

November 2018



DISCUSSION PAPER

ALIGNING INDIA'S WATER RESOURCE POLICIES WITH THE SDGs

Girija K Bharat and Nathaniel B Dkhar



THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

© COPYRIGHT

The material in this publication is copyrighted. Content from this discussion paper may be used for non-commercial purposes, provided it is attributed to the source. Enquiries concerning reproduction should be sent to the address:

The Energy and Resources Institute, Darbari Seth Block, India Habitat Centre, Lodhi Road, New Delhi – 110 003, India

Authors

Girija K Bharat, Sr Consultant, TERI | **Nathaniel B Dkhar**, Associate Fellow, TERI

Advisors

S Vijay Kumar, Distinguished Fellow, TERI | **Dr S K Sarkar**, Sr Director and Distinguished Fellow, TERI

Internal Review

Mr S Vijay Kumar, Dr S K Sarkar, Mr Ajay Shankar, Mr Shri Prakash and Dr Divya Datt

External Review

Prof Arun Kansal (TERI-SAS), Dr Baby Kurian (OPM), Dr Srinivas Chokkakula (CPR), Mr D K Manavalan (AFPRO) as well as stakeholder consultation on August 10, 2018.

ABOUT THE AUTHORS

Dr Girija K Bharat, Former Fellow and Area Convenor, Water Resources Division, TERI and presently Sr Consultant with TERI. She works in the areas of Sustainable Development, Environmental Management, Water and Sanitation.

Nathaniel B Dkhar is an Associate Fellow with the Water Resources Division, TERI. He works on issues related to Water and Wastewater Management, Integrated Water Resources Management (IWRM) and analysing the impacts of Climate Change on water resources.

SUGGESTED FORMAT FOR CITATION

Bharat, Girija and Dkhar, Nathaniel B. 2018. *Aligning India's Water Resource Policies with the SDGs*, TERI Discussion Paper. New Delhi: The Energy and Resources Institute

Editorial and design

Anushree Tiwari Sharma, Rajiv Sharma, and Vijay Nipane, TERI Press

PUBLISHED BY

The Energy and Resources Institute (TERI)

FOR MORE INFORMATION

Natural Resources and Climate Change Programme, TERI, Darbari Seth Block, IHC Complex, Lodhi Road, New Delhi 110 003, India
Tel.: +91 11 2468 2100 or 2468 2111 | Fax: +91 11 2468 2144 or 2468 2145

Email: pmc@teri.res.in | Web: www.teriin.org

TABLE OF CONTENTS

I. Introduction	5
II. Current Water Sector Scenario in India	6
III. Current Water Policy Framework of India	9
3.1 National Water Policy of India, 2012	9
3.2 National Water Mission of India, 2008	9
3.3 Draft Water Framework Law of India, 2016	10
3.4 Model Ground Water Bill, 2016	10
IV. Implications of the Water Policy Framework of India on SDG 6	12
VI. Linkages between SDG 6 and other SDGs in the Indian Context	17
VII. Discussion	20
VII. Recommendations	22
Annexures	25
Annexure I: Goals and Strategies of National Water Mission	25
Annexure II: Synergies between SDG 6 and other SDGs	28
Annexure III: List of Indicators from the Composite Water Management India (CWMI)	31

I. Introduction

The achievements and shortcomings of the Millennium Development Goals (MDGs) of the United Nations (UN) has provided valuable insights for developing interconnected Sustainable Development Goals (SDGs) and targets with a broad and ambitious vision for 2030. The SDGs are universal, interdependent, and mutually reinforcing (and sometimes conflicting). It is recognized that achieving the 2030 Agenda for Sustainable Development and its 17 Goals and 169 targets will only be possible through an integrated approach working across sectors, ministries, and different administrative levels and geographical scales. The SDGs raise the bar by aiming not only to expand the access to respective services but also to close the gaps in service quality, with the intention of long-term sustainability.

SDG 6 deals with all aspects of water availability, access and use, and calls upon all nations to **“Ensure availability and sustainable management of water and sanitation for all”**. It places water and sanitation at the core of sustainable development agenda, cutting across sectors and regions. There are strong synergies between the targets of Goal 6 and those of the other SDGs. The interventions to meet the targets of SDG 6 extend far beyond achieving SDG 6 because it also contributes to all the other SDGs. For achieving long-lasting sustainable development outcomes, it is crucial to understand the synergistic relations between the different SDGs as well as possible trade-offs.

The linkages between water and sustainable development are numerous, complex, and often subtle. Water not only has a basic function in maintaining the integrity of the natural environment but is also a key driver of economic and social development, including health, gender equality, resilience, inclusive cities, life below water, terrestrial ecosystems, and peaceful and inclusive societies. The issues in the water sector are rooted in its wasteful use, characterized by poor management systems, improper economic incentives, under-investment, failure to apply existing technologies, and a traditional mindset focussed almost exclusively on developing new supplies rather than conservation and use-efficiency. As new water

programmes are emerging informed by earlier learnings, there is now an increased emphasis on the application of more sustainable practices to management of water as a scarce resource.

The Government of India (GoI) has been implementing a number of policies and programmes in the water and sanitation sector, which help India in achieving the MDG targets in the water sector. The Swachh Bharat Mission (SBM) with its ambitious goal of providing universal sanitation by 2019¹ is trying to address the gap in the sanitation sector. While India has achieved remarkable progress towards universal coverage of drinking water, it is far from achieving universal access to piped water supply and providing a quantity of water that is consistent with international norms. This discussion paper analyses the current alignment of the Government of India’s policies, programmes, and schemes with SDG 6 and their implications on the other SDGs. The objective of this document is to explore and establish these connections so that we know the shortcomings, contradictions, and lack of alignment between SDG 6 and other SDGs and can make conscious choices, prioritizations, and optimizations in implementing the programmes at the field level. To that extent, the paper takes forward the general linkages between the various SDGs in the economic, social, and environmental dimensions by adding the country-context.

Under the Constitution of India, water is a State subject, with the States’ jurisdiction extending to ‘water supplies, irrigation and canals, drainage and embankments, water storage, and water power’ (Schedule VII, List II, Entry 17). The expectation is also that the methodology taken further forward in a sub-national context can yield additional insights in terms of policies and strategies. Taken still further in a local context (ideally keeping in view the Panchayat and Municipal framework provided in Article 243 of the Constitution of India), the methodology may well provide pointers for more effective implementation as well.

¹ Swachh Bharat Mission, 2014. Available online at <<http://sbm.gov.in/sbmreport/home.aspx>>

II. Current Water Sector Scenario in India

India, with its high population and high-dependence on monsoon, creates great susceptibility to hydrological shocks by any global standards. About 90% of rivers in India flow during four months and over 50% of rain pours in just 15 days, resulting in floods in many parts of the country. India, with its huge potential for rainwater harvesting, could enhance its water storage, which is currently 209 m³ per capita compared to developed countries, such as USA (2192 m³), Canada (25337 m³), and Australia (3223 m³) (AQUASTAT Data). The water balance modelling for reassessment of water availability of Indian basins (Figure 1) has provided a comprehensive understanding of the water flow system and water resources in the basins/sub-basins.

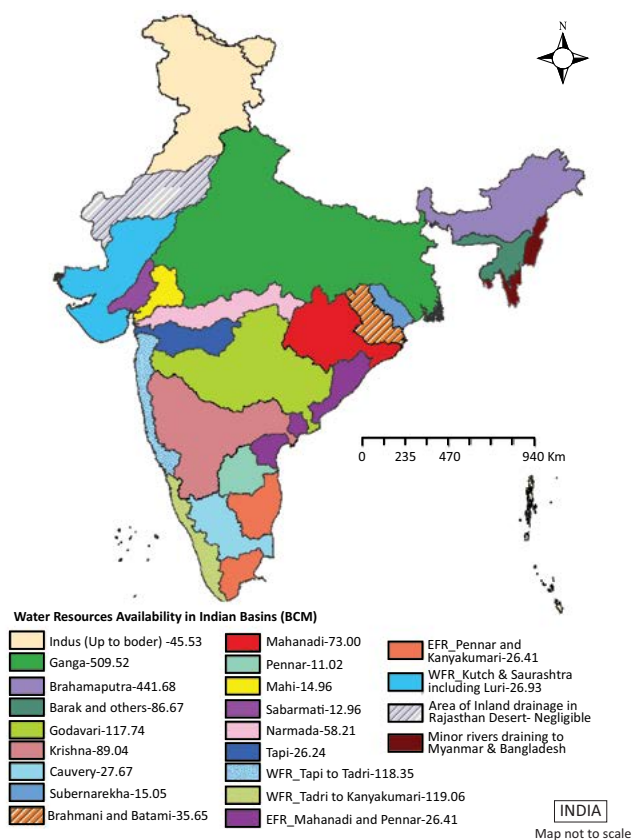


Figure 1: Basin-wise water resource availability (BCM) in India

Source: Reassessment of water availability in basins using spatial inputs, CWC, 2017

The National Commission for Integrated Water Resources Development (NCIWRD) has projected the demand for water for the years 2025 and 2050. By the year 2050, the total demand for water is expected to be 973 BCM according to the low demand scenario and 1,180 BCM² according to the high demand scenario. The McKinsey³ study (Figure 2) also indicates the water scarcity as percentage of total implied demand between 50%–100%.

The water resources in India also face the challenge of geogenic as well as anthropogenic contaminants. According to the Ministry of Drinking Water Supply and Sanitation, Government of India, out of 593 districts from which data is available, 203 districts are affected by high levels of Fluoride, 206 districts are affected by Iron, 137 districts by Salinity, 109 districts by Nitrate, and 35 districts by Arsenic. Biological contamination problems causing enteric disorders are present throughout the country and are a major concern, being linked with infant mortality, maternal health, and related issues.

Due to the rainfall pattern and low surface storage, about 63%⁴ of India's irrigated agriculture and 85% of drinking water supplies are dependent on groundwater. In the last few decades, India has witnessed intense groundwater development and exploitation for agriculture, industrialization, and city-development. One of the underlying reasons for excessive use of groundwater is the legal framework governing access to the ground water resource, which gave the landowners the right to access groundwater from below their land without regard to the migrating nature of the resource. The landowners have traditionally seen ground water as their own resource to exploit in any manner and this has led to rapid depletion of water tables in many parts of the country (Figures 3 and 4) as there seemed no necessity to replenish the extracted water. There used to be no legal provision to protect and conserve groundwater at the aquifer level. Furthermore, the legal regime failed to give

² R M Saleth *et al.*, Promoting Irrigation Demand Management in India: Policy Options and Institutional Requirements, 2010. Available online at <<http://ageconsearch.umn.edu/bitstream/127982/2/28.pdf>>

³ 2030 Water Resource Group Report, McKinsey Report, 2010.

