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INDIA: ATAL BHUJAL YOJANA (ABHY) - National Groundwater  
Management Improvement Program  
(Program-for-Results)

Environmental and Social Systems Assessment Report

FINAL DRAFT

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Prepared by

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## Contents

|   |           |
|---|-----------|
| <b>EXECUTIVE SUMMARY .....</b>  | <b>1</b>  |
| <b>1. Introduction .....</b>  | <b>15</b> |
| 1.1 Background .....  | 15        |
| 1.2 National Groundwater Management Improvement Program (NGMIP).....                | 16        |
| 1.3 Purpose of Environmental and Social Systems Assessment (ESSA).....              | 17        |
| <b>2. Program Description .....</b>   | <b>20</b> |
| 2.1 Groundwater Management and Regulation Program .....                             | 20        |
| 2.1.1 National Program on Aquifer Mapping and Management .....                      | 21        |
| 2.1.2 Participatory Groundwater Management .....                                    | 22        |
| 2.1.3 Implementation Progress of GWMR.....  | 22        |
| 2.2 National Groundwater Management Improvement Program.....                        | 22        |
| 2.2.1 Geographic Scope of the Program .....   | 23        |
| 2.2.2 Example Civil Works and Investments Under the Program .....                   | 24        |
| 2.2.3 Implementation Arrangements .....   | 25        |
| 2.2.4 Independent Verification Agency .....   | 26        |
| <b>3. Program Environmental and Social Management Systems .....</b>                 | <b>27</b> |
| 3.1 Institutional Responsibilities .....  | 27        |
| 3.1.1 National-level Institutions.....  | 27        |
| 3.1.2 State-level Institutions .....  | 29        |
| 3.2 Legal and Regulatory Framework Applicable to the Program .....                  | 31        |
| 3.2.1 National-level Legal and Regulatory Framework.....                            | 31        |
| 3.2.2 State-level Legal and Regulatory Framework .....                              | 33        |
| 3.3 Relevant National Programs on Groundwater Management.....                       | 35        |
| 3.4 Relevant State-level Programs on Groundwater Management .....                   | 37        |
| 3.5 Decentralised/Community Groundwater Management in India.....                    | 40        |
| <b>4. Program Capacity and Performance Assessment .....</b>                         | <b>42</b> |
| 4.1 National-level Assessment .....   | 42        |
| 4.1.1 Adequacy of Legislative Framework .....                                       | 42        |
| 4.1.2 Effectiveness of Administrative and Organisational Environment .....          | 43        |
| 4.1.3 Performance in Implementation and Support in Groundwater Programs.....        | 43        |
| 4.1.4 Institutional Capacities to Address Environment and Social Issues.....        | 43        |
| 4.2 State-level Assessment .....  | 45        |
| 4.2.1 Adequacy of Legislative Framework for Groundwater Regulation and Management . | 45        |
| 4.2.2 Adequacy of Legislative Framework for Environmental Assessment.....           | 46        |
| 4.2.2 Adequacy of Legislative Framework for Social Safeguards.....                  | 46        |
| 4.2.3 Effectiveness of Administrative and Organisational Environment .....          | 47        |
| 4.2.4 Effectiveness in Inter-departmental Coordination .....                        | 47        |
| 4.2.5 Performance in Implementation and Support in Groundwater Management.....      | 47        |
| 4.2.5 Institutional Capacities to Address Environment and Social Issues.....        | 49        |
| <b>5. Assessment of Program System .....</b>  | <b>51</b> |
| 5.1 Potential Environmental Impacts, Risks, and Benefits of the Program .....       | 51        |
| 5.1.1 Potential Environmental Benefits .....  | 51        |
| 5.1.2 Potential Environmental Impacts and Risks.....                                | 52        |
| 5.2 Potential Social Impacts, Risks, and Benefits of the Program.....               | 55        |
| 5.2.1 Potential Social Benefits .....   | 56        |
| 5.2.2 Potential Social Risks.....   | 57        |
| 5.3 Program Consistency with PforR Core Principles.....                             | 58        |
| 5.3.1 General Principle of Assessment and Management .....                          | 58        |
| <b>6. Recommendations.....</b>  | <b>62</b> |

|           |  |           |
|-----------|--|-----------|
| 6.1       | Environmental Recommendations .....                  | 62        |
| 6.2       | Social Recommendations.....                          | 64        |
| <b>7.</b> | <b>Annexes .....</b>                                 | <b>68</b> |
| 7.1       | Annex 1: State and District Selection Criteria ..... | 68        |
| 7.2       | Annex 2: Detailed Note on Consultations.....         | 70        |

### Tables

|          |   |    |
|----------|---|----|
| Table 1: | Results Areas and DLIs of NGMIP.....  | 1  |
| Table 2: | Indicative Breakdown of Program Expenditures at Central and State Levels (Crore of Indian Rupees) ..... | 4  |
| Table 3: | NGMIP Environmental and Social Risks - Selected Institutional Perspective.....                          | 6  |
| Table 4: | India NGMIP Environmental and Social Risk - Investment Perspective.....                                 | 9  |
| Table 5: | DLIs and Example Investments.....   | 24 |
| Table 6: | National- and State-level Institutions and Their Role in Groundwater Management.....                    | 27 |
| Table 7: | State-level Agencies and Their Role in Groundwater Management.....                                      | 30 |
| Table 8: | Implementation Plan for Environment Actions .....   | 64 |
| Table 9: | Implementation Plan for Social Actions .....  | 66 |

### Figures

|           |  |   |
|-----------|--|---|
| Figure 1: | Selected Institutions and Investments Current Groundwater Program..... | 4 |
| Figure 2: | Planned Investments to be Supported by NGMIP .....                     | 5 |

## Acronyms

|             |  |
|-------------|--|
| ABHY        | Atal Bhujal Yojana (also referred to interchangeably in this document  |
| AMP         | as National Groundwater Management Improvement Program, or NGMIP)  |
|             | Aquifer Management Plan  |
| APFAMGS     | Andhra Pradesh Farmer-Managed Groundwater Systems Project  |
| BP          | Bank Procedure (World Bank)  |
| CGWA        | Central Ground Water Authority   |
| CGWB        | Central Ground Water Board   |
| CPCB        | Central Pollution Control Board  |
| EIA         | Environmental Impact Assessment  |
| EMP         | Environmental Management Plan  |
| ESSA        | Environmental and Social Systems Assessment  |
| EHS         | Environment, Health and Safety   |
| GoI         | Government of India  |
| GP          | Gram Panchayat   |
| GW          | Ground Water   |
| GWMR        | Groundwater Management and Regulation  |
| IVA         | Independent Verification Agency  |
| IWRM        | Integrated Water Resources Monument  |
| MGNREGS     | Mahatma Gandhi National Rural Employment Guarantee Scheme  |
| MOA         | Ministry of Agriculture  |
| MOEF        | Ministry of Environment and Forests  |
| MORD        | Ministry of Rural Development  |
| MOWR, RD&GR | Ministry of Water Resources, River Development and Ganga Rejuvenation  |
| NAQUIM      | National Program on Aquifer Mapping and Management   |
| NGMIP       | National Groundwater Management Improvement Program (also referred to interchangeably in this document as Atal Bhujal Yojana, or ABHY) |
| O&M         | Operations and Management  |
| OP          | Operational Policy (World Bank)  |
| PAP         | Program Action Plan  |
| PDO         | Program Development Objective  |
| PESA        | Panchayat Extension to Scheduled Area  |
| PGWM        | Participatory Groundwater Management   |
| PIA         | Project Implementing Agency  |
| PMKSY       | Pradhan Mantri Krishi Sinchayee Yojana   |
| PMU         | Project Management Unit  |
| PRI         | Panchayati Raj Institutes  |
| PSU         | Project Support Unit   |
| RTI         | Right to Information   |

# EXECUTIVE SUMMARY

## Introduction and Purpose

1. The Government of India has requested World Bank support to help improve groundwater management in the country given the significance of the resource for meeting societal needs and development objectives, and the growing threats to resource availability and quality. The proposed Atal BHujal Yojana (ABHY) - National Groundwater Management Improvement Program (NGMIP)<sup>1</sup> will build on current national and State efforts targeted at the long term goal of arresting resource decline. Considering the complexities of reaching this goal, the Program Development Objective (PDO) is to “improve the management of groundwater resources in selected States.” This is a realistic objective for the six-year Program, and will be achieved by enhancing the enabling framework for action, and implementing appropriate investments and management actions.

2. To enhance the innovative nature of the Program, a Program-for-Results (PforR) Financing has been proposed which provides for disbursement on the basis of the achievement of key results specified in disbursement-linked indicators (DLIs). The two results areas and seven DLIs envisaged for the NGMIP are shown in Table 1.

**Table 1: Results Areas and DLIs of NGMIP**

| Results Area  | DLI   |
|---|---|
| Improved planning and implementation of groundwater management interventions                  | DLI#1: Arrest in the rate of decline of groundwater levels                |
|   | DLI#2: Community-led Water Security Plans prepared                        |
|   | DLI#3: Public financing allocated to approved Water Security Plans        |
|   | DLI#4: Area with reduction in water consumption                           |
| Strengthened institutional framework and effective groundwater data monitoring and disclosure | DLI#5: Improved groundwater monitoring and disclosure of groundwater data |

3. Seven States (Gujarat, Maharashtra, Haryana, Karnataka, Rajasthan, Uttar Pradesh and Madhya Pradesh),<sup>2</sup> will participate in the Program and are referred to as ‘participating States’. The participating States have some of the most heavily exploited groundwater areas in India, and confront serious availability and quality problems that are expected to intensify in the future and might, unless addressed, be irreversible. These States represent 25 percent of the total number of over-exploited, critical and semi-critical Blocks in India, cover the two major types of groundwater systems (alluvial and hard rock aquifers), and span a broad spectrum of legal and regulatory instruments, institutional readiness, and experience. Some States (such as Gujarat) are advancing towards groundwater legislation and have relatively strong groundwater institutions, whereas other States have not made as much progress in these areas. Some States have focused purely on supply-side measures for improving the status of groundwater resources (especially artificial recharge), whereas others are beginning to focus on demand-side measures.

<sup>1</sup> This document uses the program names and their acronyms, ABHY and NGMIP, interchangeably.

<sup>2</sup> Participation of other states will be decided by MoWR, RD & GR based on States’ commitment to reform, criticality of groundwater issues, presence of adequate legal-policy regulatory framework, establishment and readiness of appropriate and cross sectoral institutional mechanisms to achieve the Program objectives.

4. The World Bank PforR Policy adopted by the Board in July 2015 governs the preparation of the NGMIP,<sup>3</sup> and requires the Bank to assess the Program’s “strategic relevance, technical soundness, expenditure analysis, economic rationale, results framework, fiduciary and environmental and social systems and risks.” Separate assessments are required for a number of these topics, with all of these informing both an overall integrated risk assessment and, as necessary, any relevant actions needed during final Program preparation and implementation to enhance Program system performance.

5. This Environmental and Social Systems Assessment (ESSA) is prepared in response to the PforR Policy, and considers relevant factors, such as: (i) promoting environmental and social sustainability, (ii) avoiding, minimizing or mitigating adverse impacts on the environment, natural habitats and physical cultural resources; (iii) protecting public and worker safety; (iv) managing land acquisition and loss of access to natural resources; (v) the cultural appropriateness and equity of benefits; and (vi) avoiding social conflicts.

6. The ESSA was prepared by an experienced team of World Bank staff and expert consultants, and reflects literature reviews, discussions with officials, and consultations and interviews with affected stakeholders in the Program States. The draft version of this document was disclosed on the MoWR, RD&GR website on May 23, 2016 to receive inputs and comments. The document was also disclosed in World Bank Infoshop on June 1, 2016. A national level stakeholder consultation workshop was held on May 30, 2016 following this disclosure. Further, State level consultations were also held in Haryana, Rajasthan, and Karnataka between 8 to 15 September 2016 for sharing the findings of ESSA. This final version of ESSA is to be disclosed on MoWR, RD &GR and State websites as well as WB infoshop.

7. This ESSA presents the World Bank’s summary views of Program benefits, impacts and risks – both to meet Bank PforR policy requirements and guide further Program preparation. It also reflects comments received during the formal disclosure and consultation period that precedes project appraisal.

### **Framing the Program for Environmental and Social Assessment**

8. As presented in detail in Chapters 3 and 4 of this report, groundwater management in India is an extremely complex topic that reflects an inordinately wide array of laws, institutions and policies at the national and State levels. There is no one institution, law, or coordinating body that addresses either groundwater availability or quality let alone the critical intersections. Some sector policies support good management (for example, the Model Bill to Regulate and Control the Development and Management of Ground Water; 2005), while other policies targeted to different societal needs appear to detract from resource sustainability (for example, low or no cost power to groundwater irrigators to bolster farmer income). Some supply-side investments are of clear relevance and have already been made a government priority (for example, the Master Plan for increasing groundwater recharge across the country), some are also clearly relevant but perhaps less well-funded (for example, bolstering the network of groundwater monitoring stations with improved technology and access), and some hold great promise but are hindered by policy constraints (for example, widespread use of drip irrigation stymied by low water/energy prices). With groundwater management essentially devolved to the State and even local level, no one system of improvement can be effective nationwide.

9. It would be impossible for the NGMIP to address all needs and issues. Instead, the Program targets support through one of the leading national institutions – the Central Ground Water Board (CGWB) within the MoWR, RD&GR, and the participating States that are amenable to reversing

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<sup>3</sup> The PforR home page is: <http://www.worldbank.org/en/programs/program-for-results-financing>

declining groundwater levels and quality.<sup>4</sup> By establishing the requisite enabling framework (institutions and information systems) and promoting new and innovative approaches in the planning, design and implementation of investments and management actions to address groundwater degradation and depletion, the NGMIP will set the stage for wider reform and broader impact in the longer run.

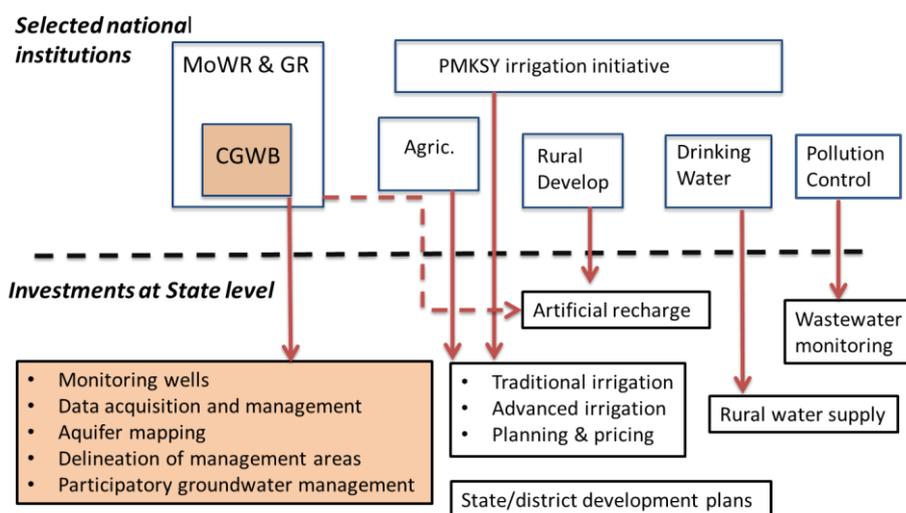
10. As the PforR policy requires the Bank to look at the environmental and social implications of the Program, it is absolutely critical to frame the scope of assessment in a way that is commensurate with the financing envelope per results area. Figures 1 and 2 provide an illustration of how the NGMIP is framed, and builds on, current institutions and investments. The CGWB is currently implementing a scheme for Groundwater Management and Regulation (GWMR); India's first attempt to support groundwater management at national level through the CGWB and the implementation capacity of States in local groundwater resource management. The Scheme comprises a National Program on Aquifer Mapping and Management (NAQUIM), efforts to advance participatory groundwater management (PGWM), funding for technology upgrades, and groundwater regime monitoring, along with a number of other technical assistance and outreach products. With the aim of better coordinating across these multi-agency initiatives and invigorating participatory groundwater management, MoWR, RD&GR has recently proposed an expansion of the existing GWMR Scheme – the National Groundwater Management Improvement Scheme (NGMIS). CGWB also prepared the Master Plan for Ground Water Recharge in 2013, which provides recommendations on feasible areas for recharge by District, type of structures and other factors.

