, Egypt, Ethiopia, Kenya, Rwanda, South Sudan, The Sudan, Tanzania and Uganda to provide a forum for consultation and coordination among the basin states for the sustainable management and development of the shared Nile Basin water and related resources for win-win benefits. Eritrea participates as an observer.

8 <http://orasecom.org/>

9 <http://www.nilebasin.org/>

- vii. **Senegal River Basin Development Organization (OMVS)**¹⁰: Senegal River Basin Development Organization created in 1972 as a regional cooperative management body of the Senegal River which currently includes Guinea, Mali, Mauritania, and Senegal and others. OMVS creation comes in the context of serious climatic deterioration, marked by a persistent and severe drought that devastates the entire valley. The OMVS assigned common mission to achieve food self-sufficiency, secure and improve the incomes of the populations, preserve the balance of ecosystems in the basin, to reduce the vulnerability to climate hazards and external factors, accelerate the economic development, which cemented by the ideals of solidarity, sharing, equity and culture of peace.
- viii. **Mekong River Commission (MRC)**¹¹ : Mekong River Commission was established through the April 1995 Agreement on Cooperation for Sustainable Development of the Mekong River Basin (the Mekong Agreement) by the governments of Cambodia, Lao PDR, Thailand and Viet Nam. The People's Republic of China and the Union of Myanmar are dialogue partners. The objective of cooperation among Member Countries is to promote optimal and well balanced development of the Basin while ensuring the equitable sharing of benefits among all users of Basin water and related resources. The objective also aims to prevent any harmful effects that may hinder the continued functioning of the Mekong River systems to ensure the continuation of the multi-generational benefits that the Mekong River Basin brings to all its people. In 2010 the MRC Council approved an IWRM-based Basin Development Strategy that was updated in 2015 and endorsed in early 2016. It provides a framework for transboundary governance of this development process, including alignment of national plans and projects, basin management processes and the identification of strategic analyses to address current knowledge gaps.

10 <http://www.portail-omvs.org/>

11 <http://www.mrcmekong.org/>

6.0 The Conclave on River Basin Management

Vivekananda International Foundation (VIF) in collaboration with International Commission on Irrigation and Drainage (ICID) organized a Conclave on “River Basin Management” for equitable use of water on 29 and 30 November 2017. Through this conclave following questions were addressed.

1. Does the legal framework facilitate cooperative, collaborative and equitable water development among inter-state river basins?
2. Why do the disputes arise? Has enough been done to avoid differences becoming disputes? And have the Water Dispute Tribunals served the desired objectives successfully, if not then why? What are the main reasons for delay in awards?
3. Are we ready with the data, science and tools required for holistic river basin planning, development and management?
4. Are mechanisms for conflict management in place? Do we have platform(s) for social engineering to facilitate collaboration and cooperation among various stakeholders? And Do we have the mechanism for confidence building among stakeholders?
5. Are the policies and approaches within the major sectors, such as (a) Hydropwer development (b) Food security and (c) Waste water disposal, addressing the issues related to equitable river basin needs and do the river basin management practices support these policies and environmental needs?

The Conclave was inaugurated by Honourable Chief Minister of Uttarakahnd Mr. Trivendra Singh Rawat. The conclave was attended by more than 50 experts from various sectors including, Rep of Ministry of Agriculture, Water and Power, and a number of experts including former Secretaries of MoWR, former Chairmen of Central Water Commission (CWC), former

Chairman Brahamaputra Board, Chairman of Krishna River Management Board, representatives of ADB, Government of Uttarakhand, Maharashtra and Telangana, IARI, ICRISAT, TERI, CEEW, CBIP and ICID, among others. A List of participants is given at the beginning of this Report.

Honourable Chief Minister highlighted that river Ganga originating in Uttarakhand provide water for irrigation to about 40% of irrigated area leading to food security of large population of the country and in addition to faith is also linked to livelihoods. He further highlighted need for taking strong actions to conserve each drop of water in view of diminishing per capita water availability, increasing population, urbanisation and stressed need for integrated and holistic river basin management. In order to meet the challenge, Hon'ble Chief Minister stressed on need for creation of storage projects, recycle and reuse of waster/poor quality water, recharge of ground water, rejuvenation of rivers and make water conservation a mass movement. He also stressed importance of harnessing abundant hydro power of the region (only about 4000 MW developed out of 25,000MW) for economic prosperity of the state as well as the nation.

Although, there are many issues and sectors which need to be considered while undertaking integrated and holistic river basin planning but in the conclave discussions were focussed only on three major issues, i.e. hydropower development, food security and waste water management as illustration. Outcome of the conclave and recommendations emerging from the discussions spread over two days are as follows.

6.1 Legal Context

Governments whether Federal or State and Local have to address the challenges associated with equitable use of water through river basin development in present circumstances in a variety of ways. They were not of such great concern when the Constitution was being framed and so the subject of 'environment' as such does not appear in any of the Lists in the Seventh Schedule. On the other hand the Constitution makers gave priority to the working of a federal polity

where the primary aim was to provide social, economic and political justice to its citizens and mandated the judiciary to be the protector of the rights of the individual and arbiter of disputes between the Union and States and inter se between the States.

However, complacency has given way to concerted action both nationally and internationally. The United Nations Conference on Environment held at Stockholm in 1972 placed the protection of the biosphere at the centre of international policy and several Constitutional Amendments have been made since then, the most significant of which have been insertions of Art 48A in the Directive Principles of State Policy, Art 51-A (g) in the part on Fundamental Duties and by specific changes to the Seventh, Eleventh and Twelfth Schedules of the Constitution, all of which cast responsibilities on the Union and State Governments as well as rural and urban local bodies. However, substantive legislation, surprisingly is still done by taking recourse to Act 253, (which gives the powers to the Union to legislate for giving effect to international agreements) which is a very indirect way to go about addressing a matter of such great import. It is high time that the Constitution is amended and a specific item be introduced in the Seventh Schedule preferably in List 1, which is the Union List. There are many reasons for putting it in the Union List, as it is difficult to segregate air, water, wind and the eco-system into geographical boundaries. In fact it is a global phenomena let alone a national one. What happens to El Nino in the South Pacific affects the Indian monsoon and agricultural production.

The National Environmental Policy of 2006 characterises India's fresh water resources, comprising river systems, groundwater and wet lands as its single most important natural endowment. Equitable use of this natural resource is thus vital for the well-being of individuals and the community. The term 'equity' is extremely important as undue importance given to legal rights and the legal system, in spite of our robust legal structure whilst resolving some issues can create complications elsewhere, especially if it leads to an imperfect management of the ecosystem.

The Constitution provides a role for all three tiers of Government, the Centre, States and local bodies, in the management of water. It would be apparent that primacy in this matter has been given to the States, with the Union given a role in regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest. The Centre has exercised its jurisdiction in the matter of inter-State rivers by enacting the River Boards Act of 1956. Thus the Constitution provides for central management of an inter-State river basin by legislation or by setting up of a Board under the Act. However, till now no River Board in true sense has been set up by the Centre taking recourse to this legislation.

It emerged from the discussions that the Constitutional Provisions are well thought out and hence, perhaps need no change. However, what is required is to put greater reliance on those provisions that encourage cooperative efforts at all levels to find optimal solutions satisfying all stakeholders (Art 263) and that the dispute resolution measures through Tribunals (Art 262) should be resorted to as a last resort only. In this regard suggestions made by the Commission on Centre State Relations, chaired by former Chief Justice of India Justice M M Punchhi, in its Report of 2010 in Chapter 2 of Volume VI of its Report (summarised in Paragraphs 6.2.01 to 6.2.04 of that volume) need to be actively considered.