⁴ CWMI Report, NITI Aayog, 2018

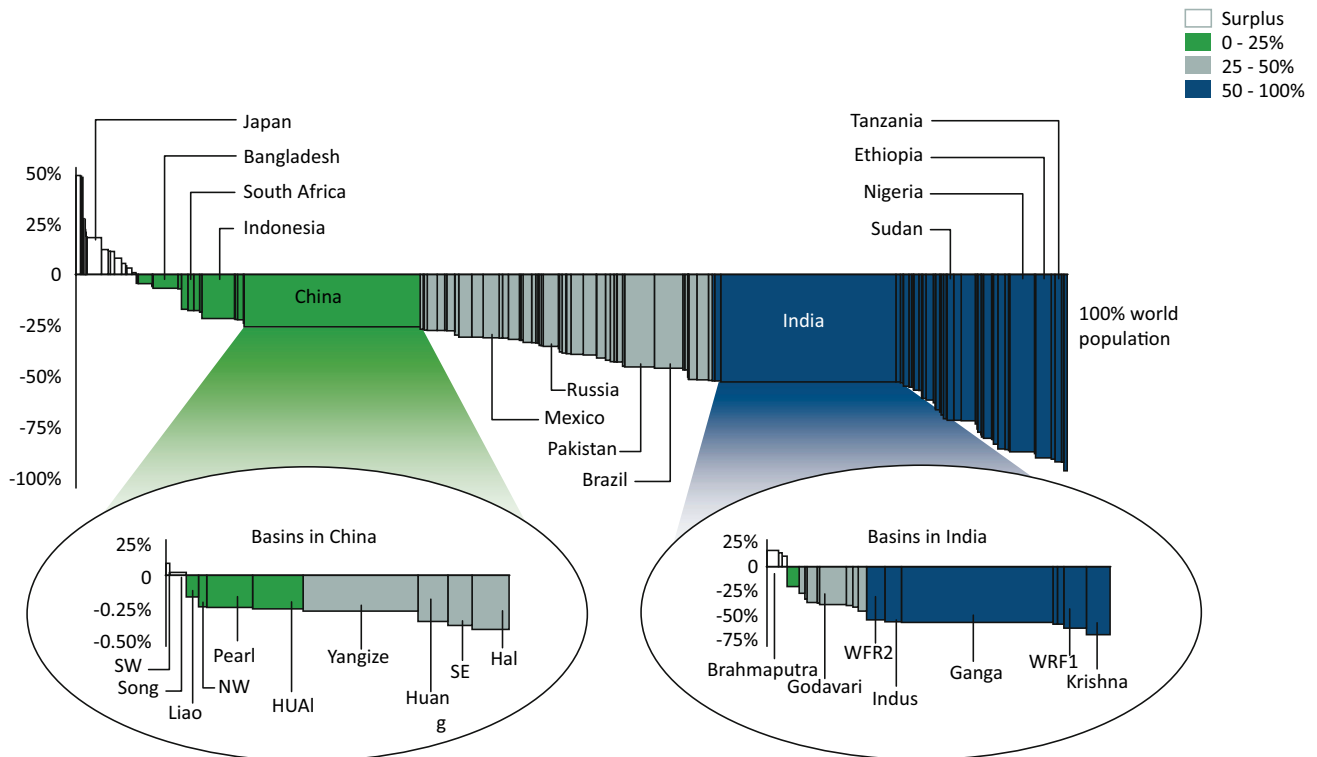


Figure 2: Water scarcity projections for 2030

Source: McKinsey Report, 2010

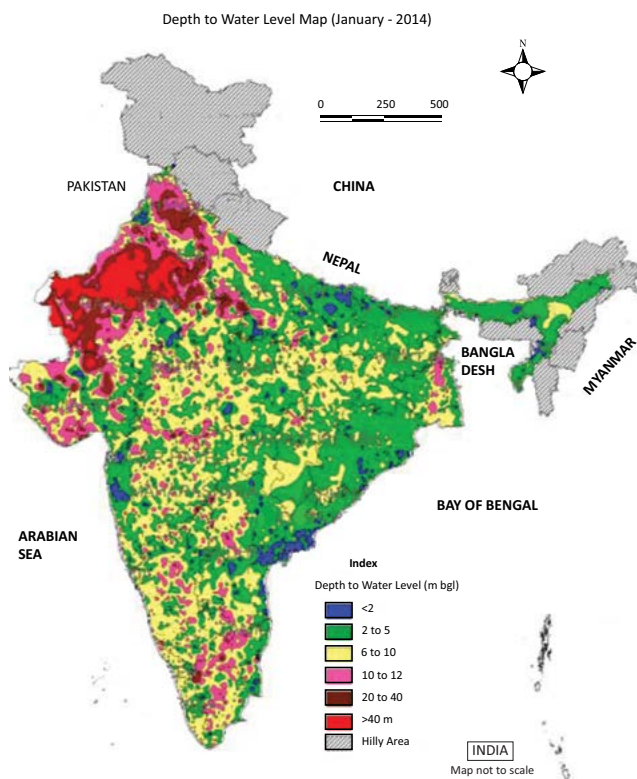


Figure 3: Status of Ground Water withdrawal in India⁵

Source: CGWB, 2014

community-level institutions like *Gram Panchayats* (the administrative unit at the village level) a prevailing say in the regulation of water resource for the common good. These led to high levels of depletion of groundwater in the States of Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh. These States represent about 25% of the total number of over-exploited, critical, and semi-critical blocks in terms of groundwater in India.

In May 2018, a National Groundwater Management Improvement Program (NGMIP) titled, *Atal Bhujal Yojana (Abhy)*, has been initiated with an aim to build on current National and State efforts targeted at the long-term goal of reducing groundwater level decline and to improve the management of groundwater resources in selected States. The objective of this Rs 6000 crore-World Bank assisted programme is to arrest the country's depleting groundwater levels and strengthen groundwater institutions.⁶ The scheme will be implemented by the

⁵ Ground Water yearbook, CGWB, 2014. Available online at <<http://www.cgwb.gov.in/documents/Ground%20Water%20Year%20Book%202013-14.pdf>>

⁶ PIB, Government of India, Ministry of Water Resources, dt 06.06.2018. Available online at <<http://pib.nic.in/newsite/PrintRelease.aspx?relid=179796>>

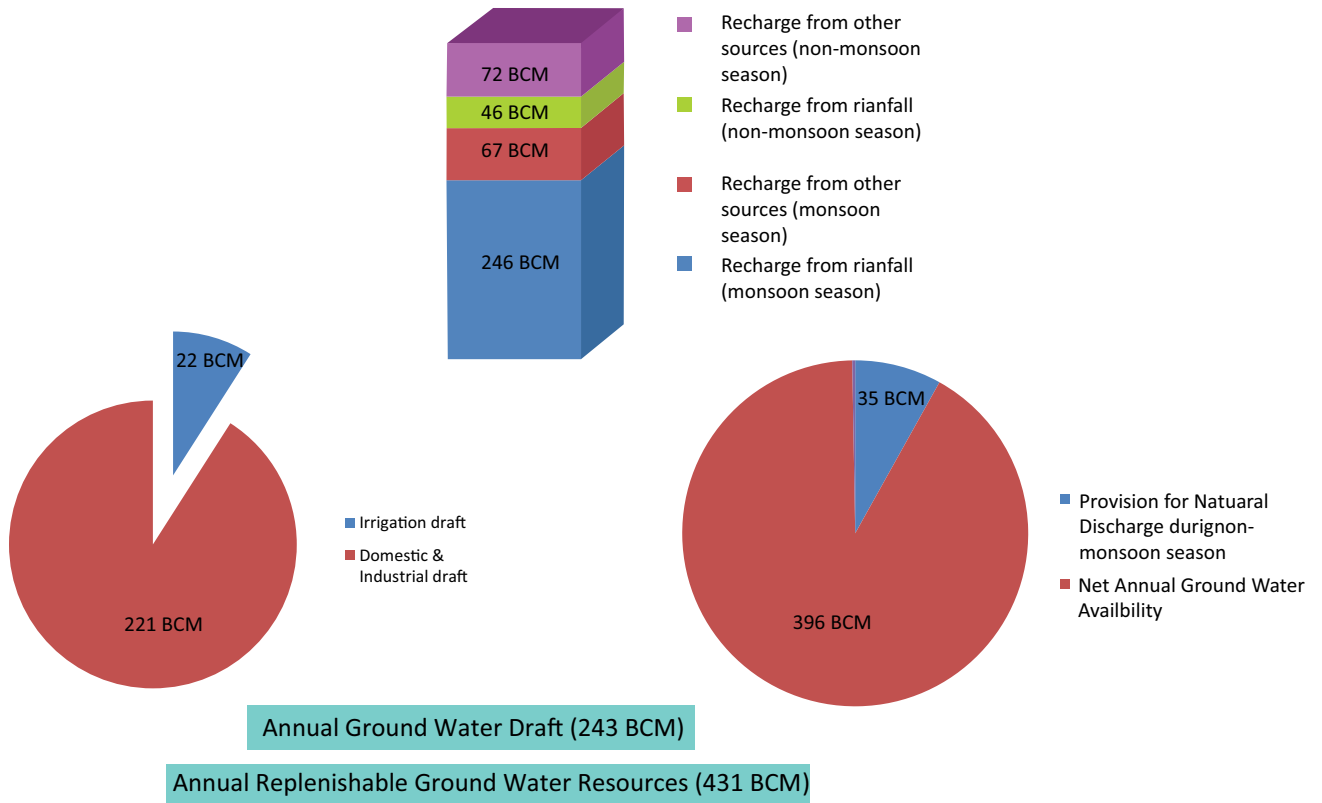


Figure 4: Ground Water Resource and Development Potential in India

Source: CGWB 2014

Ministry of Water Resources, River Development and Ganga Rejuvenation and aims to improve ground water

management through community participation in priority States.

III. Current Water Policy Framework of India

India has several comprehensive national level laws, policies⁷ and programmes, and the formulation is an ongoing process, with several legislative proposals and executive policies currently under discussion. Since water is a State subject and there is also considerable diversity across India, there is a limit to the extent that national laws can holistically address the issues of the sector, and the national laws have to be complemented by State level legislation, regulation, and governance mechanisms. However, in most parts of the country, due to weak governance, the policies and strategies are falling short if not actually failing, resulting in poor outcomes. Water crisis is in considerable part a governance crisis for India. Operationalizing and monitoring policies through effective strategies and mechanisms are as critical as good policies themselves. The National Water Policy, National Water Mission, Water Framework Law (Draft), Model Groundwater Bill (Draft), Dam Safety Bill, Interstate Water Disputes Amendment Bill, are some of the important policy documents, which need to be analysed not only for the content but also for implementational effectiveness. A few of these policies/missions are discussed in this paper.

3.1 National Water Policy of India, 2012

The National Water Policy (NWP 2012) of India was introduced in relation to the rapidly changing scenario in the domain of water to address the emerging issues and provide critical policy inputs. This policy built upon the NWP 2002, which gave emphasis for the first time to ecological and environmental aspects of water allocation. The NWP 2012 calls for a common integrated perspective to govern the planning and management of water resources. Such a perspective would consider local, regional, and national contexts and be environmentally sound. The Policy clearly states that water needs to be managed as a common pool community resource that is held by the State under the public trust doctrine to ensure equitable and sustainable development for all. NWP 2012 also emphasizes the fact that the service provider role of the State has to be gradually shifted to that of a

regulator of services and facilitator for strengthening the relevant institutions. The NWP makes recommendations on several major issues including the following:

- Adapting to climate change
- Enhancing water availability
- Water demand management through efficient water use practices
- Water pricing
- Conservation of river corridors, water bodies, and infrastructure
- Project planning and implementation
- Management of floods and droughts
- Water supply and sanitation
- Institutional arrangements
- Trans-boundary rivers
- Database and information system
- Research and training needs
- Preparation of a plan of action by the National Water Board based on the National Water Policy

Several institutions at the National and State levels are involved in carrying out the recommendations of NWP.

3.2 National Water Mission of India, 2008

In India, the National Action Plan on Climate Change (NAPCC), has set up eight missions with Ministry of Environment, Forest and Climate Change (MoEFCC) as nodal ministry to implement the programmes/ schemes and to monitor progress of the issues related to climate change. The eight missions are: National Solar Mission, Energy Efficiency Enhancement Mission, Sustainable Agriculture, Green India, Water Mission, Sustainable Habitat, Sustainable Himalayan Ecosystem, and Strategic Knowledge on Climate Change.

The main objective of the National Water Mission (NWM) of India is:

“Conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within

⁷ TERI Discussion Paper: Perspectives on a Water Resource Policy for India, October 2014

States through integrated water resources development and management”.

The five identified goals of the Mission are:

- **Goal 1:** Comprehensive water database in public domain and assessment of impact of climate change on water resources;
- **Goal 2:** Promotion of citizen and State action for water conservation, augmentation and preservation;
- **Goal 3:** Focused attention to vulnerable areas including over-exploited areas;
- **Goal 4:** Increasing water use efficiency by 20%, and
- **Goal 5:** Promotion of basin-level integrated water resources management.

The strategies for achieving these goals are elaborated in Annexure I.

3.3 Draft Water Framework Law of India, 2016

The National Water Policy (2012) emphasizes the need to evolve a National Water Framework Law as an umbrella statement of general principles governing the exercise of legislative/executive powers by the Centre, the States, and the local governing bodies. The Draft National Water Framework (NWF) Bill, 2016, seeks to provide an overarching national legal framework based on principles for protection, conservation, regulation and management of water as a vital and stressed natural resource under which legislation and executive action on water at all levels of governance can take place. This Bill aims to set up comprehensive water governance structure in aiding the State governments and local bodies to manage water systems. This is an important step to empower the lowest administrative levels of the country for the management of water resources.

The Bill seeks to incorporate legal aspects for prioritizing water use, conservation, and management. However, many existing legislations would require amendment if the proposed NWF legislation becomes a reality. These provisions are to be identified and the amended sections of these legislations should be part of a suitable schedule of the proposed NWF legislations.