11. The GWMR largely provides technical information and tools for assisting better groundwater management, with the necessary regulatory/financial incentives to foster sustainable change, primarily at the States and lower levels of government. A first step towards the development of Aquifer Management Plans (AMPs) under the NAQUIM is aquifer mapping and modeling of different resource development scenarios. The CGWB has produced reports on different pilots to date in the NGMIP States, covering two Districts in Rajasthan and one each in Maharashtra, Bihar and Karnataka. While these provide considerable information on the physical and hydrologic conditions, the emphasis is primarily on supply-side interventions with a focus on artificial recharge solutions. Only one of the pilot (Tumkur District) has any substantive recommendations on the demand-side solutions, and even in this case the emphasis is only on efficient irrigation, with merely passing reference to price controls. It is helpful that one pilot emphasizes the benefits of upscaling traditional recharge mechanisms, though the scenarios presented appear to be very limited to one or two supply-side options (for example, no change in recharge versus a doubling). It is not clear how the NAQUIM will actually spur on the drivers needed to address quality and quantity management. As depicted in the shaded box of Figure 1, the CGWB does provide the tools to help this State in this regard, but other national institutions and their State-level counterparts are responsible for investments – be they supply oriented such as constructing recharge structures and irrigation efficiency improvements, or demand-side investments such as pricing incentives that stem from development planning.

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<sup>4</sup> Implementation arrangements are being defined as part of project preparation since some investments through the NGMIP will be made through administrative structures over and above those now in place for the current Program.

**Figure 1: Selected Institutions and Investments Current Groundwater Program**



12. As shown in Table 2, the NGMIP will support investments ranging from monitoring systems to small scale groundwater recharge structures, to irrigation efficiency enhancements, to institutional strengthening, and capacity-building. These investments focus on both supply side measures for improving the groundwater levels through recharge structures and demand side measures for reducing the groundwater use primarily through promoting efficient water usage.

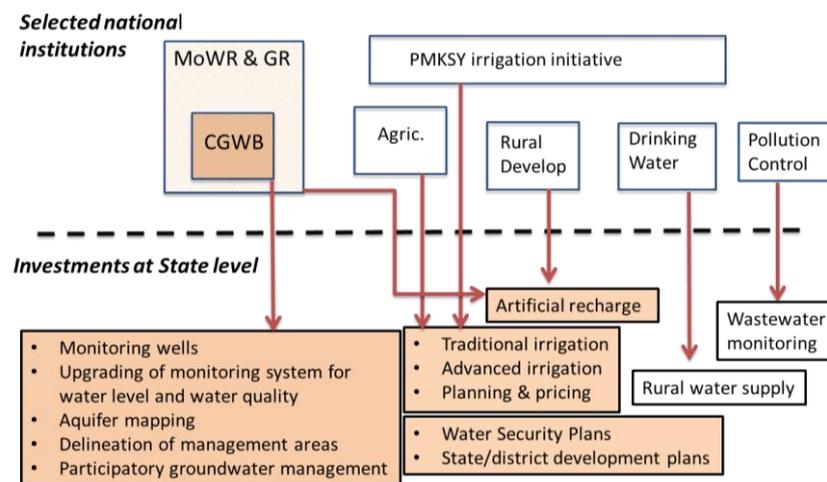
**Table 2: Indicative Breakdown of Program Expenditures at State and District Levels for each DLI (US\$, millions)**

| DLI   | Total Allocation | State         | District   | Gram Panchayat (GP) |
|---|------------------|---------------|------------|---------------------|
| DLI#1: Arrest in the decline of groundwater levels                        | 50               | —             | 25         | 25                  |
| DLI#2: Community-led Water Security Plans prepared                        | 75               | 5             | 10         | 60                  |
| DLI#3: Public financing allocated to approved Water Security Plans        | 100              | 30            | 50         | 20                  |
| DLI#4: Area with reduction in water consumption                           | 173.875          | 23.875        | 60         | 90                  |
| DLI#5: Improved groundwater monitoring and disclosure of groundwater data | 50               | 20            | 30         | —                   |
| <b>Total</b>  | <b>448.875</b>   | <b>78.875</b> | <b>175</b> | <b>195</b>          |
| Percentage of allocation  |                  | 17.57         | 39         | 43                  |

13. As part of project preparation, the seven participating States affirmed that the ABHY-NGMIP is an ideal vehicle for enhancing the expanded GWMR Scheme by establishing stronger linkages with States to incentivize behavioral changes. While there are a number of activities underway to improve the condition of groundwater resources in participating States, these are largely supply-side focused, with management aspects merely as relatively generic recommendations, rather than governmental actions extending all the way to the village level. Hence they are less effective than they could be and limiting the possibility of scale-up for broader impact. The overarching enhanced framework for informing and guiding actions that is provided by the NGMIP will clearly be of benefit. As depicted in the wider range of shaded boxes in Figure 2, the NGMIP will support investments initiated by the GWMR, but linked through the development of Water Security Plans (participatory water

management plans at the Gram Panchayat level), which can be the integrating element of State efforts to reverse falling groundwater levels and reduce threats to water quality.

**Figure 2: Planned Investments to be Supported by NGMIP**



14. The NGMIP will enhance positive developments already in play at the State level. Some examples of State groundwater acts and rules have made progress at showing the benefits of greater regulation of groundwater extraction. Important linkages to sector policies governing multiple uses of water – such as for drinking, irrigation, and industry – are becoming clearer to some States. The NGMIP States each have more than two decades of strengthening a community-centered legal framework promoting decentralized and inclusive governance. The established presence of strong Panchayats and Municipalities to ensure community interests - with functions devolved at various levels on different aspects of water-drinking and irrigation – bodes well for related institution strengthening and Water Security planning under the NGMIP. In addition, States have shown they can be effective at targeting socially vulnerable groups (for example, small land-holdings) under agriculture, employment, irrigation, drinking water and sanitation schemes.

15. Implementation arrangements and the DLI verification processes are relevant to environmental and social issues. The existing institutional arrangements governing the management of groundwater resources vary by State, with some States having a relatively well-established institutional structure (for example, existing mechanisms for cross-sectoral coordination, as Rajasthan’s River Basin Authority, and strong groundwater departments as in Gujarat), while others exhibit substantial weaknesses. In all cases, the linkages from Central to State to local levels remain relatively limited and will need to be strengthened in order to ensure that the expected results of the proposed Operation are realized. Technical assistance from national to State entities will occur in both results areas. For Results Area 1, the focus would be to build the capacity and know-how at the local level (Gram Panchayats) to prepare the participatory groundwater management plans (Water Security Plans) and effectively implement them. For Results Area 2, it would focus on enhancing the enabling framework for groundwater management at the Central level and in the participating States including strengthening of groundwater departments, develop groundwater models, advise on regulatory processes, and upgrade monitoring systems for both groundwater quality and quantity. Capacity building on environmental and social aspects will be woven into these efforts.

16. State level steering committees and project implement agencies will be constituted for Program implementation. At the national level, National Project Monitoring Unit (NPMU) has been established, which will receive funds directly from MoWR, RD&GR and be responsible for the overall Program implementation at the Central level. Independent Verification Agencies (IVAs) will be chosen to annually verify DLIs, showing progress made by each of the States and by the CGWB. While some

of the DLIs will be verified by examining official records, physical infrastructure and satellite imagery, others will be verified through random sampling. State-level Steering Committees for Groundwater Management, headed by the Chief Secretary of the State, and a State Level Program Implementation Agency (PIA) will be set up. The responsibility for Program implementation at Panchayat Raj level (District, Block and Gram Panchayat) will be held with the existing institutions. Panchayati Raj Institutions are a critical link as they are one of the key agencies through which many national Programs such as MGNREGS, PMKSY, and so on, are implemented at the field. To support implementation by Panchayati Raj Institutions, the NPMU will contract National Technical Support Agency and the States shall contract State Technical Support Agencies (STSAs), with the aim of building capacity in participatory groundwater management.

## Environmental and Social Systems Risk and Mitigating Actions

17. This ESSA looks at risk from two general perspectives – institutional and investment-specific. An institutionally-focused perspective is needed since, as noted earlier, the NGMIP augments the current CGWB-led efforts on groundwater management and regulation by supporting a wider array of actions at the State level – actions supported in part by national institutions beyond the purview or coordinating efforts of the CGWB. An investment-focused perspective is needed since as depicted in Figure 2, more than one institutional source of funding will be used for similar categories of investments such as artificial recharge structures and improved irrigation system technology.

18. This ESSA provides a consistent approach to: (i) describing the relevant environmental and social systems in place for the major and supporting national or State institutions, (ii) providing a perspective on current capabilities and performance, (iii) identifying major and minor environmental and social effects of the current and NGMIP-enhanced Program, and (iv) recommending mitigating actions to reduce risks. Observations on capabilities and performance consider strengths and benefits, gaps or apparent weaknesses, and opportunities for improvement. Recommendations on mitigating actions inherently acknowledge that only some of these can be addressed directly by the NGMIP.

19. An integrative institutional perspective is provided in Table 3, focusing on three of the main Programs that will be enhanced through the NGMIP at the national level and through State implementation. These three are the afore-mentioned GWMR that represents the bulk of CGWB effort on groundwater management, the Master Plan for Artificial Recharge which lays out detailed investment plans on this topic by State and District (funding for which comes from multiple sources), and the 2005 Model Bill to regulate and control the development and management of groundwater, which provides the template for the State governments to regulate and control the development of groundwater resources in the notified overexploited Blocks in the respective States.

**Table 3: NGMIP Environmental and Social Risks - Selected<sup>5</sup> Institutional Perspective**

| Current Program Element                                 | Status Implications            | NGMIP focus & Result Area Link                                   | Overall Risk | NGMIP Recommended Mitigating Actions                                |
|---|--------------------------------|--|--------------|---|
| Scheme for Groundwater Management and Regulation (GWMR) |                                |  |              |   |
| 3D Mapping & characterization of aquifers               | Active Program; low risks from | Increase the number of monitoring stations, comprehensiveness of | Low          | Establish environmental and social standards for minor civil works. |

<sup>5</sup> This list covers three of the critical Program elements that will be enhanced through the NGMIP. It is not meant to be a comprehensive list and analysis of all related major and minor Programs that have a bearing on, or are influenced by, groundwater availability and quality matters.

| Current Program Element  | Status Implications   | NGMIP focus & Result Area Link  | Overall Risk            | NGMIP Recommended Mitigating Actions   |
|--|---|---|-------------------------|--|
| Technological upgrade of monitoring systems  | installation of new monitoring stations (construction-related )   | assessment and overall Program effectiveness. Increase # trained personnel in key positions. (Result Area2)   |                         |  |
| Develop aquifer management plans (AMP)   | Limited progress to date; limited modality for public participation.  | Strengthen attention to broader and more comprehensive GP Water Security Plans (Result Area 1)  | Low to Moderate         | N/A as Water Security Plans directly reduce risk and increase public participation.  |
| Implement AMPs through regulatory and non-regulatory means   | Some progress to date in a few States on regulatory approaches despite fundamental gaps in National and State law and policy; equity and access questions. Some notable successes on PGWM at pilot scale. | Provide significant support for progressive States to take important steps at improving groundwater management and reverse decline in groundwater levels. (Result Areas 1 and 2).                       | Moderate to Substantial | Set of recommended studies and actions to improve access, equity, community participation and decision-making at the appropriate level. Build on successful PGWM pilots in India   |
| Advance Participatory Groundwater Management   |   |   |                         |  |
| <b>Master Plan for Artificial Recharge to Ground Water in India</b>  |   |   |                         |  |
| Increase groundwater supply via small scale artificial recharge structures and rainwater harvesting <sup>6</sup> | Active Program with national and linked State funding. Environmental and social screening weak though more of a concern at cumulative level given small-scale structures.                                 | State-by-State listing in 2013 provides candidate recharge structures for support under the NGMIP (DLI #1) with potential for Master Plan to be integrated into GP Water Security Plans (Result Area 1) | Substantial             | Strengthen environmental screening (including studies on cumulative impacts on downstream river flows and river morphology) and management/maintenance of structures; improve social management processes through better public participation and accountability ; State-specific studies. |
| <b>Model Bill to Regulate and Control the Development and Management of Ground Water, 2005</b>                   |   |   |                         |  |
| Registration of existing users. Regulate and control the   | Only Maharashtra and Karnataka have   | Provide support to other participating States (Haryana, Rajasthan, Gujarat and Madhya   | Substantial             | Community based management for enforcement of the regulation or limiting the   |

<sup>6</sup>Includes numerous categories in the 2013 CGWB Master Plan and 2008 guidelines of the Bureau of Indian Standards; some structures may have multiple names (e.g. farm ponds *versus* percolation ponds).

| Current Program Element   | Status Implications   | NGMIP focus & Result Area Link   | Overall Risk | NGMIP Recommended Mitigating Actions                 |
|---|---|--|--------------|--|
| development and management of groundwater in notified over exploited Blocks (control drilling of new water wells and pumping from existing wells) | developed and enacted these regulations. Enforcing these regulations is challenging due to presence of millions of wells in each State. | Pradesh) to develop and enact similar groundwater regulations (Result Area 2). |              | scope of regulation to only few endangered aquifers. |

20. Our institutional assessment summarized in Table 3 suggests that the NGMIP will lead to net positive benefits, and that environmental and social risks of the Program are Substantial. This does assume that progress on critical mitigating actions will be taken during project implementation. Three examples to illustrate the logic flow from analysis to recommendation are described as follows:

- The development of aquifer management plans (AMPs) and advancing of participatory groundwater management (PGWM) approaches are cornerstones of the current GWMR but there has been some progress on the first, and limited progress on the second. Contributing factors include: (i) a severe shortfall in filled professional staff positions especially at the States where vacancies exceed 50 percent of slots, (ii) a focus of the AMPs on hydrogeological mapping and other technical elements without addressing for example critical cross-sector management options, and (iii) major deficiencies in opportunities for public engagement in the planning process; especially in some States. The NGMIP is designed to address all three deficiencies (as noted in the RA/DLIs indicated in Table 1). The Water Security Plans should be more holistic than the AMP process since the former is expected to be built on the more successful pilots for ensuring effective public engagement and participatory approaches. Social risks are therefore moderate to substantial, depending on how issues of equity and access are addressed during upscaling. Direct environmental risks associated with preparation of AMPs appear to be low; attainment of the objectives of the results areas will be fostering more comprehensive quality and quantity perspectives than the current structure for aquifer management plans. Gaps might still be present even in progressive States in cases where groundwater regulations or implementing authorities are lacking, for example with regards to: (i) lack of scientifically sound and enforceable controls on well spacing for large industrial and agricultural supplies, or (ii) lack of measures to control non-point sources of agricultural pollution that might be captured from monsoon runoff contributing to recharge basins.
- Technological upgrading of monitoring systems is also central to the GWMR, and financing from the NGMIP will be of great help to increase the range and density of monitoring stations to improve decision-support systems and client responsiveness. Civil works associated with such upgrading are relatively low risk and normally restricted to a small area contiguous to the station and via access roads. Land transfer is not foreseen to take place under the Program and largely government/common land will be used for treatment or restoration. Assessment has shown that private land requirement is negligible and in cases where private land is identified for limited investments, it will generate direct and private benefits for the landholders.