The issue has also been looked into by the Justice Doabia Committee in 2012, which after examining the present provisions of the River Boards Act of 1956 and noting its deficiencies has recommended a revised River Basin Management Act. This revised RBM Act needs to be enacted and implemented without any further delay.

In respect of coordinated planning at various levels both the Punchhi Commission on Centre State Relations and the Second Administrative Reforms Commission have emphasised on the need to implement the Constitutional Provisions relating to District Planning (Article 243ZD) and Metropolitan

Planning (Article 243ZE). In the latter case no such body has been constituted as yet. The plans drawn up by these bodies need to be integrated with the plans of the Basin Management Organisations, especially for surface irrigation, ground water exploitation, drinking water, sanitation, industrial use and waste water treatment.

Since river basin management involves holistic development of river basins with a national perspective there has to be a set of common principles to be adopted by all stake holders. The states have to enforce water use efficiency, appropriate cropping patterns, recycling of water, control of pollution, river water quality management, environmental flow and a host of other requirements. It is seen that most states do not address these issues. Recognizing this and with a view to evolving a set of national principles the Draft National Water Framework law was drafted by an expert committee. This is proposed as a legislation by the Central Government under Art 252 of the constitution. This matter which is currently under examination needs to be expedited.

6.2 Governance of River Basins

As already stated earlier, as a first step to equitable allocation it is necessary to identify a hierarchical set of requirements, with basic needs of drinking, washing and cooking as first priority and then proceeding to uses for agriculture and industry, and leisure and sporting requirements. But apart from the needs of humans, the environment too needs recycling of natural resources for maintenance of the eco-system and its rejuvenation.

If we were to consider usage, agriculture receives the greatest share of the total allocation of nearly 92 percent and nearly 60 percent of this is from surface water. This surface water is in the thirteen major river systems which drain the sub-continent from a catchment area of about 260 million hectares. Over 70 percent of the rivers drain into the Bay of Bengal and 20 percent into the Arabian Sea. The rest drain into interior basins and lakes. Whereas this resource is not increasing, the population and consequently the demand, is. And to add to this distress there is an alarming deterioration in the quality of

water because of contamination by biological, toxic, organic and inorganic pollutants. There is also the phenomenon of silting of reservoirs and drying up of lakes and ponds. The core challenge before India is therefore the proper management and use of water, especially surface water. And this can come about only by proper and effective governance, in which legal processes can play a crucial but not dominant role.

Governance must have a geographical focus if coordination has to result in meaningful results. In the case of water this can be accomplished within the concept of basins and catchment areas but becomes difficult when political boundaries cut across those mandated by nature. Without going into the complexities of water systems cutting across international boundaries, for our purpose we need to concentrate on national river basins.

For the purpose of good governance, an integrated approach with defined watersheds as the geographical area of attention for planning and implementation needs to be adopted. Within this area, attention would need to be given to study of precipitation, study of water bodies, ground water and its recharge (including subterranean rivulets), flowing surface water, soil management and cropping practises etc. At the micro-watershed level perhaps political boundaries may not be an issue but as the area increases they are bound to appear considering the number of river basins and the number of States. Matters are getting more complex because of population increase, more investment in dams and canals, rising expectations, clamour for more exploitation because of economic benefits on the one side and factors against exploitation like environmental degradation, pollution, loss of lands, resettlement issues and diminishing payback to the ecosystem. The positive developments are scientific advances in water use for agriculture and industry, knowledge leading to pollution control, general awakening amongst the populace and civil society movements and community participation.

A major issue has been the use of surface water resources involving more than one State and management of River Basins. Inter-State water disputes have turned out to be one of the most intractable problems faced by the nation. It

is a volatile mixture of politics, law and rights affecting livelihood. In recent times it has also got intermingled with cultural identities, as witnessed during the recent demands for revival of the sport of Jallikattu in Tamil Nadu where proponents mixed it with other grievances including the sharing of Cauveri waters with Karnataka.

The stress has been on resolving these disputes through the Constitutional mechanism of taking recourse to Art 262 of the Constitution. Parliament under this provision has enacted the Inter-State Water Disputes Act of 1956. However, the functioning of Tribunals under this Act have been beset with long delays with cases lingering for decades; lack of final power with Tribunals; and resistance to accept awards by aggrieved parties. Moreover, contesting parties have other disputes with water sharing being only one of them. Moreover, the Tribunals have no say in the important issues which we have listed earlier especially environment concerns. Tribunals go by legal principles established over time which can give primacy to any of the riparian States or those who have prior appropriation or even follow principles of equitable apportionment or lately of commonality of interests based on principles like those of the Helsinki Rules. It is argued that the composition of the Tribunals and their procedures are not conducive to proper and scientific appreciation of the issues and dispensation of justice. Claimants always demand a major share of the resource, and present data accordingly.

There is a tendency to use water indiscriminately in years of surplus. On the other hand scientists are engaged in developing agricultural practices which conserve water, use only that amount which is required and develop seeds and practices which increase yields with lesser quantities of water. An appreciation of these developments and equitable distribution between consumers would provide satisfaction to larger members and yet return adequate quantities back to the ecosystem. Such an attitude towards the problem would eliminate the adversarial relations which have now become the norm between basin States and induce them to work together for the benefit of all. There is a view that such tribunals can do better justice to this complex task by broad basing the Tribunal

with members from concerned professions and by changing procedures which will make discussions and arguments more participative.

There is also a growing feeling that recourse to such Tribunals should be resorted to only when other efforts, such as mediation, negotiation etc., have failed. And amongst these efforts the most important is the setting up of River Boards comprising representatives of all the riparian States, Central agencies, and all other stake holders, which will be the most effective instrument for equitable exploitation of the resource. No dispute should be entertained till the matter has been taken up for resolution at the Board. Thus in India the first and immediate step should be the constitution of appropriate authorities for all the River Basins and management of the Basin. Management of these Basins would be on the principles of equity and justice and by taking account of all the existing and developing scientific knowledge available for optimum utilisation of water and with the efforts of all stake holders – individuals, communities, civil society organisations, and local, State and Central Governments – working in a participative and collaborative manner.

6.3 Hydropower

With growing concern about global warming and climate change, it is necessary to shift to non-fossil fuel based, 'low-carbon', energy sources. Also, with stress on "sustainable development", country is moving towards renewable energy. Hydro power that plays a major role in river basin development needs a more coherent and comprehensive approach. Storages based hydropower needs to be recognized as overall water security strategy and adopted to make multi-purpose development flexible when power plays major revenue earner component.

Solar and wind energy, being available over a part of a day only, were earlier not considered as suitable for absorption in the power grid, and their cost was also relatively very high. But recent developments in technology have brought down the cost of solar energy, and have enabled consideration of solar and wind energy sources also as eligible grid contributors. Hydropower, although renewable with almost a least carbon emission, does not get the required support

from the government as a renewable resource. Therefore, in the next decade or so, hydro (all sizes), wind, and solar should all form the preferred option.

The fossil fuel based thermal plants and the nuclear plants are unable to respond quickly to the load changes therefore, these plants are run to supply the base load. Hydro power plants and gas turbines on the other hand supply the peak load. Most hydro-power dams serve multiple purposes of flood control, and water storage for irrigation, and hence impart flexibility in energy generation and utilization to suit the needs according to the variability in rainfall pattern and economic activities in the areas being served.

Unfortunately, despite all its advantages and importance that hydro plants provide to grid stability in an admirable manner, hydro generation is more and more relegated or even neglected in sharing the desirable Grid Mix; it seems to be losing the battle to the sector's opponents. The arguments against hydro power are all known and there is need for a clear policy decision to decide once for all, whether hydro-power is required, or is not required. At the same time hydro-power needs to be made more attractive for private sector, which has, in the recent past, by and large exited the sector.