The Bill also aims to set a binding national water quality standard and pushes for a national water security plan

and requires the States to prepare drought mitigation, management policy, and action plan within six months of this Act coming into force. The Bill further states that the Drought Mitigation and Management Policy and Action Plan shall include a drought risk and vulnerability assessment for the State, and identify programmes and measures for drought mitigation based on the various indices of drought. It gives priority to meeting the right to water for life, followed by allocation for achieving food security, supporting sustenance agriculture, sustainable livelihoods, and ecosystem needs.

The introduction of ‘right to water for life’ is a significant step forward, emphasizing the State’s responsibility for ensuring every person’s right to safe water. This is an important step towards achieving the SDGs. Another progressive step is highlighting the Ground Water and Surface Water linkages to plan for the development and management of water in the river basin and the associated aquifers. The recognition of water as a common pool resource essential for the sustenance of life in all its forms is also an important aspect of the Bill.

The draft Bill was circulated among the States and the concerned Central Ministries for obtaining their comments and sought to be processed in accordance with Article 252 of the Constitution. The Framework law will apply to the States that pass the legislation.

3.4 Model Ground Water Bill, 2016

The Union Ministry of Water Resources has put up a Draft Ground Water Model Bill for Conservation, Protection and Regulation of Groundwater on its website www.wrmin.nic.in for comments and suggestions, in June 2016. The Bill is based on the principles of subsidiarity and equitable distribution in an integrated approach. The State, according to the Bill, should act as a public trustee of groundwater, which should be treated as a common pool resource to make sure that groundwater is protected, conserved, regulated, and managed. The Model Ground Water Bill of 2016 is expected to benefit groundwater resource through the introduction of groundwater security plans and local decision-making.

Some of the objectives of the Bill include the following:

1. Ensure the realization of the fundamental right to life through the provision of water;

2. Meet food security, livelihoods, basic human needs, livestock, and aquatic life;
3. Protect ecosystems and their biological diversity;
4. Reduce and prevent pollution and degradation of groundwater.

Overall, this Bill is an improvement over the previous groundwater bills in many respects. In fact, for the very first time, the Bill seeks to put in place a framework to

regulate and manage groundwater on the basis of a public trust doctrine and the principle of subsidiarity. This is a giant step forward from the current “open access” groundwater law in place. The proposed push to quantify and regulate groundwater use in canal command areas and urban areas is also an excellent step. However, the actual legislation would need to be passed by the individual States through their State legislature as the water is a State subject.

IV. Implications of the Water Policy Framework of India on SDG 6

Given the nature of nexus of water with other sectors, the water policy framework has implications for almost all public policies. The five main Ministries for taking forward SDG 6 are:

Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR): This Ministry has undertaken several measures to reform the water sector in India. Some of these progressive steps comprise bridging the gap of irrigation potential created and irrigation potential utilized, over exploitation of groundwater, flood management, drought resilience, conflict resolution, dam safety, reliable data availability, deteriorating water quality, etc. The **National Mission for Clean Ganga** is a flagship programme of the Ministry and under this, the **Namami Gange** programme is an integrated conservation mission approved by the Union Cabinet in May 2015 with a budget outlay of Rs. 20,000 crore for five years. **Namami Gange** programme was envisaged as a 100% centrally funded programme with provision for 15 years' operation and maintenance. This ministry's programmes and schemes such as the **Aviral Dhara, Nirmal Dhara, Swachh Kinara** directly impact the Targets 6.3, 6.4, and 6.5.

The Ministry of Drinking Water and Sanitation (MoDWS): This Ministry works towards providing drinking water and sanitation in rural areas of India. The **National Rural Drinking Water Programme (NRDWP)** was initiated in the year 2009, with a major emphasis on ensuring sustainability⁸ of water availability in terms of potability, adequacy, convenience, affordability, and equity. NRDWP is a centrally sponsored scheme with 50:50 fund sharing between the Centre and the States. NRDWP has been advised to undergo restructuring to make it outcome-based, competitive, and better monitored with increased focus on sustainability (functionality) of schemes to ensure good quality service delivery to the rural population. A sum of Rs 23,050 crore has been approved for the programme for the Fourteenth Finance Commission (FFC) period 2017/18 to 2019/20. SDG Target 6.1 is being addressed by

⁸ NRDWP Guidelines, 2013.

NRDWP and Target 6.2 is being addressed by the flagship programme, **Swachh Bharat Mission-Grameen (SBM-G)**.

Ministry of Housing and Urban Affairs (MoHUA): The mandate of this Ministry is to carry out schemes such as **Swachh Bharat Mission (Urban)** for safe sanitation access to urban and peri-urban areas in the country; Atal Mission for Rejuvenation and Urban Transformation (**AMRUT**) for water supply systems (including augmentation of existing water supply systems and rehabilitation of old water supply systems); decentralized and networked underground sewerage systems (including augmentation of existing sewerage systems and sewage treatment plants); fecal sludge management (cleaning, transport, and treatment in a cost-effective manner), etc. The **Smart City** programme is another important initiative and the core infrastructure elements of this initiative include smart management of water supply and sanitation (including solid waste management) with latest tools and techniques. These programmes and schemes directly impact the Targets 6.1 and 6.2.

Ministry of Environment, Forest and Climate Change (MoEFCC): The **National River Conservation Directorate** under this Ministry steers a number of plans and programmes, such as the **National Water Mission** as one of the eight missions of **National Action Plan for Climate Change (NAPCC)**. The river cleaning programme was initiated with the launching of the Ganga Action Plan (GAP) in 1985, which was later expanded to cover other rivers under **National River Conservation Plan (NRCP)** in the year 1995. The objective of NRCP is to improve the water quality of the rivers, which are the major water sources in the country, through the implementation of pollution abatement works. The pollution abatement works are implemented on a cost sharing basis between the Centre and State Governments. The works include: collection, transportation, and treatment of municipal sewage, River Front Development (RFD), Low Cost Sanitation (LCS), Electric Crematoria, Improved Wood-based Crematoria, etc. NRCP has been shifted to MoWR, RD&GR. Prevention and control of industrial pollution is being addressed by the Central and State Pollution

Control Boards/Pollution Control Committee. This ministry's programmes and schemes directly impact the Targets 6.3 and 6.6.

The **Ministry of Agriculture and Farmers' Welfare (MoAFW)** has rolled out a few flagship programmes, such as the **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**. The scheme has been divided into 99 prioritized projects with different timelines. Schemes such as '**Har Khet Ko Paani**' and '**Per Drop, More Crop**', etc., have been put on fast track mode. The major objective of PMKSY is to achieve convergence of investments in irrigation at the field level, expand cultivable area under assured irrigation,





improve on-farm water use efficiency to reduce wastage of water, enhance the adoption of precision-irrigation and other water saving technologies, enhance recharge of aquifers and introduce sustainable water conservation practices by exploring the feasibility of reusing treated municipal waste water for peri-urban agriculture, and attract greater private investment in precision irrigation system. SDG Target 6.4 is being addressed by the programmes and schemes of this ministry.

The different targets of SDG 6 and the Policies/ Programmes/ Acts/Guidelines to take it forward by the respective ministries are mentioned in Table 1.

Table 1: SDG 6 and its linkages with the current national policies/ programmes of the 'Water' sub-sector in India

Targets of SDG 6	Acts/Policies/Programmes/Guidelines	Nodal Ministries
 <p>TARGET 6-1 SAFE AND AFFORDABLE DRINKING WATER</p>	National Water Policy (Section 1.3)	MoWR, RD & GR
	Model Ground Water Bill (Draft) (Sections 4.1 and 5.2)	MoWR, RD & GR
	National Rural Drinking Water Programme (NRDWP) (Section 3.0)	MoDWS
	Atal Mission for Rejuvenation and Urban Transformation (AMRUT) (Section 3.1.1)	MoHUA
 <p>TARGET 6-2 END OPEN DEFECTION AND PROVIDE ACCESS TO SANITATION AND HYGIENE</p>	Swachh Bharat Mission (Rural) (Sections 4)	MoDWS
	Swachh Bharat Mission (Urban) (Sections 4,5,6)	MoHUA
 <p>TARGET 6-3 IMPROVE WATER QUALITY WASTEWATER TREATMENT AND SAFE REUSE</p>	NRDWP (Section 4)	MoDWS
	Model Ground Water Bill (Draft) (Section 4)	MoWR, RD & GR
	Water Framework Law of India (Section 22)	MoWR, RD & GR
	AMRUT (Section 3.1.1)	MoHUA
	Namami Gange (Gazette of India Notification, Part II, Section 3, Clause 39.3)	MoWR, RD & GR
	Environment(Protection)Act 1986 (Section 3.2)	MoEFCC
 <p>TARGET 6-4 INCREASE WATER-USE EFFICIENCY AND ENSURE FRESHWATER SUPPLIES</p>	Water (Control and Prevention of Pollution) Act 1974 (Sections 16,17,19)	
	Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors (Sections 2.1,2.2,2.3)	MoWR, RD & GR
	Notification S. O. 3337 E dated 16/10/2017 regarding specific water consumption upto maximum of 3 m ³ /MWh for Thermal Power Plants	MoEFCC
	National Water Mission (Section 3.4)	MoWR, RD & GR
	National Water Policy (Section 1.3.viii)	MoWR, RD & GR
	Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) (Section 2.0)	MoA & FW
	Model Ground Water Bill (Section 10)	MoWR, RD & GR
	Water Framework Law of India (Section 7.1)	MoWR, RD & GR

Table 1: SDG 6 and its linkages with the current national policies/ programmes of the ‘Water’ sub-sector in India

 <p>TARGET 6-5 IMPLEMENT INTEGRATED WATER RESOURCES MANAGEMENT</p>	National Water Mission (Section 3.5)	MoWR, RD & GR,
	National Water Policy (Section 12.4)	MoWR, RD & GR
	International Water Treaties	MEA
	Bilateral Water Treaties	MEA
 <p>TARGET 6-6 PROTECT AND RESTORE WATER-RELATED ECOSYSTEMS</p>	Model Ground Water Bill, 2016 (Sections 3, 8)	MoWR, RD & GR
	Water Framework Law of India (Sections 7, 16)	
	National River Conservation Programme (NRCP)	MoWR, RD & GR
	National Water Policy (Section 8)	MoWR, RD & GR
	National Water Mission (Section 3.5)	MoWR, RD & GR
	National Mission for Clean Ganga (Namami Gange)	MoWR, RD & GR
 <p>TARGET 6-A EXPAND WATER AND SANITATION SUPPORT TO DEVELOPING COUNTRIES</p>	South Asian Association for Regional Cooperation (SAARC)	MoDWS, MoHUA,
	South Asia Conference on Sanitation (SACOSAN)	MEA, MoWR, RD & GR
	Global Water Partnership (GWP)	MoST
	India -EU Water Partnership	
 <p>TARGET 6-B SUPPORT LOCAL ENGAGEMENT IN WATER AND SANITATION MANAGEMENT</p>	National Water Mission (Section 3.3)	Ministry of Panchayati Raj, MDWS, MoWR, RD & GR
	National Water Policy (Sections 8.1, 12.3)	
	NRDWP (Section 9)	

The **NITI Aayog**, an apex-level body under the Prime Minister, is entrusted with the task of catalyzing policy planning, particularly in the context of promoting “cooperative federalism”, and acts as the nodal agency to provide a roadmap for ensuring greater coordination among government departments and other agencies. It has mapped all the central ministries, centrally sponsored/ central sector schemes, and other government initiatives and its relevance to the respective SDGs at a preliminary level, in the expectation that this will trigger the process of better alignment of schemes and strategies with national goals. Consequently, several States have conducted similar mapping of their departments and schemes/ programmes. Many States have set up SDG Cells or ‘Centres of Excellence’ in order to coordinate SDG implementation.⁹ NITI Aayog has constituted a Task Force with participation by Central and States’

Ministries for regular review of SDG implementation in the country.¹⁰ NITI Aayog is being apprised by the States on the progress under priority indicators as well as related schemes. The national strategy is schematically represented in Figure 5. NITI Aayog has selected 63 priority indicators for regular monitoring and the two indicators for monitoring SDG 6 are: Access to potable water & sanitary toilet (Urban/Rural).¹¹

In the context of the water sector, NITI Aayog has come out with a Composite Water Management Index (CWMI),¹²

⁹ India and Sustainable Development Goals: The Way Forward, Research and Information Systems for Developing Countries, 2016.