- Increasing groundwater supplies through artificial recharge is the principal topic of a Master Plan prepared by the CGWB in 2013 that envisages more than 11 million new recharge structures nationwide across the States. These are generally small structures; with the highest cost per structure for check dams (up to 0.50 Rs. in crores per unit), and percolation tanks (up to 0.41 Rs in crores per unit). The remaining ten categories of structure cost one-quarter these amounts or less per unit. It is expected that these Master Plan listings at the State and then District levels will be considered for support under the NGMIP (along with other financing sources). While there are Indian technical standards for the design and siting of each type of structure, the focus is clearly on suitability for storing and subsurface percolation of monsoon and other surface water flow. These standards, along with a 3-page checklist for planning artificial recharge projects (prepared by CGWB and reportedly in limited use) do not consider environmental and social factors to any appreciable degree; for example, impact on the downstream water users. The NGMIP can also improve performance in this area.

21. Moving from the institutional perspective to the investment perspective (reflected in Table 4) highlights the moderate to substantial environmental and social risks, from enhancements under the NGMIP. With respect to the environmental risks, while most investment types present low to moderate risks, there is the risk in some settings of potentially significant cumulative impacts of small-scale recharge structures on the downstream rivers, lakes and wetlands; or from contaminated storm water runoff being used for direct groundwater recharge through injection wells. For this reason, these items have been rated as moderate to substantial.

**Table 4: India NGMIP Environmental and Social Risk - Investment Perspective**

| Investment Type by NGMIP Results Area  | Key Environmental Implications   | Key Social Implications  | Overall Risk            | NGMIP Recommended Mitigating Actions   |
|--|--|--|-------------------------|--|
| 1. Improved planning and implementation of groundwater management interventions                          |  |  |                         |  |
| GP Water Security Plans  | Supports integrated approach to water and related resources management. More favorable controls on groundwater quantity and quality require improved compliance and enforcement systems. | Build on successful PGWM pilots for enhancing participation by all stakeholders in the planning and implementation process. Ensure bolstering of social inclusion, equity, and grievance mechanisms; & cross-sector coordination | Moderate                | GP Water Security Plans focus directly on reducing risk and increasing public participation. Recommended studies and actions to improve access, equity and community participation. Build on successful PGWM pilots in India |
| a. Demand Side Interventions for control of groundwater use  |  |  |                         |  |
| Promote improved irrigation technologies (drip or sprinkler irrigation, laser land levelling, and so on) | Disposal of drip pipes after completion of their useful life. Improved irrigation efficiency will reduce the use of fertilizers and pesticides by farmers                                | Ensuring fairness and equity in access to benefits   | Moderate to substantial | Improve mechanisms for equitable sharing of project. Establish waste collection and disposal mechanism benefits and grievance redress.   |

| Investment Type by NGMIP Results Area   | Key Environmental Implications  | Key Social Implications   | Overall Risk            | NGMIP Recommended Mitigating Actions  |
|---|---|---|-------------------------|---|
| Crop choice management and diversification (promote less intensive crops like pulses and horticulture)  | Generally positive given expected amelioration of drop in groundwater level.  | Varies depending on implications for farmer incomes   | Moderate                | Links to agricultural sector incentives and technical assistance. Link to better on-farm power management.  |
| Promote conjunctive use of groundwater and surface water in canal command areas   | Positive if based on good science and water security planning process. Minor impacts from construction related works  | Positive if builds on participatory process with good capacity building to understand complexities.               | Low to moderate         | Ensure options are included in water security planning process. Establish environmental and social standards for minor civil works and review arrangements after the end of first year. |
| Promote treated municipal waste water for irrigation and construction use   | Health impacts on community if waste water is not adequately treated.   | Ensuring fairness and equity in access to benefits  | Substantial             | Treated waste water will comply with the Government of India standards for effluent quality for irrigation purposes   |
| Managing energy and irrigation nexus (provide quality power supply when needed through separate feeders, high voltage distribution lines, solar pumps, and so on) | Health and safety risks associated with high voltage transmission lines; recycling of pumping machinery   | Impact on poor farmers who depend on informal water markets<br>Ensuring fairness and equity in access to benefits | Moderate                | Improve mechanisms for equitable sharing of project benefits and grievance redress. Establish health and safety guidelines  |
| <b>b. Supply Side Interventions for improvement of groundwater recharge</b>   |   |   |                         |   |
| New small-scale surface artificial recharge structures <sup>7</sup> on streams (check dams, percolation tanks, gabions)   | Low risk for most individual investments (however this depend on the location and design) but cumulative impacts in a concentrated area could pose a significant risk on downstream water | Ensuring fairness and equity in access to benefits, impacts on individual assets                                  | Moderate to Substantial | Establish environmental and social standards for minor civil works and review after the first year. Strengthen environmental screening and improve public participation. Environmental  |

<sup>7</sup>Examples (from the 2013 CGWB Master Plan and 2008 guidelines of the Bureau of Indian Standards) include construction and operation of surface spreading, surface recharge structures across streams with or without some storage, surface recharge with some excavation, small-scale sub-surface recharge through wells, and new storage tanks. Associated check dams are typically less than 2-3 meters high. Some structures may have multiple names (e.g. farm ponds *versus* percolation ponds).

| Investment Type by NGMIP Results Area  | Key Environmental Implications   | Key Social Implications   | Overall Risk            | NGMIP Recommended Mitigating Actions   |
|--|--|---|-------------------------|--|
|  | releases and morphology. Risk of failure of structures.  |   |                         | measures for operation and maintenance<br>Carry out and update cumulative impact assessment studies annually.<br>Regular inspection and maintenance of structures              |
| Subsurface hydraulic controls (subsurface dykes, gully plugs)                  | Impacts from minor civil works   | Ensuring fairness and equity in access to benefits              | Low to moderate         | Establish environmental and social standards for minor civil works. Strengthen environmental screening, structure management and maintenance and improve public participation. |
| Subsurface recharge through dug wells and injection wells                      | Groundwater pollution if the source water is contaminated with fertilizers and pesticides (agriculture and urban runoff) | Health concerns if these wells are used for drinking purpose    | Moderate to Substantial | Recharge and groundwater quality monitoring  |
| Promote farm ponds and desilting of existing village water bodies and tanks    | Low risk for construction related impacts  | Ensuring fairness and equity in access to benefits <sup>8</sup> | Low to moderate         | Establish environmental and social standards for minor civil works.  |
| <b>c. Groundwater quality improvement interventions</b>                        |  |   |                         |  |
| Improved groundwater quality data collection, and control industrial pollution | Improvement of groundwater quality   | Improvement in water quality                                    | Low to moderate         | Coordination with State pollution control boards.  |
| Supply domestic drinking water filers  | Health benefits. Lack of proper disposal facilities.   | Ensuring fairness and equity in access to benefits              | Low                     | Campaigns on efficient use and regular replacement   |
| <b>d. Other interventions</b>  |  |   |                         |  |
| Model bill for regulating well drilling and pumping                            | Generally positive as means to understand and control resource   | Increased bureaucracy could disproportionately impact less      | Moderate                | Examine international good practices in regulations and  |

<sup>8</sup> To “ensure fairness” in the entries of this table means taking into account successful pilot activities in participatory groundwater management and other Bank and Indian experiences.

| Investment Type by NGMIP Results Area   | Key Environmental Implications   | Key Social Implications                            | Overall Risk    | NGMIP Recommended Mitigating Actions   |
|---|--|--|-----------------|--|
|   | use, but implementation is challenging due to presence of millions of wells  | educated, poorer rural residents and farmers.      |                 | licensing schemes to adopt provisions in the Programs that address noted gaps and weaknesses. Community based management for enforcing regulations |
| <b>2. Strengthened institutional framework and effective groundwater data monitoring and disclosure</b> |  |  |                 |  |
| Upgrading of existing, and addition of new groundwater monitoring stations                              | Low risk for construction related impacts  | Ensure all users benefit from enhanced information | Low             | Establish environmental and social standards for minor civil works and review of processes after the first year.                                   |
| Upgrading and additions to data systems, decision support tools, and so on.                             |  |  | Low to moderate |  |
| Filling significant % of posted professional and support jobs   | Overwhelmingly positive as current vacancy levels are inordinately high, with consequent major deficiencies in meeting current and projected future Program objectives<br>Numerous Indian institutions charged with capacity building. |  | Moderate        | Filling of all vacant positions. Environmental and social staff in implementing agencies. E&S related training and capacity building activities    |
| Training and capacity building for current and new staff  |  |  |                 |  |

22. Significance of OP 7.50 (Projects on International Waterways in Operation Context). Some of the Program activities relate to tributaries or watersheds of the Indus River and Ganges River (in Haryana and Rajasthan); and some of the activities are also relate to tributaries of rivers flowing into the Rann of Kutch and the Indus River Palin Aquifer (AS78). All of these are international waterways under the Bank's Operational Policy 7.50 Projects on International Waterways. The Program interventions may cause a small reduction in monsoon season flow in the upper reaches of these rivers. They may also cause minor reductions in flood peaks or volumes downstream, however, the monsoon flow reductions in the lower reaches of downstream riparian countries are expected to be so small as to be indiscernible. A notification was issued to all riparian countries (Afghanistan, Bangladesh, China, Nepal and Pakistan) in conformance with OP 7.50.

### Recommendations for Mitigating Program Environmental and Social Risk

23. A number of mitigating actions have been presented in the earlier part of the Executive Summary, as they have been throughout the main text of this ESSA. A summary of key recommendations which could be referenced in the Program Action Plan include the following:

- Some potential investment categories that can contribute to better groundwater management which will be excluded from NGMIP support includes: (i) construction of major dams and new large scale irrigation systems, and (ii) major industrial wastewater collection, treatment and recharge systems through injection. These would fall under paragraph 9 of the PforR Policy as: "Activities that are judged to be likely to have

significant adverse impacts that are sensitive, diverse, or unprecedented on the environment and/or affected peoples are not eligible for the Financing and are excluded from the Program.”

- Procedures and associated training/capacity building for periodic Cumulative Impact Assessment at the State level of all recharge interventions in each State to identify, assess, and minimize to acceptable levels any potential cumulative impacts on the downstream river flows and river morphology caused by multiple proposed and existing recharge structures in the same watershed.
- Environmental and social staff numbers and competencies in National and State Level Project Management Units and within key implementing agencies.
- Environmental and social screening procedures for helping implementers identify sites and technologies for artificial recharge to avoid/mitigate site-specific impacts.
- Environmental management procedures for operation and maintenance of Program interventions.
- Adequate budget and arrangements for maintenance of recharge structures (for example, repair of cracks in check dams, removing of siltation from check dams and percolation tanks, cleaning of filter material in the recharge shafts, and so on).
- Implement integrated sub-project scheme cycles covering technical, social and environmental aspects recognizing social and environmental processes as core principles of sustainability.
- Suggested general occupational and environmental health and safety guidelines for civil works contracts to mitigate impacts.
- Selected monitoring of recharge and receiving water where the storm water surface runoff may have elevated levels of contaminants from agriculture, urban and industrial uses.
- Staffing up and capacity building for multiple audiences on environmental and social issues related to the Program specifically on participation, accountability, grievance handling and use of appropriate community monitoring tools.
- District level grievance-redress committees or dedicated official(s) to complement State and national level ICT-based grievance management systems in order to address issues related to the Program interventions, along with procedures for analyzing, documenting and sharing results.
- Selected oversight and periodic review of land use requirements to avoid any adverse impact on people
- Support to local governments, including intensive capacity development on groundwater management issues and improving public participation, social inclusion, equity and conflict resolution.

- Encouraging demand-side management; recognizing the need for greater institutional reform and removal of conflicting incentives in a manner that can yield more substantive results.

# 1. Introduction

## 1.1 Background

1. India has extensive groundwater resources and it is the largest user of groundwater globally. India abstracts about 245 BCM of groundwater per year, which represents about 25 percent of the total global groundwater abstraction. Groundwater use helped to spur the Green revolution and currently provides 65 percent of irrigation. Over 80 percent of the rural and urban domestic water supplies in India are served by groundwater. It contributes to the base flow in rivers and wetlands and supports terrestrial vegetation. In arid and semi-arid regions, it is often the sole water supply source. Therefore, groundwater plays a crucial role in the socioeconomic development of the country.

2. However, India's groundwater resources are under threat. Intensive and unregulated pumping has caused a rapid and widespread decline in groundwater levels. Between 1950 and 2010, the number of tube wells drilled increased from 1 million to nearly 30 million, representing an unprecedented scale of development. This explosive groundwater use – the so-called 'silent revolution' – has led to extensive overdraft in several rural areas, including in the "bread basket" States of the North and the Northeast, as well as in major urban settings. Falling water tables have, in turn, led to groundwater yield reductions, pump failure in rural water-supply wells, unreliable urban water supply, salinization, land subsidence and drying of wetlands, all of which have direct consequences for the economies, livelihoods and societies that are dependent on groundwater resources. A recent assessment of selected Districts in India<sup>9</sup> shows that poverty rates are 9-10 percent higher in areas where groundwater tables are below 8 meters.

3. Deteriorating groundwater quality is also a significant and growing problem. Pollution from poor sanitation, mining, industry and agro-chemicals (pesticides and fertilizers) together with naturally occurring contaminants (arsenic, fluoride and iron) reduce 'effective' groundwater supply further. In areas with high groundwater tables, poor drainage is contributing to waterlogging, salinization and alkalinity problems, especially in the States of Uttar Pradesh, Rajasthan, Gujarat, Punjab and Haryana. Improving the quality of polluted aquifers is often prohibitively expensive and sometimes technically impossible.

4. Currently, over half of all Districts in the country show signs of groundwater depletion and/or contamination. If the current trends persist, 60 percent of the aquifers could reach a critical condition<sup>10</sup> within two decades. Climate change could exacerbate current pressures on groundwater resources, particularly if users increasingly turn to this relatively more shielded resource with changes in the reliability of surface water supplies. On the other hand, groundwater can play an important role in adapting to climate change, if it protected and managed in conjunction with surface water.

5. The status of groundwater exploitation in the country is being regularly assessed by CGWB at the Block level (sub-District level also known as taluka or mandal in some States). Out of the total

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<sup>9</sup>Sehri, S. (2014). Wells, water, and welfare: the impact of access to groundwater on rural poverty and conflict. *American Economic Journal: Applied Economics*, 6(3), 76-102.