6.4 Food Security

Agriculture must transform itself if it is to feed a growing global population and provide the basis for economic growth and poverty reduction. Climate change is likely to make this task increasingly difficult. To achieve food security and agricultural development goals, adaptation to climate change and lower emission intensities per output will be absolutely warranted. This transformation must be accomplished without depletion of the natural resource base.

Many of the small farmers in India are already coping with a degraded natural resource base. They often lack knowledge about potential options for adapting their production systems and have limited assets and risk-taking capacity to access and use technologies and financial services. More productive and more resilient agriculture requires a major shift in the way land, water, soil nutrients

and genetic resources are managed to ensure that these resources are used more efficiently.

Water is the prime channel through which the impacts of climate change on the world's ecosystems and on the livelihoods of societies will be felt. Agriculture will be affected by increased evaporation demand, changes in the amount of rainfall and variations in river runoff and groundwater recharge, the two sources of water for irrigation. The distribution of precipitation, with longer periods between rainfall events and more intense precipitation, are expected to increase frequency of dry spells during the cropping season, and will directly affect soil moisture and the productivity of rainfed crops. Crop selection and changes in crop calendars will help farmers adapt to new temperatures and rainfall patterns. The use of crops or varieties with better resilience to dry spells will be preferred. At the same time watershed development works through rainwater harvesting would have to retain the soil-moisture for longer durations. However, water shed development has to be considered in tandem with the existing downstream projects, considering the river basin as a Unit.

In order to encourage Climate Smart Agriculture, efforts are needed both on the supply side and on the demand side. Enhancing supply includes: increased access to and improved management of conventional water resources; habitat rehabilitation; dam operations; re-use of drainage water and wastewater; transfer of water between river basins; desalination; and pollution control. Demand management is defined as a set of actions that control water demand, either by raising the overall economic efficiency of its use as a natural resource, or operating intra- and intersectoral reallocation of water resources.

Farmers will favour more efficient irrigation technologies that reduce evaporation losses such as drip irrigation and mechanised/sprinkler irrigation. These actions can be combined with deficit irrigation approaches to maximize productivity per volume of water applied rather than per area of land, reuse of waste water with appropriate precautions and mixing treated waste water with fresh water to reduce a high fresh water demand in agriculture. Existing large irrigation systems require to be modernized for better water allocation

mechanisms, the clear transmission of alerts about water scarcity to farmers, and the adaptation of both infrastructure and management for more flexible and reliable delivery of water. Intermediate storage within the irrigation scheme and, where possible, access to groundwater are part of the options for building the resilience and reliability of water supply and must be considered in adaptation plans for irrigation schemes. In order to bring latest technologies, including micro-irrigation, satellite, drone and ICT in daily use for the benefit of farmers, extension services would require to be rejuvenated through private sector and civil society involvement.

6.5 Wastewater

The quality of both surface and ground water is deteriorating due to pollution from wastewater discharge of large quantity of municipal and industrial untreated effluents into rivers as well as return flows from irrigated areas which pollute water sources with residual fertilizers, pesticides, and herbicides. Ground water is contaminated for geogenic and man-made reasons. Due to its high quantities of usage spread all over (about 56% of fresh water withdrawals), wastewater is to be considered as a resource which can be put to agricultural, industrial, and domestic use with varying degrees of treatment.

Thus, wastewater management is another critical and very important area which needs attention in our attempt to increase the availability of water. A large part of wastewater is used in agriculture without any treatment or partial treatment giving rise to extensive adverse health impacts. Wastewater is also a vast source of nutrients which can be used in agriculture.

7.0 Recommendations

Management of river basins should be on the principles of equity and justice, and by taking account of all the existing and developing scientific knowledge available for optimum utilisation of water and with the efforts of all stakeholders – individuals, communities, civil society organisations, and local, State and Central Governments – working in a participative and collaborative

manner. Considering that China has done so far most of its river basins, and that there are other successful models national and international (the Rhine river, the Mekong basin, the Murray-Darling basin), India should set about this task without further delay. Some of the areas that needs immediate attentions are listed in the following paras.

(a) Water Resources Management: Legal Issues

1. Water resources development in the country needs to be guided by along-term vision of future developments scenarios and emerging technologies.
2. While the basic frame work of constitution for water management is in place, the necessary legal instruments needed to put them in operation are lacking.
 - a. A National Water Framework Law, as a legislation by the Central Government under Art 252 of the constitution needs to be finalized and adopted soon as an umbrella statement of general principles governing the exercise of legislative/executive powers by the Centre, the States and the local governing bodies.
 - b. Bill seeking to amend the Inter-State River Water Disputes Act, 1956 needs to be urgently passed to avoid undue delays in the resolution of inter-state water disputes.
 - c. The Draft River Basin Management Bill that proposes establishment of separate River Basin Authorities for regulation and development of waters for major inter-State river basins in the country, which is under consideration since 2013, requires urgent attention
3. In the quasi-federal setup, negotiated settlements are more desirable, politically. With the presence of legislative route as a firm alternative, the negotiations may become easier. If the inter-basin transfers in consideration to transfer surplus water conflict with existing settlements or awards, these existing instruments may have to be re-adjusted.

- a. Establishing/empowering a national agency for quasi-judicial determination of basin surplus and deficit, for finalization of plans for inter-basin transfers, and overseeing their implementation.
 - b. Detailed study in regard to the legal instruments, available and required, for water transfers from International basins, is required to be taken up.
4. As peninsular basin states do not agree to the availability of surplus water in the peninsular region, in order to ease inter state issues, surplus water of Brahmaputra needs to be utilized, through the Himalayan links on priority. But this requires international cooperation of neighbours; enhancing the regional welfare as a part of the Water Transfer Projects with suitable instruments which can make the proposals attractive for neighbouring nations, addressing international legal issues could be explored since there are good examples of water Cooperation in international arena.

(b) River Basin Management

5. Although basin has been identified as a unit of development in so far as the water resources management is concerned, the water resources development in India has been largely centered around developing individual schemes and projects for the development of a particular region without any consideration to their downstream impacts. It is therefore imperative that planning, development and management of river basins needs to be done at basin level in an integrated and holistic manner.
6. Considering the new ambitious political goals of water to each farmer's field (*Har Khet ko Paani*) and doubling farmers income, it becomes imperative that the watershed development activities under various schemes under the government (such as MNREGA), rainwater harvesting, implementation of the district irrigation plans, and other

water development activities are coordinated under an empowered River Basin Organization. It shall ensure a mechanism for coordination, collaboration and cooperation among all the authorities within a river basin at all the levels of administration.

7. In order to get grass root level participation in the river basin planning it is essential that quasi-formal organization such as Association, Council or Commissions should be established initially based on the specific needs to bring various stakeholders at the same platform and create awareness among them and the masses in general on the issues that the water sector faces and development paths which are flexible and based on scientific principle.

(c) Hydropower development

8. Hydropower, which is the cleanest form of renewable energy, has suffered a checkered past in the last two decades due to some ambiguity in the government policy and environmental activism; its share in the total portfolio in the country suffers a steady decline and is presently about 13% whereas it used to be about 40% in seventies. With government's commitment to Paris Agreement on Climate to increase the renewable energy to meet its development needs, hydropower needs the focus back to its due share in the energy mix. In view of the decreasing interest in the hydro power sector and the well known arguments against it, there is an urgent need for a clear policy decision to decide once for all, whether hydro-power is required, or not and if yes then to announce new new hydro power policy immediately.
9. Proposed storage projects, particularly in country's NE region, should be undertaken as 'multi-purpose', 'multi objective' projects; in any case, it should be ensured that the regional potential in Hydro is not converted to single purpose run-of-the-river hydro power projects. In case of development of project by the private developer, government should fund the flood management

and irrigation development components utilizing appropriate cost allocation principles so that the Hydro is not burdened with separable costs for other objectives. In order to make hydro sector economically viable, proposal for suitable assistance for power component in order to make tariff reasonable may be considered by the government. In addition, long term financing up to 20/25 years and Interest subvention may also be considered.