¹⁰ Sustainable Development Goals (SDGs) – Draft Mapping (August 2017), Development Monitoring and Evaluation Office, NITI Aayog, New Delhi. Available online at <<http://niti.gov.in/content/SDGs.php>>.

¹¹ NITI Aayog presentation to States on SDGs, dt 23.01.2018-13.02.2018. Available online at <<http://www.niti.gov.in/>>.

¹² Composite Water Management Index, NITI Aayog, 2018



Figure 5: National Strategy for achieving SDGs in India

Source: NITI Aayog, 2018

as a major step towards creating a culture of databased decision-making for water in India. This index is an attempt to nudge the States towards more efficient utilization and better management of water and recycling thereof with a sense of urgency. This exercise has helped in establishing a benchmark for State-level performance on key water indicators based on nine broad themes, as shown in Table 2. This also gives an insight on how States have progressed in the water sector over 2015/16 and 2016/17. However, aggregating these divergent indicators to arrive at a composite index seems problematic, and further work is clearly required to arrive at a composite index which can depict not only the relative status among the States, but also the changes in a State over a period of time on the specific parameters related to governance, management, developmental initiatives, etc., in a consistent and sectorally appropriate way.

Table 2: Indicator themes in the Composite Water Management Index (CWMI)

1.	Source augmentation and restoration of water bodies
2.	Source augmentation (Groundwater)
3.	Major and medium irrigation—Supply side management
4.	Watershed development—Supply side management
5.	Participatory irrigation practices—Demand side management
6.	Sustainable on-farm water use practices—Demand side management
7.	Rural drinking water
8.	Urban water supply and sanitation
9.	Policy and governance

The Ministry of Statistics and Programme Implementation (MoSPI) has developed a measurement framework for tracking/monitoring the progress of nationally defined SDGs and is placed in the public domain for wider consultation.¹³ These draft indicators for SDG 6, presented in Table 3, are aligned with many of the CWMI Indicators. Annexure III has details of the CWMI Indicators.

The sub-indicators of CWMI has established a baseline on key water indicators in 24 States of India. This has also helped identify areas for deeper engagement and investment on the part of the States. If regularly monitored, this will be an effective tool to assess the progress of various SDG 6 targets in these States. These efforts should be progressively up-scaled in these States and replicated in the remaining ones, in order to institutionalize a comprehensive monitoring mechanism towards achieving the targets of SDG 6.

¹³ Draft National Indicator Framework for Sustainable Development Goals, Ministry of Statistics and Programme Implementation (MoSPI), 8 March 2017

Table 3: Alignment of Indicators developed by MoSPI with CWMI Indicators for achieving SDG targets

SDG Target	Indicator as per MoSPI	CWMI Indicator
6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Proportion of population using safely managed drinking water services	20 (a,b) 22 (a,b) 27 (a,b)
	Proportion of population using an improved drinking water by source	
6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	Proportion of population using safely managed sanitation services, including a hand-washing facility with soap and water	
	Percentage of population using basic sanitation services	
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	The Indicator is being developed	21 (a,b) 23 (a,b) 24 (a,b)
	Percentage Water withdrawal (%) against water availability	5, 6 (a,b)
	Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)	8, 9 (a,b); 17 (a,b,c); 18 (a,b,c), 19 (a,b,c,d)
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity		
6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	Percentage of River basins brought under Integrated Water Resource Management	11; 12 (a,b,c); 26
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	Area under over exploited blocks	1 (a,b); 2 (a,b); 3 (a, b); 4 (a,b); 25
	Percentage sewage load treated in River ganga	
6.a By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	Amount of water- and sanitation-related official development assistance that is part of a government-coordinated spending plan	
	Number of officials trained in advanced training courses on water and sanitation activities	
	Number of MoU/Co-operation agreements for capacity building and technology transfer	
6.b Support and strengthen the participation of local communities in improving water and sanitation management	Percentage of developed Irrigated Command Area brought under WUAs	13; 14 (a,b,c,d);
	Percentage of developed Irrigated Command Area managed by WUAs	15(a,b,c,d)

VI. Linkages between SDG 6 and other SDGs in the Indian Context

SDG 6 aims not only to expand access to basic water and sanitation services but also to close the gaps in service quality, with the intention of long-term sustainability. This means not only providing water in people’s homes, but also making sure that the water is safe to drink and continuously available. The targets within this goal are closely linked to one another and to the other SDGs. Some of the SDGs are enabled by efforts to achieve the targets of SDG 6, while some of the SDGs enable the targets of SDG 6.

Under the ‘business-as-usual’ scenario, most of the SDGs have positive inter-linkages with SDG 6, but some targets within the other SDGs could have potential conflict and involve trade-offs with SDG 6, which must be recognized and optimized for implementation. As for example, increasing water and sanitation access helps in poverty

reduction and has positive health and educational outcomes. It also supports the targets of gender equity, productivity, among others. However, agricultural activities (**SDG 2, Target 2.4**) and energy services (**SDG 7**) could have negative impacts on ambient water quality, water availability, and ecosystems. Similarly, the targets related to economic productivity, growth, industrialization, and urbanization that do not explicitly mention sustainable management of natural resources must be implemented in an integrated manner with the other targets in the same goals, as well as across sectors, to avoid any potential conflict with targets on water quality, water use, and freshwater ecosystems. Table 4 summarizes the inter-relationship between different targets with that of SDG 6 and the synergies between SDG 6 and other SDGs is elaborated in Annexure II.

Table 4: SDG targets that enable and hinder SDG 6

SI No	SDG 6 enabling other SDGs	SDG 6 enabled by other SDGs	SDG 6 impacted by programmes targeting other SDGs
1	Target 6.1 (Safe and affordable drinking water)		
	Target 1.4 (Access to basic services) Target 2.2 (End malnutrition, stunting and wasting in children) Target 3.2 (Reduce neo-natal mortality) Target 3.3 (End water-borne and other diseases) Target 3.9 (Reduce deaths due to polluted water and other pollutions) Target 4.2 (Ensure that all girls and boys have access to quality education) Target 4 A (Build and upgrade education facility which is gender-sensitive) Target 5.1 (End gender discrimination) Target 16.1 (Reduce violence) Target 16.2 (End exploitation of children)	Target 8.3 (Promote development-oriented policies that support productive activities, decent job-creation) Target 9.1 (Develop resilient infrastructure) Target 13.1 (Strengthen resilience and adaptation to Climate related hazards)	Target 2.3 (Double agricultural productivity) Target 2.4 (Ensure resilient agriculture) Target 7.1 (Universal access to affordable, reliable and modern energy services) Target 7.2 (Increase the share of renewable energy) Target 11.1 (Safe, affordable housing and basic services to all)

Table 4: SDG targets that enable and hinder SDG 6

SI No	SDG 6 enabling other SDGs	SDG 6 enabled by other SDGs	SDG 6 impacted by programmes targeting other SDGs
2	Target 6.2 (End open-defecation and provide access to sanitation and hygiene)		
	Target 1.4 (Access to basic services) Target 2.2 (End malnutrition, stunting and wasting in children) Target 3.2 (Reduce neo-natal mortality) Target 3.3 (End water-borne and other diseases) Target 3.9 (Reduce deaths due to polluted water and other pollutions) Target 4.2 (Ensure that all girls and boys have access to quality education) Target 4 A (Build and upgrade education facility which is gender-sensitive) Target 5.1 (End gender discrimination) Target 5.2 (Eliminate all forms of violence against women and girls) Target 16.1 (Reduce violence)	Target 8.3 (Promote development-oriented policies that support productive activities, decent job-creation) Target 9.1 (Develop resilient infrastructure) Target 13.1 (Strengthen resilience and adaptation to Climate related hazards)	Target 11.1 (Safe, affordable housing and basic services to all)
3	Target 6.3 (Improve water quality, wastewater treatment and safe reuse)		
	Target 3.2 (Reduce neo-natal mortality) Target 3.3 (End water-borne and other diseases) Target 3.9 (Reduce deaths due to polluted water and other pollutions) Target 8.3 (Promote development-oriented policies that support productive activities, decent job-creation) Target 8.9 (Promote sustainable tourism that promotes local culture) Target 14.1 (Reduce marine pollution from land-based activities) Target 14.2 (Protect marine and coastal ecosystem) Target 15.1 (Ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystem and their services)	Target 11.6 (Reduce per capita impact of poor air quality, municipal and other waste management) Target 12.2 (Efficient use of natural resources) Target 12.4 (Environmentally sound management of wastes for reducing water and other pollution) Target 12.5 (Reduce waste generation through prevention, reduction, recycling and reuse)	
4	Target 6.4 (Increase water-use efficiency and ensure freshwater supplies)		
	Target 9.4 (Upgrade infrastructure for resource efficiency)	Target 12.2 (Efficient use of natural resources)	Target 2.3 (Double the agricultural income) Target 2.4 (Ensure sustainable and resilient agriculture) Target 7.1 (Universal access to affordable, reliable and modern energy services) Target 7.2 (Increase the share of renewable energy)

Table 4: SDG targets that enable and hinder SDG 6

SI No	SDG 6 enabling other SDGs	SDG 6 enabled by other SDGs	SDG 6 impacted by programmes targeting other SDGs
5	Target 6.5 (Implement Integrated Water Resource Management)		
	<p>Target 11.1 (Access to adequate housing and basic services for all)</p> <p>Target 11.3 (Inclusive and sustainable urbanization)</p> <p>Target 15.1 (Ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystem and their services)</p> <p>Target 15.2 (Promote sustainable management of forestation and increase of afforestation)</p> <p>Target 15.3 (Combat desertification, drought, flood)</p> <p>Target 15.4 (Ensure conservation of mountain ecosystem)</p>	<p>Target 12.2 (Efficient use of natural resources)</p> <p>Target 12.4 (Environmentally sound management of chemicals and all wastes and release to water)</p> <p>Target 12.5 (Reduce waste generation through preventions, reduction, recycle and reuse)</p> <p>Target 13.1 (Strengthen climate adaptability and resilience)</p>	
6	Target 6.6 (Protect and restore water-related ecosystem)		
	<p>Target 8.9 (Promote sustainable tourism that promotes local culture)</p> <p>Target 14.2 (Restoration of marine ecosystem)</p> <p>Target 15.1 (Conservation, restoration and sustainable use of freshwater ecosystem)</p> <p>Target 15.2 (Promote sustainable management of forestation and increase of afforestation)</p> <p>Target 15.3 (Combat desertification, drought, flood)</p> <p>Target 15.4 (Ensure conservation of mountain ecosystem)</p>	<p>Target 13.1 Strengthen climate adaptability and resilience)</p>	<p>Target 2.3 (Double the agricultural income)</p> <p>Target 2.4 (Ensure sustainable and resilient agriculture)</p> <p>Target 7.1 (Universal access to affordable, reliable and modern energy services)</p> <p>Target 7.2 (Increase the share of renewable energy)</p> <p>Target 9.1 (Infrastructure for all)</p> <p>Target 9.3 (Increase in small-scale industries)</p>
7	Target 6.A (Expand water and sanitation support to developing countries)		
	<p>Target 10.6 (Enhanced representation and voice from developing countries for decision making at global platform)</p> <p>Target 15.1 (Conservation, restoration and sustainable use of freshwater ecosystem)</p>		
8	Target 6.B (Support local engagement in water and sanitation management)		
	<p>Target 16.7 (Ensure responsive, inclusive, participatory and representative decision-making at all levels)</p>		

VII. Discussion

Section 5 and Annexure II of this discussion paper explore and elaborate the synergies between targets of SDG 6 with those of other SDGs in India-specific context. It is evident that many a times they are supportive, however, in a few instances they are not and involve a trade-off and require optimization. As for example, water is required for agriculture (SDG 2), energy production (SDG 7), industrial production processes (SDG 9), domestic use and urbanization (SDG 11), and to maintain ecological flows (SDG 6). Water resource allocations, based on the principles outlined in the SDG framework and the commitments agreed upon under SDG 6, are vital for sustainability of ecosystem services. For SDG 6 to succeed in India, the existing schemes and programmes of the hindering SDGs need to be optimized at the local levels and the adaptation measures under the specific goals of National Water Mission need to be aligned with the SDG 6 targets.