<sup>10</sup> As cited in Livingston, 2009. The Central Groundwater Board categorizes the groundwater Blocks according to the decline in water level and the stage of groundwater use (the stage of groundwater use is the annual groundwater draft expressed as a percentage of net annual groundwater availability). Safe (stage < 90 percent; no pre- or post-monsoonal significant long-term decline in water level); semi-critical (stage > 70 percent and < 100 percent; significant long-term decline in pre- or post-monsoonal water level); critical (stage > 90 percent and < 100 percent; significant long-term decline in both pre- and post-monsoonal water levels); overexploited (stage > 100 percent; significant long-term decline in pre- or postmonsoonal water level or both). Deep wells and prudence: towards pragmatic action for addressing groundwater overexploitation in India. Report, World Bank, p. 3.

assessed Blocks of 6,607 in the country, 4,530 (69 percent) are safe, 697 (11 percent) are semi-critical, 217 (3 percent) are critical, 1,017 (16 percent) are over exploited and 92 (1 percent) are saline.

6. The causes of the dramatic increase in largely uncontrolled and unplanned groundwater abstraction over the last fifty years are many. Cheap drilling and pumping technologies and energy subsidies are predominant 'pull' factors. Poor water supply and irrigation service delivery from surface water have 'pushed' users to resort to this alternative source. More generally, contributing factors include limited investment in the protection and management of water resources and insufficient attention to demand side measures; a weak legislative and regulatory framework; the fragmented and sometimes conflicting roles and responsibilities of various entities involved in groundwater management and development at the Central, State and local levels; the limited capacity of groundwater departments (where they exist at all); the inadequate coordination of groundwater management and development with other related sectors (drinking water, energy environment, health, and so on); and the limited knowledge base and poor understanding of this 'invisible' resource.

7. India increasingly recognizes that more attention must be given to the planning, protection, regulation, and management of groundwater resources in the country. Gol is taking active steps to tackle what is now acknowledged to be a 'crisis' through a national Program to reform water policies and address groundwater management challenges. India's recent announcement at Conference of Parties 21 demonstrates its intention to accelerate this Program and bring great focus to results.

## ***1.2 National Groundwater Management Improvement Program (NGMIP)***

8. Gol has requested the World Bank's support to improve groundwater management in the country by strengthening, expanding and accelerating its existing Program. The proposed National Groundwater Management and Development Program (NGMIP) responds to this request by putting in place incentives to build the requisite institutional foundation, knowledge and information base, and on-the-ground investments for more efficient and sustainable use of India's groundwater resources. The Program will be implemented in seven States: Haryana, Rajasthan, Gujarat, Maharashtra, Karnataka, Uttar Pradesh and Madhya Pradesh

9. The development objective for the Operation (hereinafter referred to as the "Program Development Objective" or "PDO") is to improve the management of groundwater resources in selected States. This will be achieved by enhancing the enabling framework and implementing appropriate investments/management actions generated from an evidence-based and participatory planning process.

10. The proposed results areas and disbursement linked indicators (DLIs) under the Program are:

- *Result Area 1. Improved planning and implementation of groundwater management interventions.* Activities will focus on: (i) introducing bottom-up planning of groundwater interventions through community-led Water Security Plans (WSPs); (ii) improving government budget allocation through the planning process; and (iii) implementing participatory groundwater management measures and demand-side groundwater management measures.
  
- DLI#1 incentivizes the overall goal of the ABHY—to arrest the decline of groundwater levels. Sustainable management of groundwater resources will significantly improve the project residents' resilience to drought, as it will contribute to the efficient use of available water resources and serve as a buffer during dry periods. Reducing the residents' reliance on groundwater will also reduce GHG emissions—thanks to the reduced need for groundwater pumping, thereby yielding

energy efficiency gains.

- DLI#2 incentivizes the roll-out of a bottom-up participatory groundwater planning process.
- DLI#3 incentivizes the use of bottom-up groundwater planning process to improve the effectiveness of public financing and align implementation of various government programs on groundwater.
- DLI#4 incentivizes the implementation of demand-side measures within the WSPs and signals the importance of shifting focus away from supply-side measures toward demand-side measures to improve groundwater conditions.
- *Result Area 2. Strengthened institutional framework and effective groundwater data monitoring and disclosure.* This result area focuses on building institutional capacity at all levels, including improved groundwater information. Activities will include building institutional capacity at Central and State levels by ensuring that the necessary staff with the correct skill mix are in place and are adequately trained to effectively perform their duties. At the local level, GPs will be trained in technical matters related to participatory groundwater management. Support to monitoring, sharing, and using groundwater data will include the acquisition of equipment, software, as well as technical support so that various entities can fulfill their mandates. The Program will also support the sharing and public disclosure of the additional groundwater data that will be collected.
- DLI#5 incentivizes the strengthening of groundwater management institutions to ensure public disclosure of groundwater information.

### **1.3 Purpose of Environmental and Social Systems Assessment (ESSA)**

11. The Environmental and Social Systems Assessment (ESSA) of the proposed NGMIP was undertaken to have a thorough understanding of the environmental and social risks, benefits, impacts and opportunities linked to the existing groundwater management practice in India with specific focus on the participating States. The assessment is also part of the World Bank's preparation in line with the requirements of OP/BP 9.00. The assessments were carried out through a comprehensive review of relevant government policies, legislation, institutional roles and implementation of various ongoing government Programs related to groundwater management. Further, actions to address gaps to enhance risk mitigation were identified and detailed. The broad objectives of ESSA were to identify the potential environmental and social impacts/risks applicable to the Program interventions; to review the policy and legal framework related to management of environmental and social impacts of the Program interventions; to assess the institutional capacity for environmental and social impact management within the Program system; to include assessment of M&E systems for environment and social issues; to describe necessary actions in order to strengthen the Program's performance with respect to the core principles of the PforR instrument

12. Methodology for carrying out this assessment is summarized below:

- **The ESSA was carried out at two levels.** National and State to understand how environment and social concerns<sup>11</sup> are addressed in the policy framework within which groundwater is managed; the different legal and regulatory instruments; the various Programs/schemes related to groundwater management; and, the capacity and performance of the key institutional stakeholders – including nodal and related departments, statutory authorities, local bodies, community institutions.
- **Team and staffing.** ESSA team included designated environmental and social specialists for overall guidance and coordination, for undertaking national and State level assessments.
- **Methodology.** ESSA included both **secondary literature review** (of available policy documents, relevant Acts, amendments, Rules, Government Orders and guidelines, assessment reports and independent studies) and **primary study** through consultations, personal interviews, group discussions, and observation of recharge structures. Stakeholders and institutions directly and indirectly linked with regulating, managing, using groundwater were consulted. At the national level it was primarily the MOWR RD&GR, CGWB and CGWA. At the State level, the assessment focused on understanding the actual implementation on the ground, and consultations were held with Ground Water Institutions, Regional Office of CGWB, Pollution Control Board, and various other government departments that are involved in groundwater management such as Departments of Agriculture, Water Supply and Sanitation; Water Resources; Watershed and Soil Conservation; Rural Development; Urban Development; Minor Irrigation; and so on.
- The teams also met with the District administration officers (Deputy Commissioner/District Collector, and CEO Zilla Parishad) Block Development Officers, PRI representatives, Urban Local Body representatives, Farmer Groups/Clubs, different Water User Groups (Water User Associations/Watershed Development Committees, Village Water and Sanitation Committees, and so on), Women’s collectives, members of vulnerable and marginalized communities, and NGOs working on participatory water resources management. For the consultations, the teams prepared detailed checklists and questions of inquiry, the State checklists were pilot tested in Rajasthan before all the teams started their independent fieldwork.
- **Samples and selection criteria for State-level assessments.** To make the assessment representative of country situation, the selection was based on geographical spread within the country (coastal and inland), geo-hydrological characteristics [hydro-geological variability such as hard rock aquifers (Karnataka), mostly alluvial (Gujarat) and both hard rock & alluvial aquifers (Rajasthan)], stage of groundwater development, socio-economic profile of States, levels of poverty and vulnerability, nature of existing participatory practices and Panchayat-related legislations in the States. The three States

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<sup>11</sup> From environment perspective, the contours of the assessment included environmental sustainability, addressing negative environmental impacts; promoting informed decision making on environmental management; extent to which Program systems avoid, minimize, and mitigate negative impacts on natural habitats and physical cultural resources and extent to which Program systems promote public health and occupation safety. From a social perspective, the assessment looked at how the Program promotes or addresses issues of social inclusion, equity and access, how accountable, responsive and transparent are the governance mechanisms in the state and in the stakeholder institutions, what are the established mechanisms and practices for promoting participation, citizen engagement, community monitoring and grievance redressal and their effectiveness.

were selected to ensure the diversity of issues is well captured. The teams developed thorough selection criteria to narrow down the States and within that the Districts for carrying out the assessment.

- The select States and Districts included – Rajasthan: Barmer and Alwar; Gujarat: Kutch and Mehsana; and Karnataka: Kolar and Bidar. For selection of Blocks, Panchayats and municipalities, Regional groundwater offices were consulted such that the representative samples could meet the environmental and social parameters. Each State team conducted assessment in two Districts, four Blocks and 8-10 local bodies.
- The parameters for selection included presence and nature of groundwater, extent of poverty and backwardness, average landholding size and proportion of smallholders in the District, extent of urbanization, presence of socially vulnerable communities and presence of industries. Additionally, care was taken that the sample demonstrate a variety of implementation practices on the ground of distinct character in terms of groundwater situation and use, topography, agro-climatic conditions, hydrogeology, socio-economic profile, institutional and governance systems. (See Annex 1: Selection Criteria).
- In addition, ESSA team also visited Haryana, Maharashtra and Bundelkhand<sup>12</sup> to interact with State level stakeholders to assess the State level systems (while preparation of the report) as well as share findings of ESSA during updation and as a part of disclosure process. (See Annex 2: Detailed Note on Consultations).

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<sup>12</sup> Bundelkhand Region is situated in central part of India, spread over 70,866 km<sup>2</sup> area covering about seven Districts of Uttar Pradesh and six Districts of Madhya Pradesh.

## 2. Program Description

### 2.1 Groundwater Management and Regulation Program

13. The Central Scheme for "Groundwater Management and Regulation" (GWMR) is Government of India's attempt to support groundwater management at national level. The Scheme is implemented by the Central Ground Water Board (CGWB) in the MoWR, RD&GR. The Scheme comprises four main elements: i) National Program on Aquifer Mapping and Management, (NAQUIM), ii) participatory groundwater management (PGWM), iii) procurement for technological up-gradation, and iv) groundwater regime monitoring, assessment, regulation, publication, seminars, awards, and so on. The NAQUIM and PGWM elements form the main channels through which aquifer management results are anticipated.

14. The main focus of the Scheme to date is in aquifer mapping, concentrating on over-exploited or critical<sup>13</sup> administrative (sub-District) Blocks with the intention of putting into place a set of aquifer management plans to arrest trends in aquifer depletion and conserve groundwater resources for the future. The expected outcomes of the Scheme have been stated (by CGWB) as;

- State Governments enabled to manage their resources in an efficient and equitable manner, thereby contributing to improved overall development.
- Improved understanding of aquifers and aquifer responses at community level. The amalgamation of scientific inputs and traditional wisdom would ensure sustainable groundwater resource management.
- Community based groundwater management embedded in local administration to plan sustainable cropping patterns adapted to available groundwater resources.

15. MoWR, RD&GR has recently proposed an expansion of the GWMR scheme. Its aim is to support "participating States in applying alternative approaches to groundwater governance through direct engagement with groundwater users and beneficiaries." It will also strengthen the critical role of the Central government in, "guiding groundwater management, providing the solid science required for groundwater management, providing training and other capacity building, and providing uniform standards and guidelines for quality assurance and coherence across States." These enhancements to the GWMR scheme are key to effectively managing groundwater resources. They include a strong technical/advisory role for the Central government; enhanced participation by the States; and increased involvement at the community level in planning and implementation. The expanded scheme is referred to as the Atal BHujal Yojana (ABHY) - National Groundwater Management Improvement Scheme (NGMIS).

16. The objectives of the national Scheme include: (i) enhancing recharge of aquifers and introducing water conservation practices; (ii) promoting activities relating to water harvesting, water management and crop alignment; (iii) creating an institutional structure for sustainable groundwater management; and (iv) incentivizing communities and stakeholders to sustainably manage groundwater. The Scheme proposes four components that aim to, "*address key limitations with respect to policy, regulatory framework, knowledge, investments, and institutional capacity.*" The components are: (i) Decision Support Tools for Groundwater Management; (ii) State Specific

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<sup>13</sup> A Block is over-exploited when the stage of groundwater development is more than 100 percent, and critical when more than 90, but less than 100 percent. As per CGWB, such areas should be under intense monitoring and evaluation, and future groundwater development to be linked with water conservation measures. Blocks where the stage of groundwater development is less than 70 percent are considered safe. <http://www.cgwb.gov.in/faq.html>

Institutional and Legal Framework for Sustainable Groundwater Management; (iii) Enhance Groundwater Recharge and Improve Water Use Efficiency; and (iv) Strengthening Community Based Institutions to foster Management.<sup>14</sup> The Scheme covers the seven States of Gujarat, Maharashtra, Haryana, Karnataka and Rajasthan, Madhya Pradesh and Uttar Pradesh (that is, hereinafter the participating States).

### 2.1.1 National Program on Aquifer Mapping and Management

17. A National Program on Aquifer Mapping and Management (NAQUIM)<sup>15</sup> is the largest element of the Scheme. The Scheme, inter-alia, aims at 3D mapping of aquifer on a scale of 1:50000 and characterize aquifer in terms of quantity, quality, spatial and temporal distribution of water level & resources. The end product of NAQUIM would be preparation of Aquifer Management Plan which will address the long-term solution to arrest the declining water levels as well as attenuate the deterioration of water quality. At present, the management plans are shared with concerned State Governments to take up the measures so as to optimize the extraction from aquifers and recharge the aquifers in order to capture the run-off from rainfall.

18. NAQUIM's main objectives are to: (1) map and characterize aquifers (2) develop aquifer management plans (AMP), and (3) implement AMPs through the use of regulatory instruments and participatory/community based groundwater management approaches. NAQUIM is a comprehensive but complex Program in generating aquifer information. It includes data generation through exploratory drilling, geophysical surveys, extensive data collection and preparation of aquifer management plans.

19. Challenges experienced in implementation of the NAQUIM component include limited support from States due to lack of State funds and the States' other commitments as well as delays in the tendering of activities to be outsourced relating to NAQUIM.

20. In addition to the AMPs to be generated by the NAQUIM Program, CGWB has prepared Master Plan for Ground Water Recharge, 2013 which details out the District wise feasible areas for recharge, type of structures feasible and tentative cost and dimensions. According to this master plan, major type of recharge structures recommend in the Program States are:

- **Gujarat.** Percolation tanks, check dams and roof top rain water harvesting
- **Karnataka.** Percolation tanks, check dams, sub-surface dykes, point recharge structures, and roof top rain water harvesting
- **Haryana.** Check dams, recharge shafts, horizontal trenches (with or without injection wells), reuse of treated sewage water (for example, for construction purposes), and roof top rainwater harvesting
- **Rajasthan.** Percolation tanks, anicuts (check dams), recharge shafts and roof top rain water harvesting
- **Maharashtra.** Percolation tanks, check dams and recharge shafts; and roof top and run off water harvesting in urban areas

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<sup>14</sup> NGMIS has been approved by the MoWR, RD&GR and the associated Expenditure Finance Committee (EFC) memo is with the Ministry of Finance for final approval.