10. Considering that the potential of hydropower largely lies in the Himalayan States, which suffer from gender specific migration of population due to lack of livelihood opportunities, hydropower redevelopment with potential to bring all round development in the project areas, (having also the additional potential to provide accessibility and the multi-purpose development opportunities) should be considered as a strategic development option.
11. With a lack of awareness about life cycle costs and short-term environmental impacts, hydropower has been kept out of benefits of renewable energy sources. Hydropower needs to be given the status of renewable energy and all such investment incentives available to renewable energy related to GST, water tax or cess, interstate and intra state transmission charges etc. should also be extended to hydropower irrespective of its size. In addition, cost of infrastructure may be considered for reimbursement through National Clean Energy Fund (NCEF).
12. There is an urgent need for taking the total review of the existing framework in implementing/ developing the hydro power projects and improve the area “Enforcing Contracts” for ease of doing business, with specific reference to incorporating balance risk sharing mechanism in contractual management. In addition, there is need for adopting standard format of the contract conditions like FIDIC etc. which provide balanced responsibilities for both client and contractor and this will avoid unnecessary disputes leading to time & cost overruns.

To promote ease of doing business- Single window, online, time bound approval and monitoring needs to be promoted.

13. Hydropower sector should take cognizance of environmental activism detrimentally impacting the national economy and should organize itself for awareness building among various stakeholders including the executive, the legislature as well as the judiciary.
14. Significant disparities between policies applicable to hydro-power vis-à-vis solar energy projects in terms of PPAs, royalty energy, transmission, wheeling and waiver of cross subsidy charges for captive units, large capital outlays with high interest burden and issues associated with lack of power evacuation arrangements from remote project sites need to be urgently corrected. The very large number of stalled hydro power projects both from the public and private sectors need a special redressal mechanism to free up locked capital contributing significantly to NPAs in the banking system.
15. Hydro power project life can easily be considered as more than 70 years which will make average cost of power from Hydro <Rs. 2.5 over life although initial tariffs may be higher due to long gestation period and high interest cost.

(d) Food Security

16. Major and medium irrigation Projects contribute to assured food security in the country; they provide resilience to agriculture sector against climate variability through assured irrigation and will continue to play that role more so, in the changing scenario of Global Climate Change in the near future.
17. A number of new technologies and techniques are available for optimizing the use of water in agriculture and improve the outputs for the farmers. However, such initiatives are required to be up-scaled in

the field on a larger scale. Intermediary service layer are required to be strengthened and created where not existing, for integrating the new technologies into the routine agricultural practices.

18. Integration of processing, distribution and consumption promotion are required to improve the resilience of farmers against the price cycles created by shortages and surplus production.
19. Exclusive dependence on wheat-rice cycle based nutrition security is required to be curtailed and less water consuming crops with higher nutrition value, which are more suited to local agro-climatology of the areas need to be promoted.
20. Climate Smart Agriculture practices including drip and sprinkler irrigation have large potential in terms of using water more efficiently. It needs to be expanded further.
21. There is a greater need for intense farm level interventions for improving surface irrigation efficiency; these can be achieved through less energy consuming interventions based on simple technologies. But these would ask for greater efforts and forming Water Users Association and Participatory Irrigation Management.

(e) Waste water Management

22. Wastewater from urban, industrial and agriculture need to be counted as a source of water, particularly in water scarce regions of the country and needs to be factored into basin planning. Urban planning needs to address the issue of mixed wastewater from household and industry.
23. In view of increasing water scarcity policy needs to be developed to treat wastewater as a viable resources and for safe use of waster water or poor quality water after varying degree of treatment for its use for various applications- agriculture, industries etc.

24. While power intensive STPs are essential and have proven to be effective with limited efficiency, proven low cost treatment of wastewater technologies also need to be encouraged.
25. Water users should be charged for water they use by paying for three components: volume of water supplied, the volume of water returned and the pollution load that is discharged back into the water bodies.
26. There is need for building public awareness for welcoming the recycling and reuse of wastewater. Harmony among various stakeholders is required.