Over 600 million people in India depend on agriculture for their living and nearly 2/3rd of land under cultivation relies on rain and underground water sources. It is pertinent to note here that about 80% water is consumed by the agricultural sector. The efficiency of water use is lower than several other countries and provides a huge opportunity to reduce use. India is the largest extractor of groundwater¹⁴ in the world. In order to cater to the rising population pressure in India, production of food grains (SDG 2-sustainable agriculture) is bound to increase. In the business-as-usual scenario, attaining food security would have an adverse impact on water security, unless watershed development in rainfed areas is given highest priority, water is used efficiently, water leakages are prevented, change in cropping patterns is practiced, groundwater and surface water are used in conjunction.

Integrating schemes such as '*Har Khet Ko Paani*' and '*Per Drop More Crop*' with improved water management (Target 6.3), water-use-efficiency across all sectors (Target 6.4), and ensuring sustainable withdrawals are crucial to address the issue of water scarcity. Efficient and sustainable water use is an integral part of agricultural

productivity and its sustainability. More proficient water technologies provide greater support to farmers (Target 2.3). It is important to take cognizance of the fact that eastern and north-eastern India is broadly characterized by under-utilization of groundwater resources and this region has the potential to contribute to the needs of national food security.

The current regime of power subsidies for agriculture has had a major role to play in the declining groundwater tables in most parts of the country; these are the subsidies which had fueled the 'Green Revolution'. However, given the emerging stresses on groundwater, an imaginative way needs to be found, which breaks the groundwater-energy-food nexus, without hurting farmer interests. The *Atal Bhujal Yojana* (Abhy) under the National Groundwater Management Improvement Program (NGMIP) is an initiative towards addressing the over-exploitation of groundwater. Reflections from ground-level experience would be vital for effective implementation of this programme, an important one being the issue of power subsidy affecting groundwater depletion.¹⁵ To this effect, it is seen that the physical segregation of power feeders to provide 24x7 electricity to rural habitations and non-farm users, and separate feeders to give 3-phase predictable supply to agriculture, which is rationed in terms of total time, at a flat tariff are valuable insights to guard against groundwater depletion.

The industrial sector consumes about 12% water in India. Sustainable and inclusive industrialization is dependent on a water responsible industry, which practices integrated wastewater management. Many of the industries discharge their untreated /partially treated effluents into water bodies, thereby posing threat to human life as well as ecosystems. Responsible business practices warrant decentralized and/or centralized wastewater treatment systems as well as recycling and reusing water by identifying and designing innovative solutions for industrial sectors.

In line with SDG 9 (sustainable industrialization), it is important to develop sustainable mechanisms to facilitate

¹⁴ World Water Development Report 2018

¹⁵ NITI Aayog, Five Year Plan document 2012-2017

all major commercial/institutional/ industrial service entities to move to zero liquid discharge (ZLD) model in a defined time frame. There are a number of good practices in India as well as other countries which could be customized and adopted by the relevant industries. This could be institutionalized by devising incentives for water conservation (and reuse) and deterrent penalties for non-compliance. There could also be mechanisms for rational water pricing for industries for sustainable financial performance of the local bodies.

India is rapidly urbanizing and this exerts stress on the natural resources. Pollution from the discharge of untreated municipal waste water threatens freshwater safety. Biological, organic, and inorganic pollutants contaminate almost 70% of surface water resources and a growing percentage of groundwater reserves. Only 21%¹⁶ of the municipal sewage is being treated in India. The remaining is disposed into water bodies resulting in pollution of rivers. Achieving Target 6.3 will require a serious relook at the current causes of water pollution and practical measures that can prevent and address this. Safe sanitation (**Target 6.2**) and safe fecal sludge and septage management (FSSM¹⁷) should be integrated with ongoing pollution abatement measures. Strict enforcement based on polluter-pays-principle to be implemented so that fecal sludge and municipal sewage are safely treated and not disposed of into water bodies indiscriminately (Target 6.3). In the spirit of SDG 11 (sustainable cities), it is imperative to adopt IWRM (Target 6.5) for water conservation by rainwater harvesting, using recycled wastewater for urban housing complexes, groundwater recharge as well as rejuvenation of lakes and ponds in the river basin catchment.

Water is consumed for energy production. The interdependency and trade-off between water and energy is inevitable. Energy (SDG 7) is required for water distribution as well as other processes and water is required for hydroelectric, bio-fuels, and energy production systems. Enhancing water-use-efficiency (Target 6.4) by reducing non-revenue-water (NRW), adopting decentralized system of water supply and wastewater treatment, and adopting demand management measures is vital in balancing the trade-offs between water and energy.

¹⁶ JS Kamyotra and RM Bhardwaj, Municipal Wastewater Management in India, India Infrastructure Report 2011, Chapter 20, IDFC 2011.

¹⁷ National Policy on Faecal Sludge and Septage Management (FSSM), MoHUA, 2017.

Climate change impacts the water resources. India is the second most flood-prone country in the world. Increased frequency of urban flooding, primarily due to rapid and unplanned urbanization is an emerging problem, further putting pressure on drainage systems. In 2015, India accounted for nearly 60% of people globally affected by floods.¹⁸ During 1801–2002, India experienced 42 droughts. A large part of the country (68%) is prone to drought.¹⁹ The situation is exacerbated due to deforestation, groundwater extraction and poor land and water management. Episodes of floods and droughts take an economic, social, and environmental toll. India may soon move to a water stressed State, despite being home to the perennial Himalayan and peninsular rivers. Increasing demand across various sectors and a rapidly changing climate has exacerbated the problem. Efforts towards adaptation and mitigation of climate change (SDG 13, Target 13.1) could be aligned with SDG Target 6.6 at the municipal and panchayat levels for planning, management, regulation, and execution. Efforts to mitigate climate change impacts, build resilience in water and sanitation infrastructure, early warning systems with precision for flood forecast, climate proofing of cities and resilience measures to be taken up on priority.

It is generally acknowledged that the overall success in achieving the SDGs, rests to a large extent on India achieving its goals, and it goes without saying that achieving SDG 6 is a crucial part of achieving all the SDGs. From the preceding, it is also clear that given the socio-economic dynamics in India, achieving SDG 6 as well as the other SDGs will require imaginative management of trade-offs in a complex operating environment. The devil as always lies in the detail, which is the fine-tuning of mutually interacting policies in related sectors in a State and unit-specific context so as to break the silos, reinforce and synergise rather than oppose and contradict. Towards this end, an integrated set of interventions with implementation framework needs to be conceived and implemented by the respective ministries at the Central and State governments in India, perhaps coordinated by the NITI Aayog.

¹⁸ U K Sinha, Water Sector: Timely interventions, India @70 Modi @3.5, Wisdom Tree, 2018.

¹⁹ Ashok Gulati and Gayathri Mohan, Towards sustainable, productive and profitable agriculture: Case of Rice and Sugarcane, Working Paper No. 358, April 2018.

VII. Recommendations

A major objective of water sector planning is to determine the optimal balance between water use and water protection within an IWRM framework. Sustainable development of water sector requires that water is not perceived as a single sector or policy area, as is agricultural, energy, and industrial policy, but rather that an integrated approach in planning is incorporated. Scientific appraisal of systemic issues as well as innovative methods and tools to transform the business-as-usual practices in water management need to be explored and implemented. Thus, effective regulation and its enforcement, coordination and management of water sector plays a crucial role in India's transition towards a green economy and achieving the targets of SDG 6.

India, with a huge potential for rain water harvesting, should enhance its utilization of rain water. Increasing investment and efficiency in using precipitation runoff would be an important area to explore for mitigating water scarcity in most of the water scarce regions of the country. Augmenting this initiative with water use efficiency in agricultural, industrial, and domestic sectors would help bridge the demand–supply gap in the water sector.

The water sector in India is also plagued by water quality and water storage challenges. Increasing investment in water storage capacity and augmenting water availability with community participation, institutional partnerships and international collaboration would be vital for sustainability of water resources. Water quality challenges can be addressed by technological interventions, community partnership as well as by deterrent penalties for non-compliance by defaulters. Dominant community-based water supply schemes in rural areas are left without post-construction support, leading to serious dysfunctionality. Mobilizing communities and households can augment efforts in achieving SDGs, in terms of household investments.

The collection of water sector data is fragmented amongst different agencies in India. This results in the absence of a coherent and internally consistent conceptual framework and protocols for data collection and validation. It is

extremely important to create a transparent, accessible, and user-friendly system of data management for devising solutions to water sector issues and challenges.

Improving sectoral management on the one hand and deftly handling trade-off issues with other sectors (and even within the water sector) for achieving the SDGs requires huge re-engineering of the governance, planning and implementational framework at National, State, and local (community) levels. Some of the crucial issues to be addressed in this context are detailed as follows:

Institutional

- At present, the Central Water Commission (CWC) and Central Ground Water Board (CGWB) carry out functions independent of each other. For integrated water management, development, planning, water-use efficiency, and for budgeting the adoption of a river basin approach, restructuring and reforming of CWC and CGWB to a more comprehensive institution is necessary²⁰ so that they do not work in silos. Equally important, States have to shoulder the responsibility conferred on them under the Constitution of India which makes water a State subject. States must develop institutions for data collection and regulated management of the State's own water resources. Perhaps the Central government needs to facilitate and incentivize this process.
- There is an urgent need for restructuring, strengthening and empowerment of the existing institutions at the State, District and Panchayati Raj Institutions (PRIs) which are involved in different aspects of service delivery to improve efficiency in management and sustainability of the water resources. While funding under the Finance Commission award has given the Gram Panchayats some leverage, the fact is that technical and management capacity needs to be built at the District and intermediate Panchayat levels for the funds to be effectively and productively used.

²⁰ A 21st century institutional architecture for India's water reforms submitted by Dr Mihir Shah Committee, 2016

- Management of water which is in large parts a common property resource requires community participation for its development, protection and regulation. This needs recognition of the local community institution as a key stakeholder in all decisions at the local level impacting on water resources. Some of these reforms are summarized in Table 5.

Table 5: Institutions and proposed reforms

Institutions	Reforms
CWC and CGWB	Paradigm shift from supply-side management to demand-side management with focus on sustainability Multi-disciplinarily, cross-disciplinary, and multi-dimensionality in water sector institutions such as CWC and CGWB
Central and State Governments	Partnerships between Central Government, State Government, and ground-level institutions with involvement of all primary stakeholders including local communities in the collective endeavour of participatory water governance.
RBOs	River Basin Organizations to be empowered to manage water resources of respective basins as the basic hydrological unit for planning and development
State Governments	Incentivizing State Governments to reform irrigation projects to improve water use efficiency and water resource management in implementing <i>Har Khet Ko Pani, Per Drop More Crop</i> schemes
CWC, CGWB, State Government Boards	Capacity building of existing staff and inducting new generation professionals to handle a reforming water sector with latest technology. Strengthening of State level regulatory agencies who should be responsible for generating robust data, and for coordinating with State level institutions for taking advance actions towards climate risks and other issues arising from both supply and demand side.

Regulatory

- The draft National Water Framework Bill, 2016, has laid out the architecture for planning, regulation, technical, and institutional support. This document should be finalized at the earliest and implemented in convergence with targets of SDG 6.
- Effective legislation at State level (based on the Central Model Groundwater Bill) for regulation of groundwater and surface water providing an explicit and increasing role for municipal and Panchayati Raj bodies in planning, management, and regulation.

Management

- Enhancing water storage capacity would hugely augment water availability, particularly in the Indian context. There is need for increased investment in water storage capacity building from the smallest village pond to the largest multi-purpose reservoir. The earlier focus on water management of dryland and rainfed areas needs to be renewed, particularly given the context of climate change.
- Enhancing water use efficiency in irrigation,²¹ by using efficient irrigation techniques like drip and sprinkler systems and implementing micro-irrigation systems through participatory irrigation management (PIM) would address Target 6.4 substantially.
- Enhancing water use efficiency in industries²² and domestic water consumption as highlighted in the National Water Mission objective would help achieve Target 6.4.
- Watershed management and an integrated approach to soil-water conservation by design and construction of watershed structures, such as farm bund, farm ponds, check dams, contour bunding, and minor irrigation, are already proposed to be taken up in conjunction with NGWIP (*Atal Bhujal Yojana*). Given the limitations on assured irrigation, there are many areas where watershed management and soil-water conservation will need to be the main strategy, and investments must be supported with systems that can incorporate the results of research and development (R&D).

²¹ Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors (Sections 2.1, 2.2, 2.3).

²² Notification S. O. 3337 E dated 16/10/2017 regarding specific water consumption upto maximum of 3 m³/MWh for Thermal Power Plants.