<sup>15</sup> [http://aquiferindia.org/About\\_AQUIM\\_vision.aspx](http://aquiferindia.org/About_AQUIM_vision.aspx)

### *2.1.2 Participatory Groundwater Management*

21. This element anticipates the implementation of aquifer management plans (AMPs) through the combined use of existing regulatory instruments, and the adoption of participatory groundwater management approaches (PGWM). Implementation of AMP's through PGWM can be anticipated if States express willingness to engage with the Scheme and develop AMPs in collaboration with technical support from the CGWB regional offices.

22. At national level CGWB should be able to design PGWM tools adapted to specific aquifer types and socio-economic settings at Gram Panchayat (GP) level that could provide a basis for scaling-up. This objective is to be achieved by building capacity at the national, State, District, and GP levels for (i) creating demand for local planning, (ii) promoting cost effective and appropriate technologies for ecologically safe and sustainable groundwater recharge and abstraction, and (iii) closely monitoring results and supporting the States and subsidiary tiers in planning, implementation and sustaining results, as appropriate.

23. This element of the Scheme extends and upgrades the technical and monitoring equipment which has been a long term objective of the CGWB. At present, the Central Ground Water Board has a network of 22,339 groundwater observation wells, which includes both dug wells and piezometers (dedicated tube wells/bore wells used for monitoring purposes). About 35,000 new observation wells (mostly public wells) and 2,000 piezometers with AWLRs and telemetry are planned under the GWMR Scheme during XII Five Year Plan in order to bring the total to approximately 50,000 wells. This is not specifically designed to support NAQUIM, rather to achieve a desired density of observation wells from a current estimate of 1 for every 500 abstraction wells to a ratio of 1:100. However, due to non-availability of open wells/Dug wells in several States, the target for enhancing the number of observation wells has been reduced to 25,000 rather than 50,000. All efforts are now being made to establish new observation wells to achieve the target of 25,000. To date, 8,000 additional observation wells have been established and included in the monitoring network and 300 piezometers have been constructed.

### *2.1.3 Implementation Progress of GWMR*

24. The implementation progress of GWMR is slow and expenditure outturn is low indicating weak absorptive capacity. The main reasons are reduced and delayed receipt of funds (after about 1.5 years) and capacity constraints due to weak staffing and infrastructure and recruiting contract professional staff, procedural constraints, and non-allocation of funds to State and community level agencies for effective participation and implementation.

## *2.2 National Groundwater Management Improvement Program*

25. The proposed World Bank support to 'Atal Bhujal Yojana (ABHY) - National Groundwater Management Improvement Program' (NGMIP) will strengthen the GoI's expanded GWMR Scheme in the participating States of India to support the existing efforts of the government to improve groundwater management. The NGMIP will strengthen institutional competencies and trans-sectoral linkages between key groundwater agencies, including the CGWB, State Groundwater Departments and local institutions such as the Panchayati Raj Institutions (PRIs). The State groundwater departments will be strengthened through provision of necessary equipment and by providing qualified experts in hydrogeology, geochemistry and groundwater sciences and empowered with improved State groundwater legislation, regulations and guidelines. Different approaches will be adopted for groundwater use management in urban and rural contexts. Knowledge on the status of groundwater will be improved including its abstraction and use, through real-time groundwater monitoring and extended aquifer mapping. Data management, analysis and sharing will be improved,

feeding into a fully operational decision-support system that will be established under the Program. Evidenced-based groundwater security investment plans will be developed that integrate all of the relevant sectors and promote community participation. Planned interventions will focus on improving the protection and management of groundwater and surface water resources holistically, from a quality and quantity perspective that includes supply-side and demand-side strategies and approaches that increase resilience to climate change.

### 2.2.1 Geographic Scope of the Program

26. The participating States have some of the most heavily exploited groundwater areas in India and confront serious groundwater availability and quality issues that are expected to intensify in the future and might not be reversible if business continues as usual. These States represent 25 percent of the total number of over-exploited, critical and semi-critical Blocks in India, cover the two major types of groundwater systems found in India (alluvial and hard rock aquifers), and span a broad spectrum in terms of established legal and regulatory instruments, institutional readiness, and experience in groundwater management, amongst others. The States have expressed commitment for reform and a keen interest to participate in the proposed Program.

27. The Program will be implemented mainly in the overexploited Blocks in these States; and these Blocks are grouped in to various clusters based on their contiguity. Some States have proposed the following clusters for implementation of the Program

- **Gujarat.** City Dascroi, Gandhinagar, Mansa, Kalol Dehga Mehsana, Becharaji, Kadi, Kheralu, Satlasna, Unjha, Vijapur, Visnagar, Sidhhpur, Chansma, Patan, Deesa, Deodar, Dhanera, Kankrej, Tharad, Vadgam, Bhachau, and Mandvi.
- **Rajasthan.** Rajsamand, Bhinai, Khanpur-Pirawar, Baran, Sangod, Amer, Behror-Rajgarh, Chittor, Reodar, Khandar, Govindgarh, Bandikui, Mahwa, Atru, Sultanpur, Sanganer, and Ghaggarg.
- **Maharashtra.** Katol, Narkhed, Karanja, Ashti, Lakhandur, Pauni, Aurangabad, Gangapur, Khultabad, Soygaon, Bhokardan, Ghansavangi, Ambad, Jalna, Ahmadpur, Latur, Renapur, Chakur, Nilanga, Osmanabad, Kalamb, Omerga, Selu, Parbhani, Gangapeth, Sonpeth, Ambejogai, Georai, Patonda, Aundha, Basmat, Nanded, Mudkhed, Hadgaon, Malshiras, Madha, Mohol, Pandharpur, Karmala, Kavathemahankal, Miraj, Jat, Kahanapur, and Tasgaon.
- **Karnataka.** Kolar, Chikballapur, Tumkur, Bangalore Rurl District, Ramnagar, Chickmangalur, Chitradurga, Davangere, Bellary, Bagalkot, Dakshin Kannada, Dharwad, Vijayapura, Yalgyr, Koppla and Belgaum.
- **Haryana.** Gurgaon, Sohna, Pataudi, Yamuna Flood Plain, Tohna, Ratia, Jakhal, Narnaul, Nangal Chaudhury, Karnal, Indri, Nissing Goharuauda, Asandh, Nilokheri, Rania, Ellenabad, Davwalli, Loharu, Sivani, Badhra, and Panipet.
- **Bundelkhand.** Tikamgarh, Chattarpur, Damoh, Sagar and Panna (Madhya Pradesh). Jhansi, Hamirpur, Mahoba, Banda and Chitrakut (Uttar Pradesh).

2.2.2 Example Civil Works and Investments Under the Program<sup>16</sup>

28. The typology of works under various result areas of the Program are given in the Table 5.

**Table 5: DLIs and Example Investments**

| Result Area   | Disbursement Linked Indicator (DLI)  | Example Civil Works and Investments   |
|---|--|---|
| 1. Improved planning and implementation of groundwater management interventions | <p>DLI#1: Arrest in the rate of decline of groundwater levels</p> <p>DLI#2: Community-led Water Security Plans prepared</p> <p>DLI#3: Public financing allocated to approved Water Security Plans</p> <p>DLI#4: Area with reduction in water consumption</p> | <p>Preparation of aquifer management plans at the Gram Panchayat Level; and building capacity of the Gram Panchayats for participatory groundwater management.</p> <p>Various demand side and supply side measures will be carried out to control the usage of the groundwater and improve the groundwater levels through preparation and implementation of community led Water Security Plans. These activities are broadly grouped as below:</p> <p>Demand side measures (promoting reduction in groundwater usage):</p> <ul style="list-style-type: none"> <li>• Promoting improved irrigation technologies (piped irrigation networks in canal command areas, drip or sprinkler irrigation, underground pipeline distribution, laser land leveling, and so on.)</li> <li>• Crop choice management and diversification (promoting less water intensive crops by providing incentives for pulse cultivation and horticulture; and also delayed sowing of monsoon paddy)</li> <li>• Conjunctive management of surface and groundwater in canal command areas</li> <li>• Encouraging appropriate latest technologies by farmers for remotely operating pumps</li> <li>• Promoting treated municipal waste water for irrigation and construction use</li> <li>• Managing energy – irrigation nexus (provide quality power supply when farmers needed it most and curtail when farmers do not need it through feeder separation, high voltage distribution system, energy efficient pumps and grid connected solar irrigation pumps)</li> <li>• Mainstreaming of Participatory Groundwater Management (farmer field schools, user monitoring of groundwater data for water budgets. Community self-governance and regulation on water use)</li> </ul> <p>Supply side measures (through groundwater recharge)</p> <ul style="list-style-type: none"> <li>• Surface recharge structures – across streams with some storage: Check dams; gabions, percolation tanks</li> <li>• Surface recharge structures – across streams with no storage: sub surface dykes and gully plugs</li> <li>• Surface recharge with some excavation: recharge shafts, rain water harvesting</li> </ul> |

<sup>16</sup> This typology is based on the proposals from the states.

| Result Area  | Disbursement Linked Indicator (DLI)                                       | Example Civil Works and Investments   |
|--|---|---|
|  |   | <ul style="list-style-type: none"> <li>• Subsurface recharge: dug wells, injection bore wells and tube wells</li> <li>• Roof top rain water harvesting for groundwater recharge</li> <li>• Farm ponds and tank rehabilitation: Developing farm ponds, and desilting and excavation of existing village water bodies and tanks</li> <li>• Groundwater quality improvement interventions are<sup>17</sup></li> <li>• Improved groundwater quality data collection, and control industrial pollution</li> <li>• Supplying domestic drinking water filters for treatment of fluoride<sup>18</sup></li> <li>• Other inventions will include develop and enact model groundwater bill, mass awareness Programs, farmer field schools, and user monitoring of groundwater data.</li> </ul> |
| 2. Strengthened institutional framework and effective groundwater data monitoring and disclosure | DLI#5: Improved groundwater monitoring and disclosure of groundwater data | <ul style="list-style-type: none"> <li>• Currently several State level agencies are responsible in groundwater governance and inter-departmental coordination is weak, but for the proposed NGMIP, a State level coordination body is proposed</li> <li>• Hiring of professional staff in the State groundwater departments</li> <li>• Procurement and installation of equipment for groundwater level monitoring and pumping tests</li> <li>• Establishing water quality testing laboratories</li> <li>• Establishing monitoring wells; and carrying out hydrogeological and geophysical studies for preparation of aquifer management plans and Block level reports; and dissemination of these plans and reports</li> <li>• Capacity-building activities</li> </ul>              |

### 2.2.3 Implementation Arrangements

29. At the national level a Project Management Unit (PMU) will be established in the MoWR, RD&GR and be responsible for coordinating and facilitating Program implementation across various states and their implementing agencies.

30. At the State-level, a Steering Committee for Groundwater Management, headed by the Chief Secretary of the State, and a State Level Program Implementation Agency (PIA) is set up. PIA is either an existing mechanism or a specially constituted SPV and the selection of PIA will vary from State to State. The PIA will be headed by the Principal Secretary of the Nodal Department for groundwater in the State and be staffed by a team of professional staff for Program management. The PIA will be responsible for all technical, financial and administrative aspects of project implementation, including

<sup>17</sup> The investments proposed, so far by the state governments, to address water quality issues do not include any direct interventions for water quality treatment. Water quality interventions are miniscule under the Program, therefore no separate indicator for water quality was proposed.

<sup>18</sup> Karnataka has proposed investments supplying domestic water filters in the fluoride affected areas. Past experience in Karnataka suggests providing domestic water filters was more successful and sustainable option than providing common water treatment plants or supplying drinking water from long distant surface water sources. Providing domestic water filters with community awareness creation on use of fluoride water and domestic filters is the option considered in the proposed Program.

planning and scheduling, financial management and procurement, and monitoring and reporting. The delegation and financial powers for each of these PIA for carrying out procurement will be clearly spelled out in the Program Operational Manual.

31. The responsibility for Program implementation at Panchayat Raj level (District, Block and Gram Panchayat) will be held with the existing institutions. Panchayati Raj institutions are a critical link as they are one of the key agencies through which many national Programs such as MGNREGS, PMKSY, and so on, are implemented at the field. A key responsibility of the PIAs will be to ensure that adequate and need based support is provided at local level to prepare the Water Security Plans. To this end, the State PIAs will enlist Support Organizations (SOs) for promoting participatory groundwater management. Community monitoring mechanisms and information dissemination systems will be strengthened to ensure community involvement at critical stages of procurement.

#### *2.2.4 Independent Verification Agency*

32. An Independent Verification Agency (IVA) will be chosen to verify annually DLIs showing progress made by each of the States and by the CGWB. While some of the DLIs will be verified by examining official records, physical infrastructure and satellite imagery, others will be verified through random sampling.

### 3. Program Environmental and Social Management Systems

#### 3.1 Institutional Responsibilities

##### 3.1.1 National-level Institutions

33. In India, the **Ministry of Water Resources, River Development and Ganga Rejuvenation**<sup>19</sup> (MoWR, RD&GR) is primarily responsible for groundwater management and is the executing agency for the GWMR Program.

34. **Central Ground Water Board** under the MOWR, RD&GR is a multi-disciplinary scientific national apex organization. The mandate of CGWB is to develop and disseminate technologies, and monitor and implement national policies for the Scientific and Sustainable development and management of India's Ground Water Resources, including their exploration, assessment, conservation, augmentation, protection from pollution and distribution, based on principles of economic and ecological efficiency and equity. The board, headed by a Chairperson (level of Additional Secretary) and six full time members equivalent to the rank of Joint Secretaries, has the mandate to develop and disseminate technologies, and monitor and implement national policies for the Scientific and Sustainable development and management of India's groundwater resources, including their exploration, assessment, conservation, augmentation, protection from pollution and distribution, based on principles of economic and ecological efficiency and equity. CGWB has 18 Regional Offices in the country, which are headed by Regional Directors; and 11 State Unit Offices (SUO). It has a strength of more than 4500 personnel to fulfil its mandate, of which nearly 3000 are technical staff with science and engineering background.

35. **Central Ground Water Authority** has been constituted in 1997 under the Section 3 (3) of the Environment (Protection) Act, 1986 for regulation and control development and management of groundwater resources in the country. It can issue necessary regulatory directions and resort to penal provisions for this purpose.

36. **Central Pollution Control Board (CPCB)**, under the Ministry of Environment and Forests, monitors the quality of national water resources, including groundwater, and industrial pollution. CPCB in collaboration with concerned State level agencies established a nationwide network of water quality monitoring comprising 2500 stations in 28 States and 6 Union Territories. The monitoring is done on monthly or quarterly basis in surface waters and on half yearly basis in case of groundwater. The monitoring network covers 445 Rivers, 154 Lakes, 12 Tanks, 78 Ponds, 41 Creeks/Seawater, 25 Canals, 45 Drains, 10 Water Treatment Plant (Raw Water) and 807 Wells. Among the 2500 stations, 1275 are on rivers, 190 on lakes, 45 on drains, 41 on canals, 12 on tanks, 41 on creeks/seawater, 79 on ponds, 10 Water Treatment Plant (Raw Water) and 807 are groundwater stations.