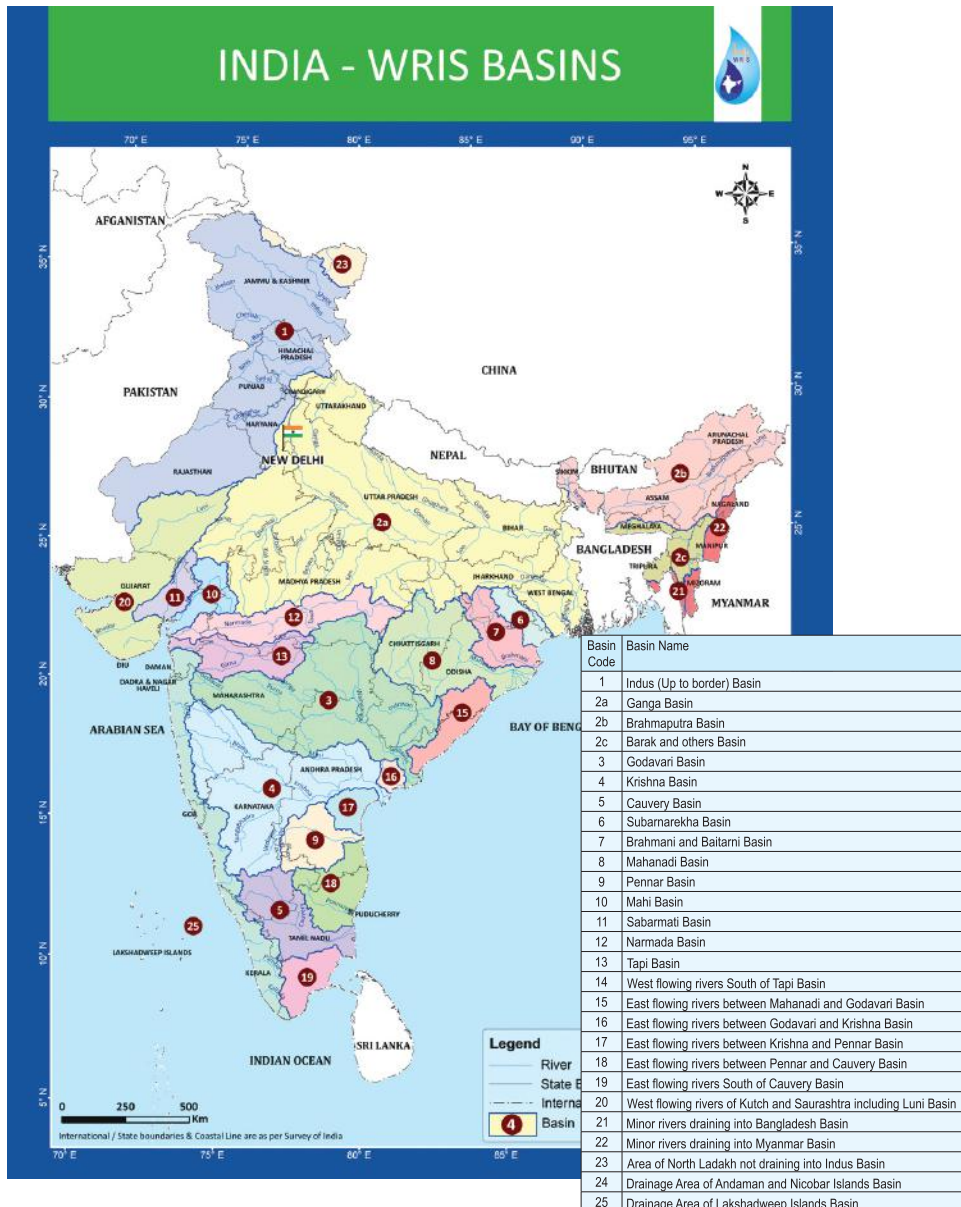
List of Abbreviations

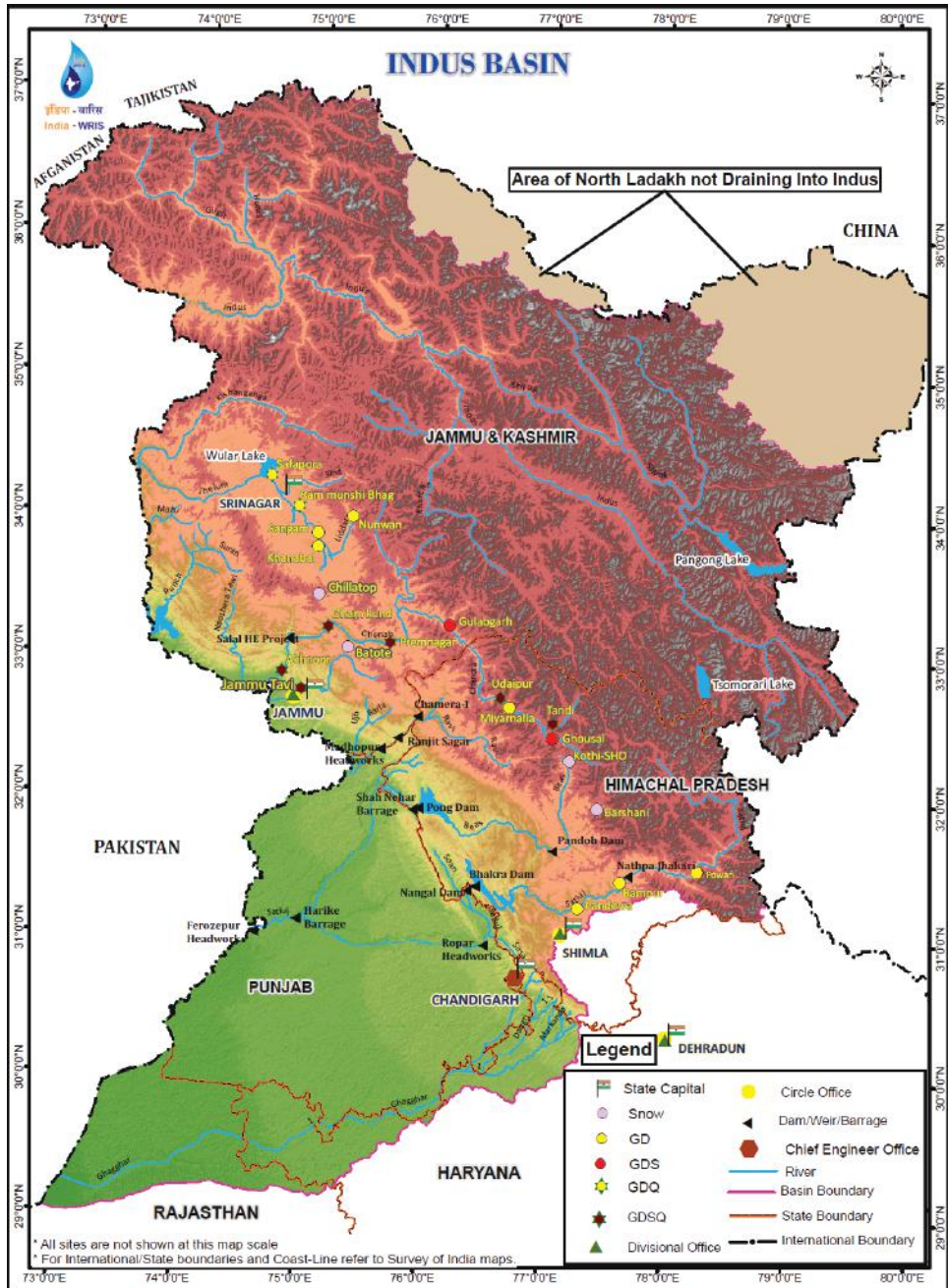
1	Bhakra Beas Management Board	BBMB
2	Bodoland Territorial Council	BTC
3	Cauvery River Authority	CRA
4	Central Board of Irrigation & Power	CBIP
5	Central Water Commission	CWC
6	Council On Energy Environment and Water	CEEW
7	Goods and Services Tax	GST
8	Gross Domestic Product	GDP
9	Households	HHs
10	Information and Communications Technology	ICT
11	Integrated Water Resources Management	IWRM
12	International Commission for the Protection of the Danube River	ICPDR
13	International Commission on Irrigation and Drainage	ICID
14	International Crops Research Institute for the Semi-Arid Tropics	ICRISAT
15	Mahatma Gandhi National Rural Employment Guarantee Act	MNREGA
16	Mekong River Commission	MRC
17	Murray-Darling basin Authority	MDBA
18	Narmada Control Authority	NCA
19	National Clean Energy Fund	NCEF
20	National Water Mission	NWM
21	National Water Policy	NWP
22	Nile Basin Initiative	NBI
23	Non- Governmental Organisation	NGO
24	Orange-Senqu River Commission	ORASECOM
25	Power purchase agreement	PPA
26	River Basin Act	RBA
27	River Basin Development Authorities	RBDA
28	River Basin Organizations	RBOs
29	Senegal River Basin Development Organization	OMVS
30	Tennessee Valley Authority	TVA
31	The Energy and Resources Institute	TERI
32	Vivekananda International Foundation	VIF
33	Water Dispute Tribunal	WDT