- There is a need for developing mechanisms and Management of Information Systems (MIS) platform with innovative information and communication technology (ICT) tools based on credible data for integrated and efficient monitoring, informed systemic responses, and decision making.
- The implementation of different SDG targets which either enable SDG 6 or are enabled by SDG 6 should be taken up in an integrated manner at the district level for increased efficiency and better outcomes. Similarly, the SDGs that hinder SDG 6 needs to be optimized so as to minimize the negative impact on the poor and vulnerable sections of the society.

Developmental

- The agrarian economy and livelihood systems in India are very vulnerable to climate change impacts. They need to be insulated from the pernicious effects of drought, flood, and climate change, and move towards sustainable water security.
- The diverse ecology of India is replete with examples of successful improved land and water management with the involvement of the local population and Water User Associations (WUAs). Such efforts need to be upscaled within the country to achieve Target 6.5. Knowledge of these practices can be shared with other countries in the spirit of Target 6.A.
- There is a need for a major shift in approach in water resource management from purely engineering works to systems that incorporate traditional practices, local materials, and are manageable and maintainable by local communities. The *Gram Panchayat*, WUAs as well as the local community needs to be involved at all stages of discussion, planning, , management, and maintenance in the spirit of Article 243 of the Constitution of India.

The IWRM approach is a key tool for addressing potential conflicts with other SDGs. It can cut across sectoral

jurisdictions, so that policies, plans, laws, regulations, information, and participation are all used to help resolve the trade-offs between water use and environmental sustainability. This will ensure that both institutional as well as infrastructure arrangements for all SDGs improve human well-being without exhausting natural resources or hindering ecosystem services and functions.

The institutional, regulatory, management, and developmental issues brought out above in the context of aligning the water policies of the country with SDG 6 specifically and the other SDGs in general need to be further analysed in a State-specific context for atleast three reasons. Firstly, water is a “State subject” under the Constitution of India and many of these issues need to be addressed at the State level, and in fact can only be addressed at State level keeping in view the sensitivities in this regard. Secondly, conditions vary widely across States and as mentioned, even within States) and a “one-size-fits-all” approach to institutional, regulatory, management, and developmental issues is impractical if not potentially disastrous. Already some of the national policies suffer from this drawback. And thirdly, if we are optimizing on all of the SDGs in an integrated manner as is being suggested, that optimization requires that State-level policies with regard to the other SDGs be also taken into cognizance.

Clearly the need of the hour is for an effective institutional framework which, on the one hand, enables communication vertically between the SDG-coordination nodes at Central and State levels, and, on the other hand enables sectoral policies (such as water) to communicate horizontally between the sectors and the SDG-coordination nodes at central as well as State levels. In the long run, this will determine our ability to optimize effectively as we seek to achieve the 2030 Agenda for Sustainable Development.

Annexures

Annexure I: Goals and Strategies of National Water Mission

Goal 1: Database & Assessment

Water related data is being collected by various Central and State agencies for different purposes. A comprehensive data base in public domain (except for the data of sensitive nature) helps in assessment of the impact of climate change on water resources in terms of availability as well as the quality of the water from surface and ground water sources. The key areas identified in the NAPCC in respect of database and assessment of impact of climate change on water resources are enumerated as follows:

- Estimate river flow
- Estimating isotopic tracer-based technology for monitoring river water discharge to all major river monitoring stations
- Establishing wide network of automatic weather stations and automated rain gauge stations.
- Deploying of inventory of wetlands, especially these with uniform features.
- Mapping of catchment & surveying on assessments of land use patterns; vegetation cover; silting; conservation of mangrove areas; human settlements & human activities and its impacts on catchments and water bodies.
- Creating climate change models for regional water bodies.
- Developing models of upstream water flow estimating drainage capacities for storm water and for sewage water.

The strategies for achieving these goals are given in Box 1.

Goal 2: Citizen and State Action

There has been several studies on the impact of climate on water resources which indicates that various components of the hydrological cycle would be affected resulting in increased temporal and spatial variations of water availability. This calls for urgent steps for conservation of available water resources and take immediate steps for augmentation of the utilizable water resources. It has been established that the participatory approach in water management yielded excellent results, as seen in the case of States such as Maharashtra and Gujarat. Some of the identified actionable issues include:

- Empowerment and involvement of Panchayati Raj Institutions (PRIs), Urban Local Bodies (ULBs), Water User Associations (WUAs), and primary stakeholders in management of water resources with focus on water conservation, augmentation, and preservation.
- Promote Participatory Irrigation Management (PIM).
- Sensitization of elected representatives of over exploited areas about the dimensions of problems and to orient investment towards water conservation.
- Provide incentives for water neutral and water positive technologies in industry.
- Encourage participation of NGOs in various activities related to water resources management, particularly in planning, capacity building and mass awareness.
- Involve and encourage corporate sector / industries to take up, support and promote water conservation, augmentation and preservation within the industry and as part of corporate social responsibility (CSR).

The identified strategies to achieve these objectives are given in Box 2.

BOX 1: Strategies for achieving Goal 1 (Database and Assessment) of NWM

Strategy 1 Review and establishment of network for collection of additional necessary data

Strategy 2 Development of water resources information system

Strategy 3 Development / implementation of modern technology for measurement of various data

Strategy 4 Developing inventory of wetland

Strategy 5 Research studies on all aspects related to impact of climate change on water resources including quality aspects of water resources with active collaboration of all research organizations working in climate change

Strategy 6 Reassessment of basin wise water situation

Strategy 7 Projection of the impact of climate change on water resources

BOX 2: Strategies for achieving Goal 2 (Citizen and State action) of NWM

Strategy 1: Empowerment and involvement of Panchayati Raj Institutions, urban local bodies, Water Users' Associations and primary stakeholders in management of water resources with focus on water conservation, augmentation and preservation

Strategy 2: Promote participatory irrigation management

Strategy 3: Sensitization of elected representatives of overexploited areas on the dimensions of problems and to orient investment under MNREGP towards water conservation

Strategy 4: Provide incentives for water neutral and water positive technologies in industry

Strategy 5: Encourage participation of NGOs in various activities related to water resources management, particularly in planning, capacity building and mass awareness

Strategy 6: Involve and encourage corporate sector / industries to take up, support and promote water conservation, augmentation and preservation within the industry and as part of corporate social responsibility

- Planning of watershed management in mountain ecosystems.
- Enhancing recharge of the sources and recharge zones of deeper aquifers.
- Mandating water harvesting and artificial recharge in relevant urban areas.
- Exploring options to augment water supply in critical areas,
- Promoting recycling of wastewater for meeting water needs of urban areas.
- Adoption of new and appropriate technologies for water supply to coastal cities such as low temperature desalination technologies that allow for use of ocean water,
- Seawater desalination using Reverse Osmosis and multistage flash distillation to take advantage of low grade heat energy e.g. from power plants located in coastal region or by using renewable energy such as solar.
- Brackish water desalination.
- Water purification technologies.
- Developing digital elevation models for flood prone areas of forecasting flood.
- Mapping areas likely to experience floods and developing schemes to manage floods.

The strategies for achieving these goals are given in Box 3.

Goal 3: Focus on Vulnerable Areas

There is urgent need for appropriate measures in the vulnerable areas which are likely to be adversely affected due to impact of climate change and the areas where the water resources, particularly the groundwater resources are declining due to overuse. In about 15% of the assessment blocks, groundwater has been over-exploited and about 14% of the blocks are in critical or semi-critical state. The key areas identified for this Goal are:

- Enhancing storage capacities in multipurpose hydro-projects and integration of drainage with irrigation infrastructures.
- Restoration of old water tanks.
- Formulating and implementing a regulatory regime to ensure wise use of wetland at the National, State and District levels.
- Environmental appraisal and impact assessment of developmental projects on wetland.
- Strengthen links with afforestation programmes and wetland conservation.

BOX 3: Strategies for achieving Goal 3 (Focus on Vulnerable areas) of NWM

Strategy 1: Expedient implementation of Water Resources projects particularly the multipurpose projects with carry over storages benefitting drought prone and rain deficit areas.

Strategy 2: Promotion of traditional system of water conservation.

Strategy 3: Physical sustainability of groundwater resources.

Strategy 4: Intensive programme for groundwater recharge in over-exploited, critical and semi-critical areas.

Strategy 5: Conservation and preservation of wetland.

Strategy 6: Intensive programme for addressing the quality aspects of drinking water particularly in rural areas.

Strategy 7: Promotion of water purification and desalination.

Strategy 8: Systematic approach for coping with floods.

Goal 4: Improving Water Use Efficiency by 20%

One of the most important goals of the National Water Mission is to improve the efficiency of water use at least by 20%. The objective can be achieved by ensuring improved efficiency both on the demand side as well as the supply side. Research in increasing the water use efficiency in agriculture, industry and domestic water is very important. Similarly, full utilization of the created facilities and better design and proper operation and maintenance would considerably help in improving the efficiency on supply side. Use of micro-irrigation, promotion of water neutral and water positive technologies, recycling of water etc. are also very important measures for increasing the efficiency. At the same time, adoption of better management practices is also very important.

Recommended Strategies in respect of Goal 4 are given in Box 4.

BOX 4: Strategies for achieving Goal 4 (Improving WUE by 20%) of NWM

Strategy 1: Research in the area of increasing water use efficiency.

Strategy 2: Incentivize recycling of water including waste water.

Strategy 3: Development of Eco-friendly sanitation system.

Strategy 4: Improve efficiency of urban water supply system.

Strategy 5: Promotion of water efficient techniques and technologies.

Strategy 6: Pilot projects for improvement in water use efficiency in collaboration with States.

Strategy 7: Promote water regulatory authorities for ensuring equitable water distribution.

Strategy 8: Promote mandatory water audit for drinking water purposes.

Strategy 9: Adequate provision for operation and maintenance of water resources projects.

Strategy 10: Incentive through award for water conservation for efficient water use.

Strategy 11: Incentivize use of efficient irrigation practices and fully utilize the created facilities.

Goal 5: Promotion of basin level integrated water resources management (IWRM)

The central goal of IWRM at the river basin level is to achieve water security for all purposes, as well as manage risks while responding to, and mitigating disasters. The path towards water security requires trade-offs to maintain a proper balance between meeting the needs of various sectors and establishing adaptable governance mechanisms to cope with evolving environmental, economic and social circumstances. IWRM strives for effective and reliable delivery of water services by coordinating and balancing the various water-using sectors – this is an important part of sustainable water management. Recommended Strategies in respect of Goal 5 are given in Box 5.

BOX 5: Strategies for achieving Goal 5 (Promotion of IWRM) of NWM

Strategy 1: Review of National Water Policy.

Strategy 2: Review of State Water Policies.

Strategy 3: Guidelines for different uses of water e.g., irrigation, drinking, industrial etc. particularly in the context of basin-wise situations.

Strategy 4: Planning on the principle of integrated water resources development and management.

Strategy 5: Expedient formulation of the projects for utilization of surplus flood water for beneficial use of the society and implementation of projects after evaluating costs and land acquisition problems.

Strategy 6: Ensuring convergence among various water resources programmes.

Annexure II: Synergies between SDG 6 and other SDGs

The synergies amongst the targets of all the SDGs with those of SDG 6 is mentioned here:

Synergy between SDG 1 and SDG 6:

Ending poverty everywhere is fundamental to human existence and caters towards improving the quality of life of a vast number of people living in abject poverty. Target 1.4 of SDG 1 (*access to basic services such as water and sanitation for the poor*) specifies the access to basic services in particular the poor and the vulnerable. The targets related to these basic services are linked through human rights, are mutually supportive and should be implemented in a coordinated manner.

Estimates suggest that every US\$1 invested in WASH yields a US\$5 return,²³ considering all social and economic benefits. Investments in water and sanitation provide significant economic and social returns, as well as generate employment, thereby reducing poverty. Target 1.4 favourably impacts Targets 6.1 and 6.2 (*access to safe drinking water and sanitation*).

Synergy between SDG 2 and SDG 6:

Improving water services for all can help protect the foundations of human development by supporting nutrition and health. Efforts towards addressing Targets 6.1 and 6.2 (*Safe drinking water and sanitation for all*) helps in significantly reduce mortality and morbidity in children below 5 years of age. There is increasing evidence²⁴ of stunting caused due to poor sanitation, which is one of the targets of SDG-2 (Target 2.2-End all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age.....).