37. **Other national level ministries** that have a role management of groundwater resources in the country are given in the following table.

**Table 6: National- and State-level Institutions and Their Role in Groundwater Management**

| Institutions                       | Role in Groundwater Management  |
|------------------------------------|---|
| <i>National-level Institutions</i> |   |
| Central Ground Water Authority     | Established in 1997, following Supreme Court orders, mainly to regulate, control, manage, and develop groundwater resources in the whole country and support States |

<sup>19</sup> The Ministry addresses the issue of water through surface water management; groundwater management; domestic and industrial water management, basin level planning and management

| <b>Institutions</b>   | <b>Role in Groundwater Management</b>   |
|---|---|
| Central Ground Water Board                                  | Established in 1950 for dedicated groundwater research and monitoring, to support overall planning for development of groundwater resources in the country, and to provide support to States  |
| Central Pollution Control Board                             | Norm setting on industries' water use and wastewater discharge  |
| Ministry of Water Resources, RD&GR (MoWR, RD&GR)            | Responsible for laying down policy guidelines and Programs for the development and regulation of country's water resources.   |
| Ministry of Drinking Water and Sanitation (MDWS)            | Nodal department for the overall policy, planning, funding and coordination of Programmes of drinking water and sanitation in the country.  |
| Ministry of Rural Development (MoRD)                        | Operates the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) which provides employment, notably through the construction of local water-related structures. The GP Development Plan (GPDP) are to have a clear component addressing vulnerabilities of poor and marginalised people and their livelihood opportunities through an integrated poverty reduction plan that converges with the labour budgeting and exercises under MGNREGS. |
| Ministry of Urban Development (MoUD)                        | The apex authority of Government of India at the national level to formulate policies, sponsor and support Programme, coordinate the activities of various Central Ministries, State Governments and other nodal authorities and monitor the Programmes concerning all the issues of urban development in the country.  |
| Ministry of Agriculture & Farmers Welfare                   | Responsible for laying down policy guidelines and Programmes related to agriculture and irrigation.   |
| Ministry of Environment, Forest and Climate Change (MoEFCC) | Nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and Programmes.  |
| National Water Board  | Established in 1990 under Ministry of Water Resources, apex organization with responsibility for progress achieved in implementation of National Water Policy and other issues, reports to National Water Resources Council   |
| National Water Resources Council                            | Established in 1983 with prime minister as chair, minister of water resources as vice-chair, and concerned Union ministers/ministers of State, chief ministers of all States, and lieutenant governors of union territories with secretary of Ministry of Water Resources as member secretary   |
| <i>Central Financing Institutions</i>                       |   |
| Rural Electrification Corporation                           | Development financing institution that finances and fully coordinates and oversees Special Project Agriculture  |
| National Bank for Agriculture and Rural Development         | Responsible for refinancing and standardizing substantial part of private sector groundwater  |
| <i>State-level Institutions</i>                             |   |
| State government departments                                | Principally responsible for groundwater use and control, as water is primarily a State subject  |
| State electricity boards                                    | Single window to individual farmers for obtaining pump set energization   |
| <i>Local Institutions</i>                                   |   |
| Panchayats  | Rural water supply, but to be devolved more water services and water resource management functions  |

### 3.1.2 State-level Institutions

38. **State Ground Water Agencies.** All the State governments in the country have groundwater departments that primarily deal with groundwater resource estimation and monitoring. The names of these departments in the various states are given below, groundwater level

- **Karnataka: State Groundwater Directorate.** The Directorate of Groundwater was carved out in 2013 from the Mines and Geology Department and is now attached to the Minor Irrigation under the Water Resources Department. Functions of the Directorate are: a) Groundwater resources estimation, b) Groundwater level monitoring, c) Approval for drilling bore well for domestic, agricultural and industrial purposes, d) Registration, regulation and monitoring of drilling in notified areas and e) small scale recharge activities. The Directorate has one State level chemical laboratory at Bangalore and divisional laboratories at Mysore, Chitradurga, Dharwar, Belgaum, Bellary and Gulbarga.
- **Haryana - Ground Water Cell.** The Ground Water Cell is established in the Department of Agriculture. The activities of the Ground Water Cell are: (i) Monitoring and Assessment of Ground Water Resources in the State, (ii) Micro-level survey, to identify potential pockets of Ground water in the saline area and deep aquifers, (iii) Conducting free Geophysical survey (Resistivity survey) for the farmers to demarcating the status of groundwater of different Aquifer zone for installation of shallow/deep tube wells, (iv) Pump efficiency tests to improve the efficiency of defective pump sets of the farmers, (v) Pump tests for aquifer parameters, (vi) Designing & installation of groundwater recharge structures, (vii) Planning and management of groundwater resources, and (viii) Implementation of directions of Central Ground Water Authority New Delhi Notified under Environment (Protection ) Act 1986.
- **Maharashtra - Groundwater Surveys and Development Agency.** This agency is located in the Water Supply and Sanitation Department in Government of Maharashtra. The mandate of this agency is (i) To collect, analyze and disseminate data on Groundwater, (ii) To carry out periodic assessment of Groundwater resources in order to regulate its use and guide its development on scientific lines, (iii) To certify groundwater based sources for Public Drinking Water Schemes and survey for certifying the safe limit of sand mining, (iv) To render technical guidance in the implementation of Maharashtra Groundwater (Development & Management) Act, 2009, (v) To map the aquifers and establish community based Groundwater Management Models, (vi) To assess and recommend the quality of groundwater for its suitability to drinking, irrigation & industrial purpose, and (vii) To ensure sustainability of Groundwater based Drinking Water Sources in the State.
- **Rajasthan - Ground Water Department.** This agency works under the Irrigation Department. The activities carried out by this department are : (i) Construction of tube wells for drinking purpose , (ii) Construction of piezometers, (iii) Feasibility reports for drilling of tube wells, (iv) Blasting for deepening of wells for weaker section, (v) Pre and post monsoon survey, (vi) Collection and chemical analysis of groundwater samples, (vii) Preparation of various groundwater maps, (viii) Estimation of groundwater resources, (ix) Regulation of groundwater resources by controlling drilling, (x) Technical guidance for the rain water harvesting structures, and (xi) Resistivity survey for delineation of bed rock configuration.
- **Gujarat - Gujarat Water Resources Development Corporation Limited.** This agency works under Narmada, Water Resources, Water Supply & Kalpsar of Government of

Gujarat. This agency was established in 1975 with a view to concentrate on groundwater investigation, groundwater exploration, groundwater management and recharge works in the State of Gujarat.

- **Madhya Pradesh - Ground Water Division**, under the Water Resources Department, is responsible for creation and maintenance of irrigation potential through construction of water resources projects, and research in groundwater resources
- **Utter Pradesh - State Ground Water Department** is an independent department whose primary objective is to research on the State's groundwater resources, management, planning and related problems

39. Other relevant departments involved in groundwater management in the States include watershed, agriculture, irrigation and horticulture departments. Details of these departments are given in the following table.

**Table 7: State-level Agencies and Their Role in Groundwater Management**

| <b>State</b>   | <b>Other Relevant Departments with Focus on Groundwater Improvement</b>  |
|----------------|--|
| Karnataka      | Watershed Development Department, Department of Agriculture<br>Minor Irrigation, Water Resource Department<br>Rural Development and Panchayat Raj Department<br>Urban Development<br>Agriculture and Horticulture Departments  |
| Rajasthan      | Water Resources Department<br>Public Health and Engineering Department (PHED)<br>Directorate/Commissionaire Watershed Development and Soil Conservation<br>Department of Agriculture<br>Rural Development and Panchayati Raj Department<br>Communication and Capacity Development Unit/Water and Sanitation Support Organization |
| Gujarat        | Narmada, Water Resources, Water Supply & Kalpsar<br>Gujarat Water Supply and Sewerage Board<br>Water and Sanitation Management Organization<br>Gujarat Water Shed Management Agency under Commissionerate of Rural Development<br>Gujarat Green Revolution Company Limited   |
| Maharashtra    | Department of Water Conservation,<br>Public Health Department<br>State Water and Sanitation Mission<br>Department of Soil Conservation<br>Department of Agriculture  |
| Haryana        | Department of Irrigation<br>Department of Agriculture<br>Public Health Engineering Department  |
| Uttar Pradesh  | Minor Irrigation Department<br>Land Development and Water Resources<br>Rural Development<br>Agriculture Department<br>Jal Nigam<br>Public Health Engineering Department  |
| Madhya Pradesh | Water Resources Department<br>Public Health Engineering Department<br>Department of Farmers Welfare and Agriculture Development  |

## 3.2 Legal and Regulatory Framework Applicable to the Program

### 3.2.1 National-level Legal and Regulatory Framework

40. Management of Water is a subject of State government as listed as entry 17 (list II) in the Seventh Schedule and State Governments have the jurisdiction and the authority to control and regulate the development groundwater within the territorial jurisdiction of such State concerned.

41. Parliament has concurrent power to make laws for territory not included in a State. Under the provisions of the Environment (Protection) Act 1986, Central government (Ministry of Water Resources) has the role of overall planning, development, management and formulation of policies, overseeing support to States on the basis that groundwater is a prime natural resource.

42. Under the Indian Easement Act of 1882, ownership of groundwater is linked to ownership of land. However, the same Act 'provides guidance for distinguishing percolating groundwater from groundwater flowing in 'defined channels'. It confirms that wherever groundwater is found to flow in defined channels, the regime for appropriation is the same as that for surface water. In 2011, since surface water is regulated under the principle of public trust, the same applies to flowing groundwater. Additionally, there are limits in cases of over-exploitation.<sup>20</sup>

43. Starting in 1970, the Government of India put forward a **Model Bill to Regulate and Control the Development and Management of Ground Water** for adoption by the States. This model bill has been revised several times (1992, 1996 and 2005) but the basic scheme adopted in 1970 has been retained to date. The overall objectives of the model bill are to (i) regulate iniquitous GW use and distribution to ensure that the safe and secure drinking water/domestic needs of every person and irrigation needs of small and marginal farmers can be met; and (ii) regulate over-extraction of GW in order to ensure the sustainability of GW resources, equity of their use and distribution, and to ensure fulfilment of ecosystem needs,

44. **Interstate River Dispute State Dispute Act 1956** (amended in 2002) enacted to resolve the disputes among the basin States of an interstate rivers but also looks at irrigation, drinking water, industrial, recreation, recharging of groundwater, groundwater use.

45. **National Water Policy 2012** advocates for prevention of over exploitation of groundwater, recharge of sources and improvement in quality of water. It also promotes the need for devolution of necessary authority to the lower tiers of government to deal with the local water situation. It states that all existing Acts need to be modified keeping in mind that water needs to be managed as a community resource as it is essential to achieve food security, livelihood, and equitable and sustainable development for all. It calls for strengthening Water User Associations, awareness generation for efficient and responsible use and planning of all projects with due consideration of social aspects and in consultation with project affected and beneficiary families. The policy recommends detailed scientific studies to determine ecological flows in to the rivers including contributions from the groundwater as base flows during low flow season. Climate change impacts should be dealt with by increasing water storage in its various forms, namely, soil moisture, ponds, groundwater, small and large reservoirs and their combination.

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<sup>20</sup> As individual's right to use groundwater is limited by the need to contain environmental consequences, such as lowering of the water table, of such use, the Central Government has the obligation to see that groundwater use does not lead to environmental degradation. The Apex Court has repeatedly held that the right to clean air and unpolluted water forms part of the right to life under Article 21 of the Constitution. The Panchayat and the State are bound to protect groundwater from excessive exploitation

### 3.2.1.1 National-level Environmental Legislation

46. **EIA Notification 2006.** The Environmental Impact Assessment (EIA) notification is under the EPA1986 and discusses the need for environmental clearances under the Act for a number of activities, either by the Central or State governments. Any river valley projects with more than 10,000 ha of culturable command area falls under Category A and less than 10,000 ha of culturable command area falls under Category B. The proposed small scale interventions under the Program such as check dams or percolation tanks which have a very few hectares of submergence area do not require any environmental clearances.

47. **Coastal Zone Regulation Notification 2011.** Coastal zone regulation applies to the coastal stretches located up to 500 m from high tidal level. Any projects within in this zone require approval from the Coastal Zone Management Authority of the respective State.

48. **Water (Prevention and Control of Pollution) Act, 1974.** This Act empowers the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCB) to identify water quality standards for all waterbodies, including flow characteristics and use. Depending on use and needs the same waterbody, such as a stream may have more than one standard in different areas. Standards for surface inland waterbodies, flowing rivers and streams, sea and tidal waters and also aquifers. It also lays down standards for sewage and effluent treatment prior to their discharge.

49. This Act mentions that the discharge of noxious or polluting substances into any water system that may either pollute it or cause impediments in its flow, or discharge sewage or waste into any water system is not permitted. The CPCB, under this Act is also to develop suitable standards for the utilization of effluents for agriculture. The CPCB has also identified water quality standards for various purposes such as drinking, bathing, wildlife, and so on. Depending upon the classification of a water system and its use, these standards need to be adhered to. In case under this project any effluent or treated sewage discharge into a waterbody is planned, permission from the SPCB or as the case might be will be needed. In case of any accidental discharge, the SPCB would need to be informed immediately and appropriate remedial actions taken. Also, in case of pollution, this Act gives the power to the CPCB and SPCB to prosecute the polluter for not adhering to identified standards.

### 3.2.1.2 National-level Social Legislation

50. **Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013.** To overcome gaps in the existing Land Acquisition Act 1894, the principle objective of the 2013 Act is fair compensation, through resettlement and rehabilitation of those affected, adequate safeguards for their well-being and complete transparency in the process of land acquisition be it for farmers, landless and those whose livelihood dependent. It also has a separate chapter on rights of schedules castes and tribes. Local governments and Gram Sabhas to play a key role, including in PESA (Panchayat Extension to Schedule Area), to approve land acquisition for public purpose. However, the 2013 Act sidesteps the prohibition on tribal land being transferred to non-tribal by allowing acquisition for private companies or for public-private partnership projects. The 2014 Ordinance which amends the 2013 Act replaces 'private company' by 'private entity'.

51. **73rd and 74th Constitutional Amendment Acts 1992.** The Decentralization or Panchayati Raj Act were aimed to institutionalize a three tier Panchayati Raj system of governance where elected bodies at District, Block and Gram Panchayats/Municipal level will be the centres for all economic development and social justice – planning, implementation and monitoring. The Act mandates elections every five years and there are reservations of seats for women, scheduled castes, tribes and other backward classes so that the elected bodies are representative of the people. All decisions

related to developmental activities in the village have to be ratified by the Gram Sabha – quarterly village meeting of the voting population.

52. **Panchayat Extension to Scheduled Areas Act, 1996 (PESA).** The Scheduled Areas were exempted from the application of the 73rd and 74th Amendment for which the Parliament enacted a separate law, PESA to extend Part IX of the Constitution to the Fifth Schedule Areas. It provides a central role to the village recognizing a habitation to be a natural unit of the community (defined as a habitation or group of habitation, the natural village as against the administratively defined unit based on population) and its Gram Sabha (as against the elected Gram Panchayat as in the Panchayati Raj Acts of the States) to be pre-eminent. The aim is to provide a balance between customary practices and modern law.