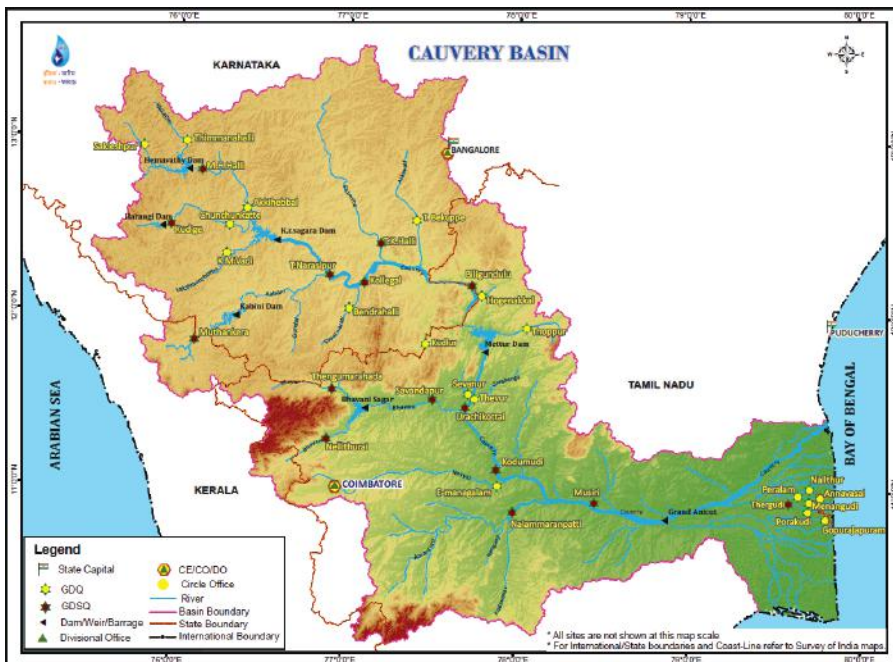
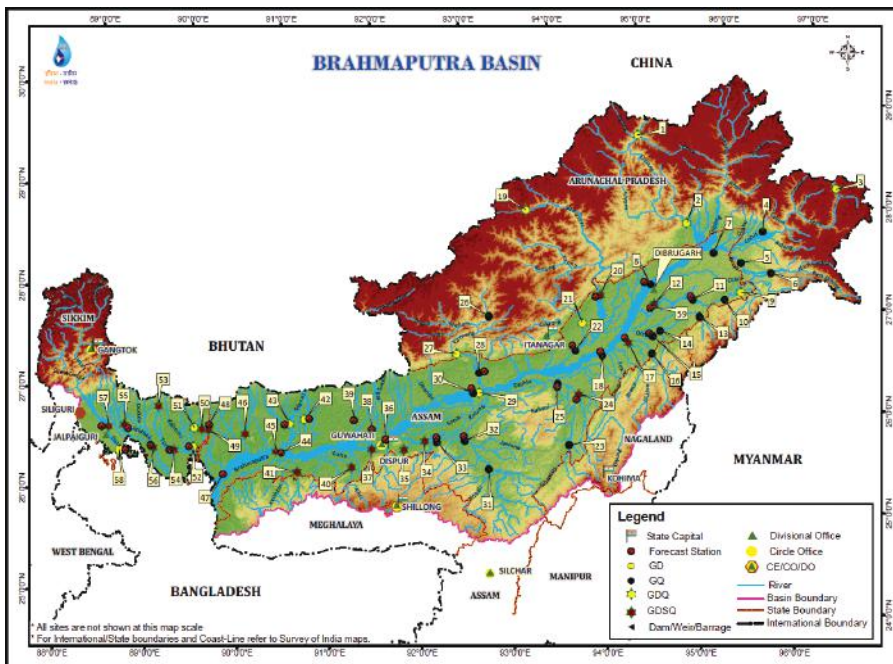
Annexure

Detailed river basin map of 13 major basins of India from Water Resource Information system of India

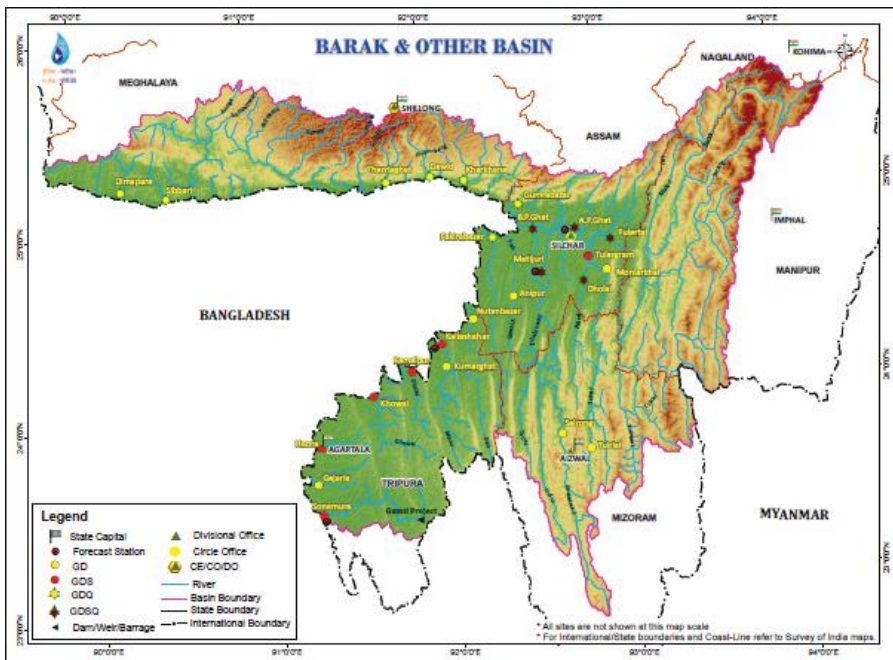
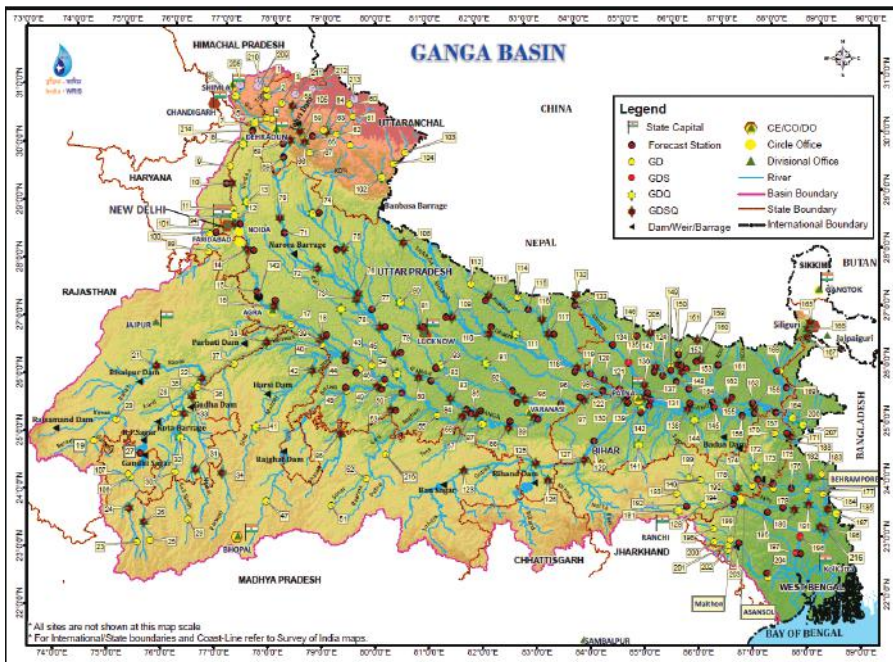
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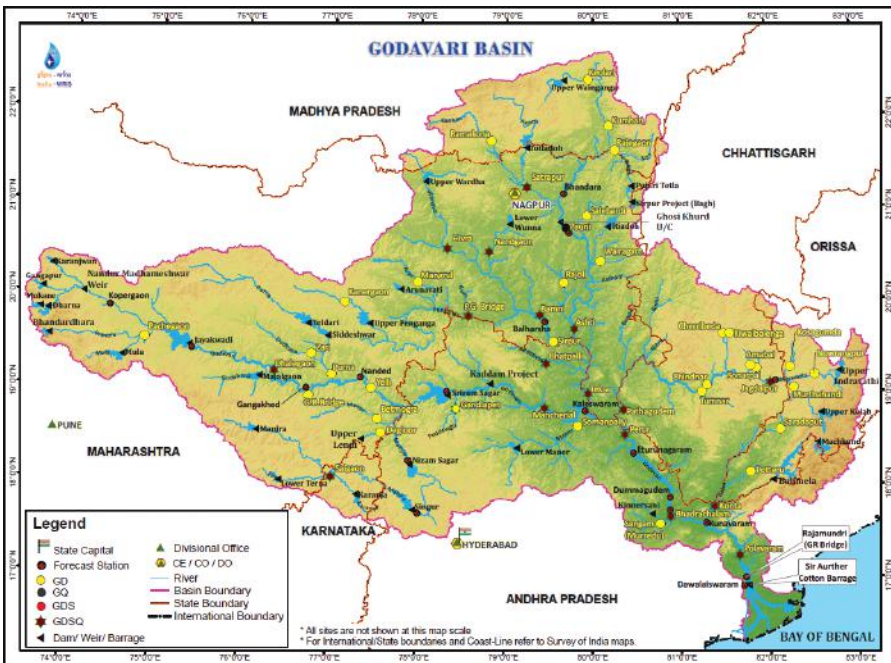