Target 6.4 of SDG 6 emphasizes on substantially increasing water-use efficiency across all sectors and ensuring sustainable withdrawals and supply of freshwater to address water scarcity and reduce the number of people suffering from water scarcity, by 2030. More proficient water technologies provide greater support to farmers, thereby supporting food security. If sustainability is not factored in, increasing agricultural area (Indicator 2.4.1), would enhance the level of water stress (Indicator 6.4.2).

Target 2.3 (Double the agricultural productivity and



incomes of small-scale food producers...) and Target 2.4 (*Sustainable food production systems and implement resilient agricultural practices that increase productivity and production...*) would be at the cost of water access (Target 6.1) and restoring water related eco-systems (Target 6.6). Hence Targets 2.3 and 2.4 need to be taken forward along with Target 6.4 (water-use-efficiency).

Synergy between SDG 3 and SDG 6:

SDG-3 includes targets that explicitly relate to improvements in water and sanitation services. Stunting is a powerful risk factor associated with 53 percent²⁵ of infectious-disease-related deaths in developing countries. The under nutrition from it can have long-lasting negative effects on children: poor mental development, behavioural abnormalities, and a reduced capacity to work, among others. Literature²⁶ reveals how poor water services contribute to under-nutrition by transmitting pathogens and infections that inhibit nutritional uptake. Inadequate water and sanitation can combine with inadequate health care to produce a disproportionate risk for people living in poor or marginalized areas.

Target 3.2 (*By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality....*), **Target 3.3** (*By 2030, end the epidemics.... water-borne diseases and other communicable diseases*) and **Target 3.9** (*Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination*) are enabled by **Targets 6.1, 6.2** (*Safe drinking water and sanitation*) and **Target 6.3** (*water pollution*). Ensuring WASH services combined with safe treatment and disposal or use of wastewater amplifies health gains.

Synergy between SDG 4 and SDG 6:

Equity in education is a major challenge in developing countries, which is embodied in this SDG. Data²⁷ reveals that children from the richest 20 per cent of households achieved greater proficiency in reading at the end of their primary and lower secondary education than children from the poorest 20 per cent. In most of the developing countries, girls from economically and socially challenged households, drop out of school for fetching water for their homes. Similarly, many girls avoid going to school due to lack of basic sanitation facilities in schools and educational institutions.



²³ WASH Poverty Diagnostic Initiative, World Bank, 2018.

²⁴ Dean Spears. 2012. "Height and cognitive achievement among Indian children", *Economics and Human Biology*.

²⁵ Ibid.

²⁶ A fair chance for every child, UNICEF, 2016

²⁷ Strategy for Water, Sanitation and Hygiene 2016–2030, UNICEF, 2016.

Investing in water and sanitation access (**Targets 6.1 and 6.2**) has very positive outcomes in terms of education and align with **Target 4.2** (*Ensure that all girls and boys have access to quality early childhood development, care and pre-primary education...*) and **Target 4.A** (*Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all*).

Synergy between SDG 5 and SDG 6:

Enabling easy access to water (**Target 6.1**) and sanitation facilities (**Target 6.2**) reduces the drudgery on girls and women.²⁷ This is addressed by **Target 5.1** (*End all forms of discrimination against all women and girls everywhere*). There is empirical evidence²⁸ of women and girls facing risk of sexual violence while defecating in the open. Access to toilet reduces this risk and addresses **Target 5.2** (*Eliminate all forms of violence against women and girls in public and private spaces...*).



Many women-led self-help-groups (SHGs) working in the water and sanitation sector at the grass root levels have empowered women and cultivated leadership capability in many. These initiatives have also witnessed sustainability and become replicable models. Inclusive and gender-sensitive water management policies support the achievement of gender equality. Both women and men must be empowered to equitably access and manage water and participate in decision-making processes.

Synergy between SDG 7 and SDG 6:

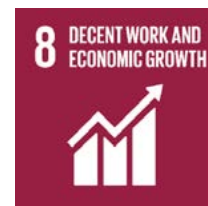
Energy and water are intricately inter-dependent. Water is required for modern energy production (hydro-electric and bio-fuels for example) and energy is required for water extraction, purification, storage, treatment and distribution. There is a negative impact on water resources with some forms of renewable energy, such as hydel projects and production of bio-fuels. Thus, increasing universal access to affordable, reliable and modern energy services (**Target 7.1**) and increasing substantially the share of renewable energy (**Target 7.2**), without focusing on the sustainability of water resources, would impact **Target 6.6** (*Protect and restore water-related ecosystems*) and could potentially affect **Target 6.1** (*Universal access to safe drinking water*).



Enhancing water-use-efficiency (**Target 6.4**) by reducing non-revenue-water (NRW), adopting decentralized system of water supply and wastewater treatment, and strictly adhering to the principles of Reduce, Reuse, Recycle and Rejuvenate would be pivotal in balancing the trade-offs between water-energy nexus.

Synergy between SDG 8 and SDG 6:

Water is an essential component of national and local economies. Nearly 80% of all jobs globally are dependent (42% heavily dependent, 36% moderately dependent)²⁹ on sustainably managed water resources and water-related services, including sanitation and wastewater services.



Economic growth for all is dependent on the availability of adequate water required for economic opportunities. Thus, access to safe water and sanitation (**Targets 6.1, 6.2**) reduces the disease burden (thereby saving healthcare costs), enhances the opportunity cost of the affected population and has a direct bearing on **Target 8.3** (*Promote development-oriented policies that support productive activities...*). Efforts to reduce water pollution (**Target 6.3**) by protecting water-related ecosystems (**Target 6.6**) decreases the time spent taking care of sick family members, leaving more time to participate in the formal economy, as embodied in **Target 8.9** (*Devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products*).

Synergy between SDG 9 and SDG 6:

Water supply and sanitation infrastructure (**Targets 6.1, 6.2**) should be resilient to natural disasters (**Target 9.1-Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being...**). Hence, efforts towards achieving **Target 9.1** enables the efforts towards **Targets 6.1 and 6.2**.



Building industrial infrastructure (**Target 9.3-Increase the access of small-scale industrial and other enterprises, in developing countries...**) adversely impacts the health of the eco-system (**Target 6.6**). Efforts towards achieving **Target 9.3** and **Target 6.6** involve a trade-off with each other and should be optimized while implementing.

²⁸ WaterAid report briefing note, Perceptions of risks related to sexual violence against women linked to water and sanitation in Delhi, India, 2011.

²⁹ The United Nations World Water Development Report 2016

Sustainable and inclusive industrialisation is depended on a water responsible industry. Efforts towards **Target 9.4** (*Upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes.....*) aligns with the **Target 6.4** (*Water-use-efficiency*) and could be taken in conjunction with each other.

Synergy between SDG 10 and SDG 6:

Sharing of trans-boundary waters as mentioned in **Target 6. A** (*...surface and groundwater should be on principles of equity and sustainability*) aligns with **Target 10.6** (*.....ensure enhanced representation and voice for developing countries in decision-making*). This supports the spirit in which the bilateral treaties between countries are supported.



Bilateral treaties between neighboring countries can also facilitate in arresting the ongoing transport of pollutants in the transboundary perennial riverine environment.

Synergy between SDG 11 and SDG 6:

Inclusive water distribution, effective water and sewerage management, safe and adequate drinking water and sanitation facilities (**Targets 6.1,6.2**) makes cities live-able (**Target 11.1**). Though urbanization *per se*, causes stress on water resources, but the mitigation efforts to reduce adverse environmental impact of cities (**Target 11.6-Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management**) augments the efforts to achieve **Target 6.3** (*reducing water pollution*).



Wastewater (**Target 6.3**) can be considered a reliable source of water in the planning and development of new settlements and water resource projects. Implementation of integrated water resource management (IWRM) (**Target 6.5**) in conjunction with efforts towards **Target 11.1** and **11.3** (*...enhance inclusive and sustainable urbanization for participatory, integrated and sustainable human settlement...*) would be mutually reinforcing.

Synergy between SDG 12 and SDG 6:

Sustainable management and efficient use of natural resources (**Target 12.2**), supports **Targets 6.4** (*Water-use-efficiency*), **Target 6.5** (*IWRM*) and **Target 6.3** (*reducing chemical pollution*). The Targets 6.3 and 6.5



also align with the **Target 12.4** (*Achieve environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil...*) and **Target 12.5** (*Substantially reduce waste generation through prevention, reduction, recycling and reuse*).

Target 6.3 calls for increase in water reuse and wastewater treatment, which can promote a circular economy by reduction in water withdrawals and loss of resources in production activities in line with **Targets 12.2, 12.4,12.5**. Businesses can enhance their environmental performance and competitive capacity, by exchange of energy, water and material flows in wastewater by-products (**Target 6.3**).

Synergy between SDG 13 and SDG 6:

Climate change substantively impacts water resources. Water and sanitation infrastructure are adversely impacted by floods and droughts, which are intense under the Climate change regime. Strengthening climate resilience (**Target 13.1**) in water and sanitation infrastructure, strengthens water and sanitation access (**Targets 6.1 and 6.2**). Strengthening adaptive capacity to climate-related hazards and natural disasters (**Target 13.1**) helps in effective management of flood and drought (**Target 6.6**).



Climate change being a transboundary concern, adaptation and mitigation efforts are strengthened by transboundary water co-operation (**Target 6.5**).

Synergy between SDG 14 and SDG 6:

Controlling pollution (**Target 6.3**) caused due to agriculture, industry and domestic wastewater helps conserve marine resources (**Target 14.1-Prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities....**). Similarly, efforts to restore water-related ecosystems (**Target 6.6**) protects marine ecosystems (**Target 14.2-By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts ...**)



The achievement of SDG Target 6.3, to improve water quality by reducing pollution, also backs the efforts to the reduction of river pollution, leading to healthy marine ecosystems (**Target 14.2**) and thereby contributing to a 'Blue economy'.

Synergy between SDG 15 and SDG 6:

Natural resources are interdependent on each other and efforts to protect and restore water related ecosystem (Target 6.6) impact conservation and restoration of forests (Target 15.1), increase afforestation (Target 15.2), combat desertification (Target 15.3), mountain ecosystem and bio-diversity (Target 15.4). IWRM (Target 6.5) augments the efforts to achieve the Targets (15.1,15.2,15.3,15.4). The efforts towards Target 6.3, to improve water quality by reducing pollution, support sustainable use of terrestrial and inland ecosystems and their services (Target 15.1).

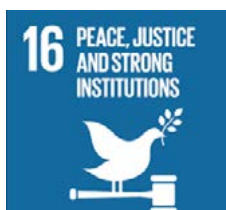


access to safe drinking water (Target 6.1) and sanitation (Target 6.2), significantly reduces violence (Target 16.1), abuse and exploitation (Target 16.2). Participation of local communities in improving water and sanitation services (Target 6.B) ensures responsive, inclusive, participatory and representative decision-making (Target 16.7). The accountability of institutions responsible for facilitating and providing water and sanitation for all promotes peace and justice.

Water has been a point of serious international as well as interstate conflicts. In a landmark judgement, the Honourable Supreme Court of India pronounced a judgement on the long-awaited Cauvery dispute³⁰ in India. This has set the stage for amicably settling long-standing water conflicts within India.

Synergy between SDG 16 and SDG 6:

At a time when water-related conflicts are on the rise, promoting peaceful and inclusive societies is vital for human values. Achieving the goals of SDG 1 significantly reduces violence and fosters a culture of peace and collaboration. Having



Synergy between SDG 17 and SDG 6:

International cooperation, cross-learning of knowledge and innovation, supporting capacity building and technology transfer in the water and sanitation sector strengthens and revitalizes global partnership for sustainable development.