53. **The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.** Also known as FRA, it was enacted to undo the “historical injustice” committed against the forest dwelling Scheduled Tribes and other traditional forest dwellers who have been living in the forests for centuries by recognizing their forest rights and occupation in forest land. In 2012, Forest Rights Rules were revised and guidelines were issued to address the implementation gaps on the ground.

54. **Right to Information Act 2005.** In order to promote transparency and accountability, RTI allows for citizens to demand information from the Government on its Programs, activities through access to records, documents, memos, e-mails, opinions, advices, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form. It also includes information relating to any private body which can be accessed by the public authority under any law for the time being in force. Public authorities have designated some of its officers as Public Information Officers responsible to give timely information to a person who seeks information under the RTI Act. The Act is a powerful grievance redressal tool and provides opportunity for both enhancing transparency in the functioning of public offices and redressing grievances related to delays and denial in the provisioning of public services and entitlements. The scope of the Act covers virtually all sectors in which the public systems function.

55. **Allocation of Business Rules 1961 along with Policy Guidelines for redress of Public Grievances 2010.** All Grievances received from the public as well as employees are required to be redressed by the Ministry/Department/Organization concerned to which the area of work for that grievance has been allocated. The business allocation rules and the policy guide make it mandatory for each national ministry to designate a Director Grievance as an appellate authority within the ministry to entertain appeals from aggrieved persons who are not satisfied with the redressal offered by the Central agency.

56. **Right to Public Services legislation, 2011.** It comprises statutory laws which guarantee time bound delivery of services for various public services rendered by the Government to citizen and provides mechanism for punishing the errant public servant who is deficient in providing the service stipulated under the statute. Right to Service legislation are meant to reduce corruption among the government officials, ensures time bound action and creates disincentives for public servants not providing the services as per defined quality standards to the citizens. The legislations also increase transparency and public accountability for the services notified under the Acts.

### *3.2.2 State-level Legal and Regulatory Framework*

57. **Karnataka.** The Karnataka Ground Water (Regulation and Control of Development and Management) Act, 2011 and Rules, 2012 is the key legislation that provides for regulation of groundwater extraction. It prescribes procedures for notification of areas where groundwater

development needs to be regulated, permits for groundwater extraction in such notified areas, registration of existing users, procedure for denotification, registration of drilling agencies, mandate for groundwater recharge, and provision for grievance redress. The State also has strong policies<sup>21</sup> in other sectors like agriculture, water supply, irrigation, power, and so on. which support in managing groundwater more effectively. Like the Agricultural Policy stresses upon efforts for identifying and rejuvenating groundwater recharge zones, rejuvenation of village tanks, community based groundwater recharge, rain water harvesting and watershed development, promotion of less water consuming crops, micro-irrigation, conjunctive use of surface and groundwater in command areas. Or the Industrial Policy proposes incentives/concessions to small and medium enterprises for rainwater harvesting, wastewater recycling and zero discharge processes. Karnataka Power Reforms Policy, 2001 recognizes that free electricity supply has led to wastage of energy besides leading to over-draft of groundwater, the KPTCL would provide in future meters for all new connections, implement tariffs which are reflective of costs of supply and will focus on improvement of efficiency of agriculture tube wells.

58. **Maharashtra.** A regulatory framework exists in the State to govern groundwater extraction based on the Model Bill 2005 which has been enacted and implemented. Maharashtra Ground Water Bill 2009 to facilitate and ensure sustainable and adequate supply of groundwater of prescribed quality, for various category of users, through supply and demand management measures, protecting public drinking water sources and to establish the State Groundwater Authority and District Level Authorities to manage and to regulate, with community participation, the exploitation of groundwater within the State of Maharashtra

59. **Rajasthan.** Rajasthan follows the Central Ground Water Authority Guidelines for groundwater management related issues. The State has several legal and regulatory instruments to support groundwater management including planning and implementation. However, the State does not have a Ground Water Act to provide legal sanction and regulation to groundwater management and development. The Bill is under approval. Rajasthan State Water policy (2010), Rajasthan Agriculture Policy (2013), Rajasthan River Basin and Water Resources Planning Act (2015) and Rajasthan Farmers Participation in Management of Irrigation Systems Act (2000) provide framework for water resources management and sectoral Programs in the State.

60. **Gujarat.** The State does not have a Ground Water Act to provide legal sanction and regulation to groundwater management and development. There is a Draft Gujarat State Water Policy of 2015 recognizes that there is a need to evolve a State Framework Law in the line of National Framework Law which is as an umbrella statement of general principles governing the exercise of legislative and/or executive (or devolved) powers by the States and the local governing bodies.

61. **Haryana.** There is no regulatory framework to govern groundwater extraction in the State. No Act is in place and the Model Bill has not been enacted, implemented, or placed before the assembly.

62. **Bundelkhand.** In Madhya Pradesh there is no regulatory framework to govern groundwater extraction in the State. Similarly, Uttar Pradesh has also not enacted any legislation on groundwater management, conservation, protection or development.

### 3.2.2.1 State-level Environmental Regulations

63. **Pollution Control Board notification, 2016.** Any construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the schedules of the

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<sup>21</sup> Karnataka Urban Drinking Water and Sanitation Policy, 2003; Karnataka Agricultural Policy, 2006; Karnataka Mineral Policy, 2008; Karnataka Industrial Policy, 2014-19; Solar Policy, 2014-2021; Urban Development Policy, 2009; Karnataka Power Reforms Policy, 2001.

Environmental Impact Assessment (EIA) notification dated 14/9/2006 requires prior environmental clearance. If certain modification in the plant and machinery including installation of additional sources of air/water pollution without obtaining environmental clearance under EIA notification has been carried out, then directions of closure/scaling of those additional plant/machineries under section 33A/31A of water Act/Air Act shall be issued. Further, such cases shall be forwarded to State Environmental Impact Assessment Authorities (SEIAA) for necessary action for past violations of EIA notifications.

### 3.2.2.2 State-level Social Regulations

64. **73rd and 74th Constitutional Amendment Acts 1992.** All seven<sup>22</sup> States have passed their State Panchayati Raj Acts, have elected Panchayats at three tiers with reserved seats duly occupied and powers to ratify developmental activities lies with the Gram Sabha. Though some States have been more progressive in the process of devolution in comparison to others.

65. **Panchayat Extension to Scheduled Areas 1996 (PESA).** Three NGMIP States<sup>23</sup> have fifth scheduled areas where PESA is applicable.

66. The **Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.** FRA is applicable throughout the country including in four of the NGMIP States- Rajasthan, Maharashtra, Gujarat and Karnataka. In Haryana, there is very small notified forest area.

67. **Right to Information Act 2005.** In all seven States RTI is applicable and Public Information Officers have been deputed.

68. **Right to Public Services legislation 2011.** Of the seven NGMIP States, six States<sup>24</sup> have introduced similar legislation for effectuating the right to service to the citizen in a speedy, timely and hassle free manner and it includes services related water supply.

### 3.3 Relevant National Programs on Groundwater Management

69. Various Programs on groundwater management and improvement are being implemented by various national government agencies including CGWB.

70. **Programs by CGWB.** State Sector Scheme of 'Artificial recharge of groundwater through dug wells' (in seven States where groundwater levels are critical) which aims to improve groundwater levels, increase sustainability of wells during lean period and seek community involvement in water management (the Scheme has ended).

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<sup>22</sup> Rajasthan Panchayati Raj Act 1994; Karnataka Panchayati Raj Act 1993; Gujarat Panchayati Raj Act 1993; Haryana Panchayati Raj Act 1994; Maharashtra Gram Panchayat Act 1993, Madhya Pradesh Panchayati Raj Act of 1993 and the Uttar Pradesh Panchayati Raj Act 1947 amended in 1994 are applicable.

<sup>23</sup>Parts of the Districts in which PESA is applicable: Gujarat - Surat, Bharuch, Dangs, Valsad, Panchmahal, Sabardham, Sabarkanta; Maharashtra - Thane, Nasik, Dhule, Ahmednagar, Pune, Nanded, Amravati, Yavatmal, Gadchiroli, Chandrapur; Rajasthan - Banswara, Dungarpur (fully tribal Districts), Udaipur, Chittaurgarh, Siroi (partly tribal areas).; Madhya Pradesh- Jhabua, Mandla, Dindhori, Barwani, Dhar, Khargone, Khandwa, Ratlam, Betul, Seoni, Balaghat, Hoshangabad, Sidhi, Shahdol, Balaghat, Umaria, Sheopur, Chhindwara.

<sup>24</sup> Karnataka Guarantee of Services to Citizens Act, 2011; Rajasthan Public Service Guarantee Act, 2011; Haryana Right to Services Act 2014; Maharashtra Right to Public Service Ordinance 2015; Uttar Pradesh Janhit Guarantee Act 2011, Madhya Pradesh Public Services Guarantee Act 2011

- Farmers Participatory Action Research Program (FPARP) aimed at increasing water use efficiency for irrigation (with a concept of more crop per drop) to provide demonstrative technologies to farmers to increase productivity and profitability.
- Awareness generation and training Programmes:
  - **Jal Kranti Abhiyan.** Jal Kranti Abhiyan has been launched at national level with an objective to strengthening grass root involvement of all stakeholders including Panchayati Raj Institutions and local bodies in the water security and development schemes (for example, Participatory Irrigation Management (PIM), encouraging the adoption/utilization of traditional knowledge in water resources conservation and its management, utilize sector level expertise from different levels in government, NGO's, citizens, and so on; and enhancing livelihood security through water security in rural areas. Under this scheme additional facilities would be created for water conservation through construction of water harvesting structures, rainwater harvesting for recharge would be made mandatory for residential, commercial and industrial buildings/premises, efforts would be made for the convergence of various departments in water resources development and management. This scheme will also institutionalize village participation in water related schemes and projects and cost sharing for O&M by the community to instill a sense of belongingness, accountability and responsible partnership and will have provision for incentivizing/honouring PRIs for devising innovative/unique ways to create water security in their areas for amelioration in water related issues.
  - **Hamara Jal Hamara Jeevan** Programmes to support water conservation in rural areas
  - **Bhoomijal Samvardhan Puraskar** (Groundwater Augmentation Awards) and National Water Award for NGOs and local governments for adopting innovative practices that result in sustainability of groundwater resources.

71. Ongoing Programs of the various national level ministries related to groundwater management are given in the following paragraphs.

72. The National Water Mission under the MoWR, RD&GR whose main objective is the conservation of water, minimizing wastage and ensuring the more equitable distribution of water both across and within States through integrated water resources development and management. The five goals of the National Water Mission are: (a) comprehensive water data base in public domain and assessment of impact of climate change on water resource; (b) promotion of citizen and State action for water conservation, augmentation and preservation; (c) focused attention to vulnerable areas including over-exploited areas; (d) increasing water use efficiency by 20 percent, and (e) promotion of basin level integrated water resources management.

73. Programs by Ministry of Agriculture include a flagship GoI scheme, the *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY) which aims to provide assured irrigation supplies to every farmer field in India. It focuses on a number of aspects like creation of new minor irrigation sources, repair and restoration of existing water sources, watershed development, enhanced water efficiency for higher productivity, and preparation of District irrigation plans for improved source, distribution and use.

74. Programs by Ministry of Power (MoP) include electric power supply and is heavily subsidizing power for agriculture, which is a major contributor to groundwater over-draft.

75. Programs by Ministry of Rural Development (MoRD) include

- **Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)** which provides livelihood security to the households of the rural area by providing not less than 100 days of guaranteed wage employment in every financial year to every house hold whose adult members volunteer to do unskilled and manual work. In addition to the Panchayati Raj Institutions, the line departments involved in implementation of the scheme include Minor Irrigation, Watershed, Panchayat Raj Engineering Division, Agriculture, and so on. The permissible works under the MGNREGS include water conservation and water harvesting works, watershed management works, minor irrigation works, renovation of traditional water bodies, and so on, all of which are relevant to groundwater management. Of the assets created under this scheme in 2015-16, about 8 percent are water conservation and water harvesting works including renovation of traditional water bodies.
- **Integrated Watershed Management Program (IWMP).** The main objectives of the IWMP are to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as water, soil and vegetative cover. The intended outcomes are: prevention of soil run-off, regeneration of natural vegetation, rain water harvesting and recharging the groundwater table. This enables multi-cropping practice and the introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed area.

76. Programs by Ministry of Panchayat Raj include:

- **Rajiv Gandhi Panchayat Sashaktikaran Abhiyan/Rashtriya Gram Swaraj Abhiyan (RGPSA/RGSA)** provides impetus to devolution of powers and responsibilities to Panchayats through systematic activity mapping, capacity building, and institutional support.
- **Jal Kranti Abhiyaan/Jal Gram Scheme** states is aimed at strengthening action and involvement of PRIs and user groups in schemes for water safety and development by encouraging the use/adoption of traditional knowledge/systems for conservation and management, promotion of self and collective regulation for creating water use-efficiency.

77. **Program by Ministry of Drinking Water and Sanitation.** To ensure, that every rural person has enough safe water for drinking, cooking and other domestic needs as well as livestock throughout the year including during natural disasters, MoDWS has launched the National Rural Drinking Water Programme (NRDWP) which talks about a grid supplying metered bulk water to GPs/village by adopting an appropriate system of pricing; move from overdependence on groundwater or any one source of drinking water to the conjunctive use; and have a decentralized approach to managing water.

### 3.4 Relevant State-level Programs on Groundwater Management

78. **Water conservation and reuse.** IWMP,<sup>25</sup> PMSKY, *Jal Kranti Abhiyan*, MGNREGS are applicable in the NGMIP States. In Rajasthan, the Water Conservation Mission is renamed, *Mukhyamantri Jal Swavalamban Abhiyan* (MJSA) in 2015 with the vision to ensure effective implementation of water

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<sup>25</sup>In all states IWMP follows a participatory approach. In Karnataka, World Bank supported Sujala-III is being implemented which aims to integrate hydrological dynamics into watershed planning

harvesting and water conservation related activities in the rural areas through an IWRM approach. MJSA has adopted a convergence model by bringing together all State departments involved in water management. MJSA has brought together all water related Programs on a single platform. MJSA aims to manage four types of water components: rainfall, runoff, groundwater and soil moisture. MJSA proposes to cover 21000 villages in four years. In Gujarat, *Sujhalam Suphalam Scheme* transfers surplus water of central and south Gujarat's rivers to water scarce areas of Northern Gujarat through interlinking of basins with expected outcomes of increase groundwater levels and quality in these areas. The Salinity Ingress Prevention Scheme aims at recharging the fresh water, increase the quality of undergroundwater and prevent salinity of surface water and undergroundwater due to spreading of tidal water.

79. **Minor Irrigation Programs.** There are two key centrally supported schemes in all States under which minor irrigation tanks are restored are: (a) Repair, Restoration and Renovation (RRR) of water bodies directly linked to agriculture with objectives that include groundwater recharge, and (b) Accelerated Irrigation Benefit Program (AIBP) which is meant for tribal areas and drought prone areas and creates new irrigation potential, but not for renovation of minor irrigation tanks.