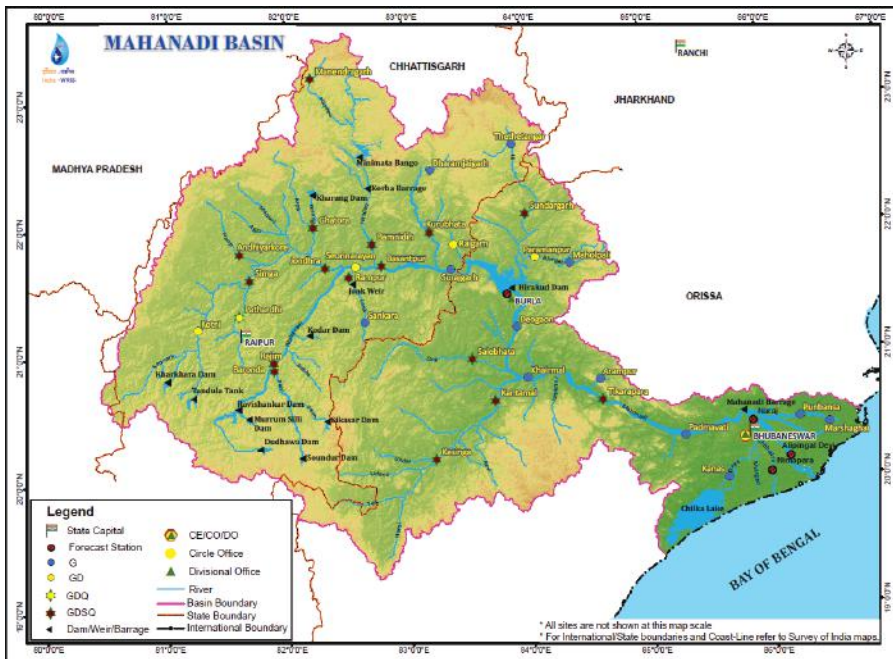
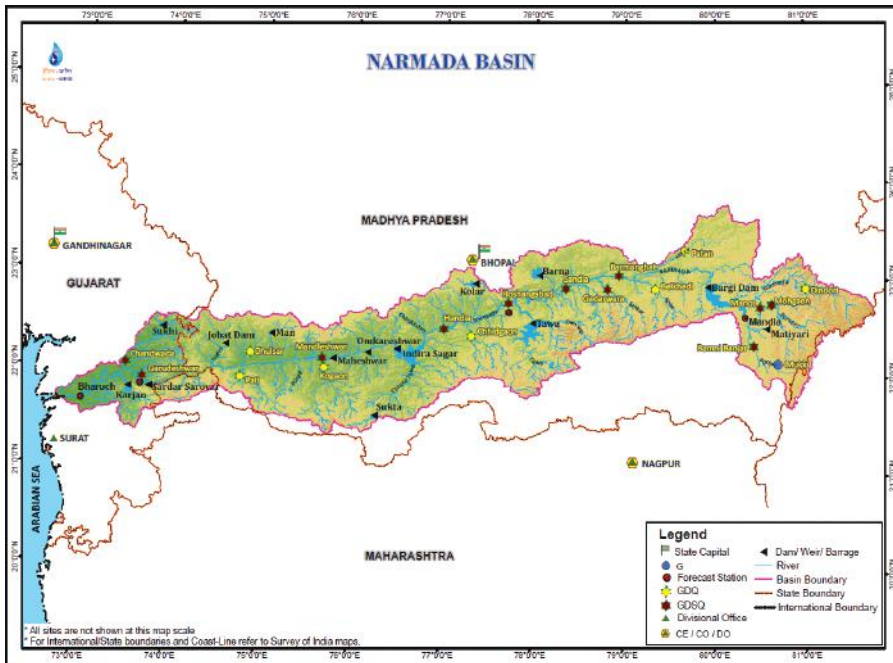