Annexure III: List of indicators from the Composite Water Management India (CWMI)

No.	Key Performance Indicator as per CWMI	Unit	Targets of SDG 6	Indicator as per MoSPI
1 (a)	Area irrigated by water bodies restored during the financial year 2015-16 as a percentage of the irrigation potential area of total number of water bodies identified for restoration.	%	6.6	Percentage sewage load treated in River ganga
1 (b)	Area irrigated by water bodies restored during the financial year 2016-17 as a percentage of the irrigation potential area of total number of waterbodies identified for restoration.	%	6.6	Percentage sewage load treated in River ganga
2 (a)	Number of overexploited and critical assessment units that have experienced a rise in water table in pre-monsoon 2016 as compared to water levels in pre-monsoon 2015 (recorded by the observation wells tapping the shallow aquifer monitored by the State and CGWB [piezometers installed for the purpose]) as a percentage of total number of overexploited and critical assessment units.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)
2 (b)	Number of overexploited and critical assessment units that have experienced a rise in water table in pre-monsoon 2017 as compared to water levels in pre-monsoon 2016 (recorded by the observation wells tapping the shallow aquifer monitored by the State and CGWB [piezometers installed for the purpose]) as a percentage of total number of overexploited and critical assessment units.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)

³⁰ Amit Ranjan, The Cauvery River Water Disputes in India, ISAS Working Paper No. 293 – 16 April 2018, Institute of South Asian Studies National University of Singapore

No.	Key Performance Indicator as per CWMI	Unit	Targets of SDG 6	Indicator as per MoSPI
3 (a)	Percentage of areas of major groundwater re-charging identified and mapped for the State as on 31.03.2016.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)
3 (b)	Percentage of areas of major groundwater re-charging identified and mapped for the State as on 31.03.2017.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)
4 (a)	Percentage of mapped area covered with infrastructure for re-charging groundwater to the total mapped area as on 31.03.2016.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)
4 (b)	Percentage of mapped area covered with infrastructure for re-charging groundwater to the total mapped area as on 31.03.2017.	%	6.6	Percentage Water withdrawal (%) against water availability Per capital storage(m ³ /person) Per capita availability of water (m ³ /person)
5	Has the State notified any Act or a regulatory framework for regulation of groundwater use/management?	Yes/ No	6.4	
6 (a)	Irrigation Potential Utilized (IPU) as a percentage of Irrigation Potential Created (IPC) as on 31.03.2016.	%	6.4	
6 (b)	Irrigation Potential Utilized (IPU) as a percentage of Irrigation Potential Created (IPC) as on 31.03.2017.	%	6.4	
7 (a)	Total number of major and medium irrigation projects in the State.	Number	SDG-2	
7 (b)	Number of projects assessed and identified for the IPC-IPU gap in the State.	Number	SDG-2	
8	Expenditure incurred on works (excluding establishment expenditure) for maintenance of irrigation assets per hectare of command area during the Financial Year of 2016-17.	₹/hectare	6.4	
9 (a)	The length of the canal and distribution network lined as on 31.03.2016 as a percentage of the total length of the canal and distribution network found suitable (selected) for lining for improving conveyance efficiency.	%	6.4	
9 (b)	The length of the canal and distribution network lined as on 31.03.2017 as a percentage of the total length of the canal and distribution network found suitable (selected) for lining for improving conveyance efficiency.	%	6.4	
10	Area under rain-fed agriculture as a percentage of the net cultivated area as on 31.03.2016 or previous year.	%	SDG-2	
11	Number of water harvesting structures constructed or rejuvenated as a percentage of the target (sanctioned projects under IWMP, RKVY, MNREGS and other schemes) during the Financial Year 2016-17.	%	6.5	Percentage of River basins brought under Integrated Water Resource Management
12 (a)	Assets created under IWMP.	Number	6.5	Percentage of River basins brought under Integrated Water Resource Management
12 (b)	Geo-tagged assets as a percentage of total assets created under IWMP as on 31.03.2016.	%	6.5	
12 (c)	Geo-tagged assets as a percentage of total assets created under IWMP as on 31.03.2017.	%	6.5	

No.	Key Performance Indicator as per CWMI	Unit	Targets of SDG 6	Indicator as per MoSPI
13	Has the State notified any law/legal framework to facilitate Participatory Irrigation Management (PIM) through Water User Associations (WUA)?	Yes/ No	6.b	Percentage of developed Irrigated Command Area brought under WUAs
14 (a)	Irrigated command area in the State as on 31.03.2016.	Hectare	6.b	Percentage of developed Irrigated Command Area brought under WUAs
14 (b)	Percentage of irrigated command areas having WUAs involved in O&M of irrigation facilities (minor distributaries and CAD&WM) as on 31.03.2016.	%	6.b	Percentage of developed Irrigated Command Area brought under WUAs Percentage of developed Irrigated Command Area managed by WUAs
14 (c)	Irrigated command area in the State as on 31.03.2017.	Hectare	6.b	Percentage of developed Irrigated Command Area brought under WUAs
14 (d)	Percentage of irrigated command areas having WUAs involved in O&M of irrigation facilities (minor distributaries and CAD&WM) as on 31.03.2017.	%	6.b	Percentage of developed Irrigated Command Area brought under WUAs Percentage of developed Irrigated Command Area managed by WUAs
15 (a)	Total irrigation service fee collected during the financial year 2015-16.	₹	6.b	Percentage of developed Irrigated Command Area managed by WUAs
15 (b)	Percentage of Irrigation Service Fee (ISF) retained by WUAs as compared to the fee collected by WUAs during the financial year 2015-16.	%	6.b	Percentage of developed Irrigated Command Area brought under WUAs Percentage of developed Irrigated Command Area managed by WUAs
15 (c)	Total irrigation service fee collected during the financial year 2016-17	₹	6.b	Percentage of developed Irrigated Command Area managed by WUAs
15 (d)	Percentage of Irrigation Service Fee (ISF) retained by WUAs as compared to the fee collected by WUAs during the financial year 2016-17.	%	6.b	Percentage of developed Irrigated Command Area brought under WUAs Percentage of developed Irrigated Command Area managed by WUAs
16 (a)	Area cultivated by adopting standard cropping pattern as per agro-climatic zoning as a percentage of total area under cultivation as on 31.03.2016.	%	SDG-2	
16 (b)	Area cultivated by adopting standard cropping pattern as per agro-climatic zoning as a percentage of total area under cultivation as on 31.03.2017.	%	SDG-2	
17 (a)	Has the State segregated agriculture power feeder?	Yes/ No	6.4	Percentage Water withdrawal (%) against water availability
17 (b)	Area in the State covered with segregated agriculture power feeder as a percentage of the total area under cultivation with power supply during 2015-16.	%	6.4	Percentage Water withdrawal (%) against water availability
17 (c)	Area in the State covered with segregated agriculture power feeder as a percentage of the total area under cultivation with power supply during 2016-17.	%	6.4	Percentage Water withdrawal (%) against water availability

No.	Key Performance Indicator as per CWMI	Unit	Targets of SDG 6	Indicator as per MoSPI
18 (a)	Is electricity to tube-wells/water pumps charged in the State?	Yes/No	6.4	Percentage Water withdrawal (%) against water availability
18 (b)	Is yes, then whether it is charged as per fixed charges?	Yes/No	6.4	Percentage Water withdrawal (%) against water availability
18 (c)	If yes, whether it is charged on the basis of metering?	Yes/No	6.4	Percentage Water withdrawal (%) against water availability
19 (a)	Total irrigated area in the State as on 31.03.2016.	Hectare	6.4	Percentage Water withdrawal (%) against water availability
19 (b)	Area covered with micro-irrigation systems as a percentage of total irrigated area as on 31.03.2016.	%	6.4	Percentage Water withdrawal (%) against water availability
19 (c)	Total irrigated area in the State as on 31.03.2017.	Hectare	6.4	Percentage Water withdrawal (%) against water availability
19 (d)	Area covered with micro-irrigation systems as compared to total irrigated area as on 31.03.2017.	%	6.4	Percentage Water withdrawal (%) against water availability
20 (a)	Percentage of total rural habitations fully covered with drinking water supply as on 31.03.2016.	%	6.1	Proportion of population using safely managed /improved drinking water services
20 (b)	Percentage of total rural habitations fully covered with drinking water supply as on 31.03.2017.	%	6.1	Proportion of population using safely managed /improved drinking water services
21 (a)	Percentage reduction in rural habitations affected by water quality problems during the financial year 2015-16.	%	6.3	Indicator is being developed
21 (b)	Percentage reduction in rural habitations affected by water quality problems during the financial year 2016-17.	%	6.3	Indicator is being developed
22 (a)	Percentage of urban population being provided drinking water supply as on 31.03.2016.	%	6.1	Proportion of population using safely managed /improved drinking water services
22 (b)	Percentage of urban population being provided drinking water supply as on 31.03.2017.	%	6.1	Proportion of population using safely managed /improved drinking water services
23 (a)	Total estimated generation of waste water in the urban areas as on 31.03.2016.	Million lit/Day	6.3	
23 (b)	Capacity installed in the State to treat the urban waste-water as a percentage of the total estimated waste water generated in the urban areas of the State as on 31.03.2016.	%	6.3	
24 (a)	Percentage waste-water treated during financial year 2015-16.	%	6.3	
24 (b)	Percentage waste-water treated during financial year 2016-17.	%	6.3	
25	Whether the State has enacted any legislation for protection of waterbodies and water supply channels and prevention of encroachment into/on them?	Yes/ No	6.6	
26	Whether the State has any framework for rainwater harvesting in public and private buildings?	Yes/ No	6.5	Percentage of River basins brought under Integrated Water Resource Management
27 (a)	Percentage of households being provided water supply and charged for water in urban areas as on 31.03.2016.	%	6.1	Proportion of population using an improved drinking water by source
27 (b)	Percentage of households being provided water supply and charged for water in urban areas as on 31.03.2017.	%	6.1	Proportion of population using an improved drinking water by source
28 (a)	Does the State have a separate integrated data centre for water resources?	Yes/ No		
28 (b)	Whether the data is being updated on the integrated data centre on a regular basis?	Yes/ No		

TERI Discussion Papers

Water Resources Division

Title	Authors	Year
Faecal Sludge Management in Urban India: Policies, Practices and Possibilities	Dr S K Sarkar and Dr Girija Bharat	2016
Perspectives on a Water Resource Policy for India	S Vijay Kumar and Dr Girija Bharat	2014

Other Discussion Papers published by TERI include:

Title	Authors	Division	Year
Restructuring the Environmental Governance Architecture for India	S Vijay Kumar and Nidhi Srivastava	Resource Efficiency and Governance	2017
Why we need a New Mineral Exploration Policy for National Mineral Security	S Vijay Kumar and Swati Ganeshan	Resource Efficiency and Governance	2017
Suggestions for an Appropriate Environmental Governance Architecture for India	S Vijay Kumar	Resource Efficiency and Governance	2016
Modelling Urban Carrying Capacity and Measuring Quality of Life using System Dynamics	Mihir Mathur and Kabir Sharma	Earth Science and Climate Change	2016
Moving Forward with a World-class Mineral Policy for National Mineral Security	S Vijay Kumar and Swati Ganeshan	Resource Efficiency and Governance	2015
Organic Agriculture: An option for fostering sustainable and inclusive agriculture development in India	Dr Shilpanjali Deshpande Sarma	Integrated Policy analysis	2015
The Mineral Development and Regulation Framework in India	S Vijay Kumar and Nidhi Srivastava	Resource Efficiency and Governance	2015
What would India need for moving to a 100% renewable energy scenario by 2050?	Ritu Mathur, Atul Kumar, Saptarshi Das, Ilika Mohan, Manish Kumar Shrivastava, and Leena Srivastava	Integrated Policy analysis	2014

TERI publications, including Discussion Papers, can be accessed at: <http://www.teriin.org/publications>

About TERI

The Energy and Resources Institute (TERI) is an independent non-profit organization, with capabilities in research, policy, consultancy and implementation. TERI has multi-disciplinary expertise in the areas of energy, environment, climate change, resources, and sustainability.

With the vision of creating innovative solutions for a sustainable future, TERI's mission is to usher in transitions to a cleaner and more sustainable future through the conservation and efficient use of the earth's resources and develop innovative ways of minimizing waste and reusing resources.

TERI's work across sectors is focused on:

- Promoting efficient use of resources across sectors
- Increasing access and uptake of sustainable practices
- Reducing the adverse impact on environment and climate

TERI works with a diverse range of stakeholders across governments, both at the National and State levels, international agencies, and civil society organizations to help deliver research-based transformative solutions. Headquartered in New Delhi, TERI has regional centres and campuses in Bengaluru, Gurugram, Guwahati, Mumbai, Nainital, and Panaji.

Currently, TERI's work is structured around seven sectors namely:

- Agriculture
- Climate
- Energy
- Environment
- Habitat
- Health and Nutrition
- Resources

TERI brings out Discussion Papers on key contemporary issues in these sectors with multi-disciplinary and multi-sectoral implications for use by policy makers, legislators, researchers and practitioners. Discussion Papers are recommended for publication by a sub-committee of Distinguished Fellows at TERI. This Discussion Paper has been brought out by the Water Resources Division as a part of TERI's work on environment. A list of Discussion Papers of the Water Resources Division and other divisions is given overleaf.

For more information, please visit: <http://www.teriin.org/>