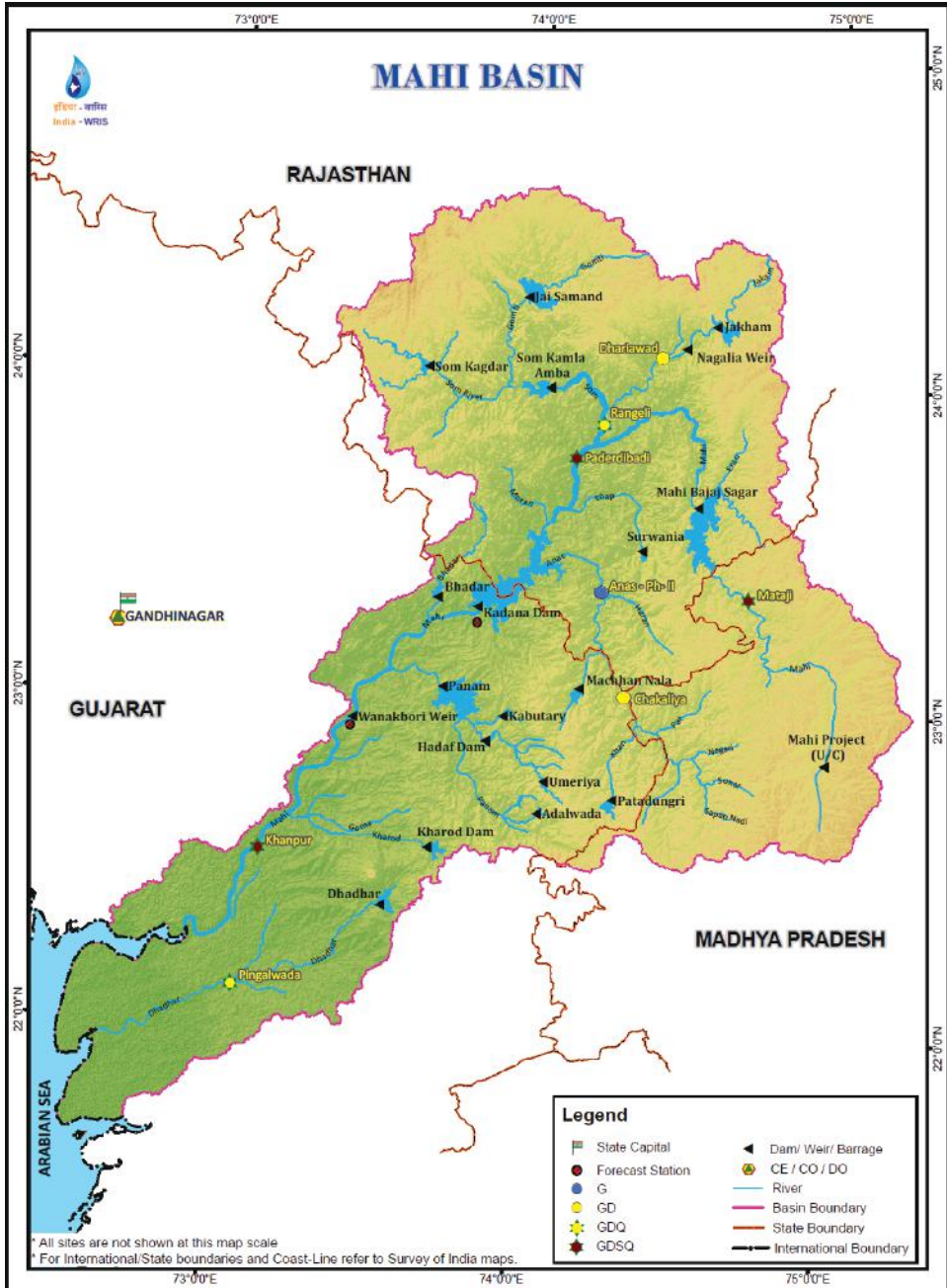


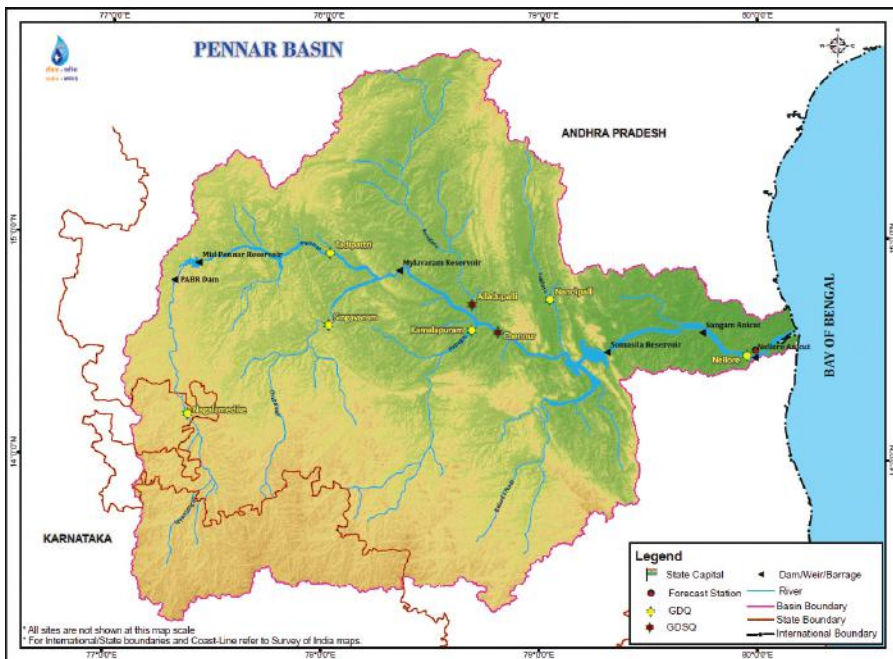
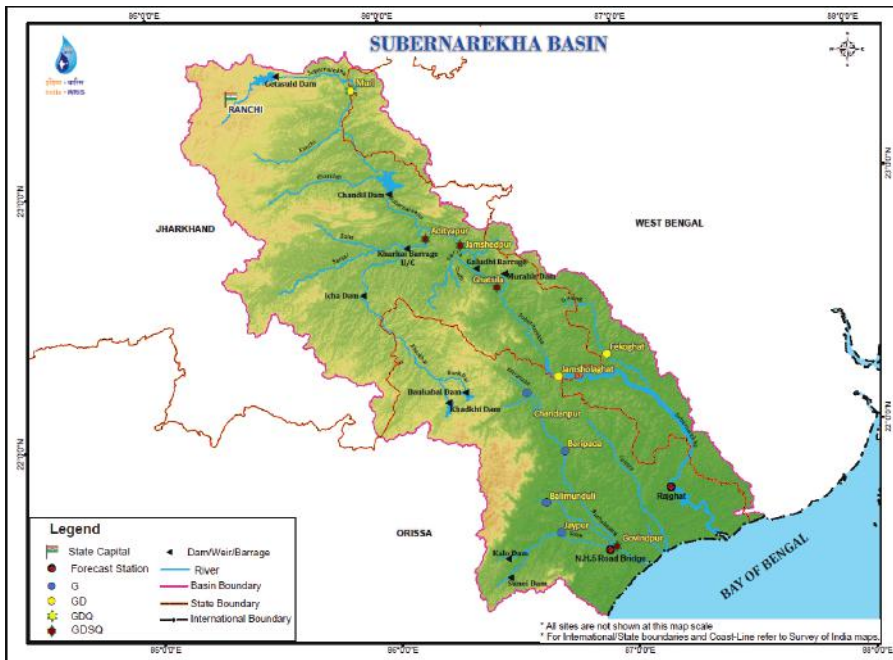


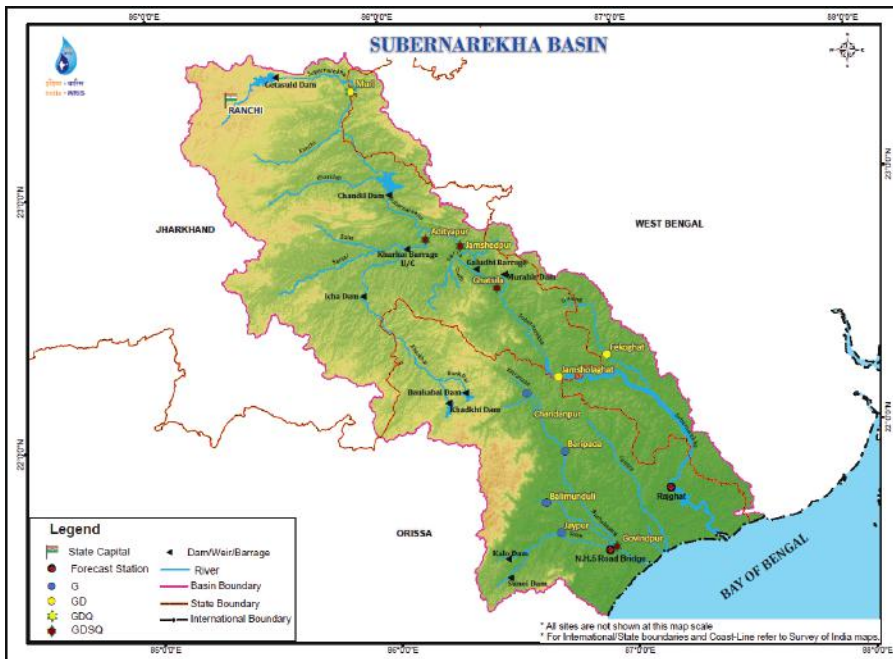
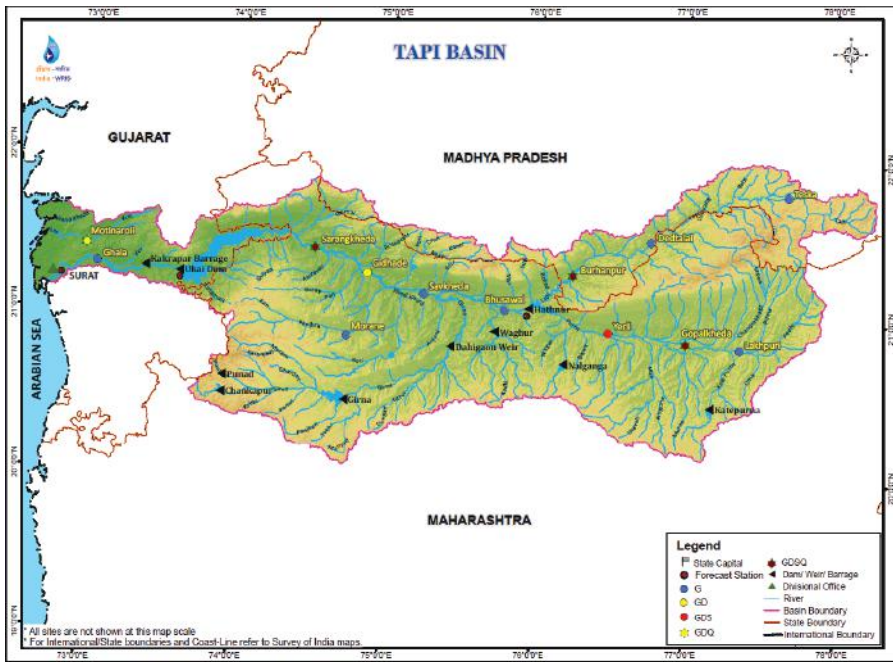












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