80. Schemes specific to States include:

- **Karnataka.** a) *Ganga Kalyan* - This State sector scheme has the objective of supporting irrigation borewells and their energisation for farmers belonging to SC, ST, OBC and minorities. Under the scheme subsidy is provided to farmers with 2-5 acres of dry land for digging open/borewells and for irrigation pumps. The Member of Legislative Assembly (MLA) of each constituency recommends 10 beneficiaries from the constituency for the scheme to the social welfare department; b) *Surya Raitha* - The scheme is for irrigation pump (IP) sets on dedicated agricultural IP feeders and is applicable for IP sets to the extent of 10 HP capacity which requires solar generating capacity of 10 kWp. The farmer meets the irrigation pumping requirements through solar power and the excess solar power generated is pumped to the grid serving as an additional source of revenue to the farmer.
- **Rajasthan.** Minor irrigation is undertaken by the Department of Irrigation within the Water Resources Department. Currently, 57 minor irrigation projects are being implemented in the State.
- **Gujarat.** Vanbandhu Kalyan Yojna in Gujarat which offers the most suitable areas specific method of irrigation and Saurashtra-Narmada Avatara Irrigation Yojna (*Sauni Yojna*) diverts excess over flowing flood water of Narmada allocated to Saurashtra Region which has indirectly improved groundwater.
- **Bundelkhand.** In the year 2007, the GoI has constituted an Inter-Ministerial Central Team for suggesting Integrated Drought Mitigation Strategies in Bundelkhand<sup>12</sup>. Based on the report by this team, the Cabinet, in 2009, approved a special package for implementing drought mitigation strategies in Bundelkhand Region at a cost of Rs. 7266 crores. The prime mover of the package was optimization of water resources through rain water harvesting through proper utilization of the river systems. For water resources sector activities such as construction of recharge dug wells/tanks/ponds; and new dug wells. Renovation of dug wells, community tube wells, rehabilitation and restoration of water bodies and drip pipe distribution were taken up.

81. **Micro Irrigation Programs.** From centre, States get support for micro-irrigation under the *Pradhan Mantri Krishi Sinchayee Yojana*<sup>26</sup> (PMKSY), the NABARD-Rural Infrastructure Development Fund (RIDF), the *Rashtriya Krishi Vikas Yojana* (RKVY) and the National Mission on Micro-Irrigation.

- Karnataka has adopted micro-irrigation systems such as drip and sprinkler irrigation which is supported under multiple schemes including the State's micro-irrigation scheme (implemented from 2003-04).
- The Micro Irrigation Scheme in Gujarat is being implemented by Gujarat Green Revolution Company Limited (GGRC) aimed towards to saving water and energy, besides increasing the agricultural production and productivity in the larger interest of the farming community of the State. Under this scheme, a farmer gets a subsidies based on cropping pattern of his choice with a flexibility of MIS; Agronomical services for 1 year; system maintenance services for 5 years are rendered to the beneficiary farmers; Insurance coverage. In tribal belts, farmers are supported right from seed procurement to the marketing of harvest, thus ensuring Technology Transfer.
- Micro-irrigation is promoted in Rajasthan in two ways: (i) On Farm Water Management under National Mission for Sustainable Agriculture/PMKSY. The scheme aims at improving water-use efficiency through on-farm water management and supports the provisioning of various categories of sprinkler and drip irrigation. Subsidies are provided on the total cost of the identified system depending on the category (small/marginal/general) to which the farmer belongs and whether the land falls in a DDP/DPAP Block. Of the total 30 percent is reserved for women farmers. The cost of the subsidy is borne equally by the Centre and the State. (ii) A massive Solar Photovoltaic (SPV) Pumping System installation Program has been taken up by Rajasthan Government. With 4000 solar pumps installed in 2012-13, Rajasthan's solar pump Program is the largest in the world. Plans are being made to install a total of 100,000 solar water pumps in the next five years.<sup>27</sup>

82. **Drinking Water and Sanitation.** For rural areas, the schemes include National Rural Drinking Water Program (NRDWP), Desert Development Program (DDP) and grants to Rural Local Bodies from the Finance Commissions and for urban areas, the Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and the Finance Commission Grants to the Urban Local Bodies.

83. **Agriculture Programs.** Besides PMKSY which is present in all NGMIP States, the specific agriculture schemes in States include:

- **Karnataka *Krishi Bhagya*.** This flagship scheme of the State government is being implemented in 5 major dry land zones covering 107 talukas in 23 Districts. In 2015-16 the scheme was further extended to 23 talukas affected by drought in the last 4 years. The focus areas of the scheme include conservation and efficient use of water. Farmer

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<sup>26</sup>PMKSY is a national level Program aiming at optimum and best use of water through practices and technologies. It puts emphasis on: (i) integration of water resources, water distribution and efficient water use; (ii) enhancing recharge of aquifers, arresting runoff and regeneration of groundwater; (iii) watershed approach for micro-irrigation as well as water and soil conservation; (iv) crop alignment, livelihood protection and natural resource management; (v) treatment of municipal waste water for peri-urban agriculture; (vi) creation and renovation of water structure; (v) revival of traditional water management; (vi) community irrigation through user groups; (vii) creation of minor irrigation through both surface and groundwater; and (viii) popularization of drip and sprinkler. PMKSY brings together IWMP, AIBP (Accelerated Irrigation Benefit Program), CDAWM (Command Area Development and Water Management) under one umbrella.

<sup>27</sup> For NGMIP, Rajasthan has proposed to install 6,000 grid connected solar irrigation pumps.

are provided subsidy for farm ponds, recharge pits, irrigation pumpsets and micro-irrigation systems apart from technical support on the package of practices and seeds/saplings from the agriculture/horticulture departments.

- **Rajasthan Agriculture Competitiveness Project (RACP).** World Bank funded RACP was launched in 2012 with an aim to increase agricultural productivity and farmer income through efficient water management, crop management, improved agricultural technology, farmer organizations and market innovations across 10 agro-ecological zones of Rajasthan. It was estimated to benefit 155,000 farmers, mostly small holders. The project was restructured in 2014 and now includes GIS mapping, procurement of thematic layers and preparation of groundwater sub plan, land and water resources development map, assessment of water resources availability and use, annual crop water budgeting, installation of piezometers, design and construction of hydraulic structures and hydraulic monitoring network, and data management.

### *3.5 Decentralised/Community Groundwater Management in India*

84. Groundwater Governance as a legal tool for controlling groundwater overuse has largely remained a fringe issue as the number of users are sizable and policing them is almost impossible. The potential opportunity to address the expanse and depth of groundwater crisis requires a decentralised system of groundwater governance that is closest to the well owners/users. Gram Panchayat as the lowest level of democracy fits this criteria as all the well owners and well users have a direct association with it. In addition, the Decentralization Acts, designate Gram Panchayats to be responsible for local rural water supply, environment, agriculture, and irrigation. If at regional scale GPs can be federated at a minor basin level so as to collectively agree on common issues on water sharing and protection, it can yield good results on the ground. Keeping in mind, the technical capacities required to address groundwater management, the nodal agencies/line departments have a crucial role. Coordinated efforts between GPs and line departments on the basis of principles of subsidiarity become an ideal way forward. The model of decentralised groundwater management addresses building the capacity of GP's on physiography, drainage, hydrology, aquifer, climate and other natural systems. Further, Demand Side Management approaches; Water saving devices/approaches such as drip, sprinkler, rain-gun, vermi-compost, mulching, soil management, improving biomass, piped water conveyance, correct positioning of pump, crop diversification, inter crop, are encouraged to be implemented at the local scale under the supervision of GP with support of various government line departments. Supply Side Interventions shall be planned at regional scale investments for collective gains and environmental protection such as harvesting runoff and artificial recharge for creating an impact at the local water balance. The effort shall be to alter the hydrological balance favourably so as to improve the resource base at the aquifer scale, reducing consumption without compromising on the economics. Improved groundwater governance operationalised under the GP will use the natural water bodies, drainages, culturable waste lands and local biomass to improve the groundwater recharge, reduce erosion, harvest rain water and route excess run off into depleted aquifers. Many on-going World Bank projects have implemented this approach in parts such as World Bank- Tank Irrigation Project in AP, WSP- Water Security Pilot, FAO-APFAMGS, SPAC project, and the Maharashtra water supply has agreed to implement this approach.

85. Andhra Pradesh is one of several States underlain by hard-rock aquifers that have suffered considerable depletion of groundwater, largely for irrigation use, in recent decades. The Andhra Pradesh Farmer-Managed Groundwater Systems Project (APFAMGS) has adopted a novel approach to the problem. The core concept of APFAMGS is that sustainable management of groundwater is feasible only if users understand its occurrence, cycle, and limited availability. To achieve this end, the project has engaged farmers in data collection and analysis, building their understanding of the dynamics and status of groundwater in the local aquifers. Even farmers with limited literacy skills have

demonstrated their ability to collect and analyze rainfall and groundwater data, estimate and regulate their annual water use based on planned cropping patterns, and increase their knowledge of improved agricultural practices through attendance at farmer water schools (at which a third of the facilitators are women). The project does not offer any incentives in the form of cash or subsidies to the farmers: the assumption is that access to scientific data and knowledge will enable farmers to make appropriate choices and decisions regarding the use of groundwater resources. The core organizational component of the project is the groundwater management committee, a village-level community-based institution comprising all groundwater users in a community. The committees are in turn grouped into hydrological units. Data gathered through hydrological monitoring of rainfall and groundwater levels are used to estimate the crop water budget, which is an aquifer-level assessment of the quantity of water required for the proposed rabi (winter) planting. Awareness of this statistic has become one of the essential variables that farmers take into account when making their cropping decisions for the coming season. Preliminary findings in the project area have shown that the project has achieved a closer alignment of water availability and water use, and reductions in groundwater use have been realized through, for example, crop diversification (with an increase in low-water-use crops) and water-saving irrigation methods. Importantly, farmers have not sacrificed profitability to reduce water use.

## 4. Program Capacity and Performance Assessment

### 4.1 National-level Assessment

#### 4.1.1 Adequacy of Legislative Framework

86. The legislative environment in India is characterized by the strong States within the wider federal framework. The Constitution lists “water supplies” under the State List, thereby giving States jurisdiction over the groundwater within their boundaries, while one of the functions of the Union Ministry of Water Resources is “overall planning for the development of groundwater resources”. In an attempt to regularize the matter the Government of India established the Central Ground Water Authority in 1997 to regulate and control groundwater development with a view to preserving and protecting the resource. It has also issued several revisions of the Model Groundwater Bill of 1970, which provides States with a template for regulation of groundwater. The Planning Commission’s Expert Group on Groundwater Management and Ownership has argued that the legislative framework is in fact reasonably robust, and the priority lies in enforcement of existing measures, supported by innovative approaches such as an expansion of communitybased management

87. There is a clear lack of a uniform legislation at the national level to address inter-regional, inter-State, intra-State, as also inter-sectoral disputes in sharing of water.

88. Under article 243 (G) of the 73rd Constitutional Amendment Act, 29 subjects can be devolved to local governments one of which is water such that planning, budgeting, monitoring is to be handled by Panchayats to ensure greater transparency, accountability and peoples participation in managing water resources. So far 26 States and 5 Union Territories have passed their own Panchayati Raj Acts. However, devolution of 29 subjects has taken place sporadically and activity mapping to guide the exercise has not taken place.

89. **Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013.** Land acquisition is not an issue for the activities under CGWB. And in case land has to be acquired, focus is on using land which is owned by the government, uninhabited and not occupied nor utilized for living or livelihood.

90. **Right to Information Act 2005.** As per the Central Information Commission (CIC) direction<sup>28</sup> in 2012, all records are to be catalogued, categorised and computerised for easy dissemination and disclosure. Based on the CIC direction, MoWR, RD&GR has categorised and catalogued and made its information and records available online at <http://wrmin.nic.in/rti/rti-mowr.html> including details of RTI applications and their replies. All groundwater related issues are under CGWB, it has designated Appellate Authority, CPIO, ACPIO at Boards’s Headquarters office, Faridabad to provide the required information to the information seekers as per the provisions of the RTI Act-2005. The CGWB has also made this act available at [http://www.cgwb.gov.in/rtiact/Manual\\_on\\_rtiact.pdf](http://www.cgwb.gov.in/rtiact/Manual_on_rtiact.pdf). Board has also designated public information officers (PIOs) at all Regional Offices, list is available at <http://www.cgwb.gov.in/pio.html>. The nature of applications range from seeking information on groundwater levels and quality, the extent of contamination, copies of rules and regulations related to groundwater use, copies of research reports, and so on. Similarly, all State nodal agencies for groundwater publicly disclose its mandate and function and also designate a PIO to handle all grievance and applications under the Right to Information Act

91. Allocation of Business Rules 1961 along with Policy Guidelines for redress of Public Grievances 2010- As per the guidelines of Department of Administrative Reforms and Public Grievances all

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<sup>28</sup><http://wrmin.nic.in/writereaddata/RTI/CICletter3939287451.pdf>

Ministries have to provide online public grievance service. CGWB provides contact of the Public Grievance Officer online but the grievance redressal page is not interactive and there is no system to track applications/complaints as has been defined by the policy directive.

92. While the above-listed, as well as State's right to service legislations provide general grievance redressal opportunity, there is an absence of dedicated public grievance redressal mechanism for handling issued arising from groundwater improvement or management.

#### *4.1.2 Effectiveness of Administrative and Organisational Environment*

93. Management of groundwater suffers from fragmentation of responsibility at both Central and State levels. Many agencies in various sectors have mandates relevant to groundwater, but there is little coordination among them and a lack of regulatory oversight. Not all States have dedicated groundwater authorities, and in almost all cases groundwater-related agencies suffer from understaffing, lack of capacity, marginalization, and outdated mandates that prioritize survey and development ahead of resource management.

#### *4.1.3 Performance in Implementation and Support in Groundwater Programs*

94. CGWB is responsible for preparing aquifer management plans, assess resources, and monitor quality and quantity across India.

95. CGWB is regularly monitoring groundwater quality on a regional scale through a network of around 22,339 observation wells. The groundwater data and information generated is made available through Web Enabled Ground Water Information System (WEGWIS).

96. CGWB collects information, maps data and prepares reports on GW across India up till the District level. Data and outcome analysis is provided to the States for informed and sustainable planning and management of GW resources. CGWB provides assistance to State governments, Central ministries, public undertakings, defense & paramilitary, and several institutions<sup>29</sup> across India. A major gap in groundwater regulation is the overall lack of controls on drilling and installation of large agricultural irrigation wells. Some regulation of industrial supply wells is in place in some States but compliance and enforcement is generally weak. Spacing requirements to prevent drawdown of neighboring wells rarely go beyond suggested uniform setbacks rather.

#### *4.1.4 Institutional Capacities to Address Environment and Social Issues*

- **Environmental screening of Program interventions.** The CGWB has prepared a 3-page screening checklist, as part of its master plan, for siting and selection of suitable recharge structures. The questions to be considered in the screening process are inundation of habituated land, creation of water logging, deterioration of groundwater quality and public participation. Generally, the planning and design of the Program interventions are carried out based mainly on technical evaluation of whether the structure can work hydraulically. There appears to have been very little dissemination or use of the checklist. Furthermore, the CGWB and implementing agencies do not have environmental and/or social specialists on board to address environmental and social issues while planning and designing the Program interventions.
- **Social Inclusion.** While the legislative provisions have inbuilt safeguards to ensure the vulnerable groups are included in the planning and implementation process, there are

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<sup>29</sup> For instance, CPWD, NHPC, ITBP, CPR, CISF, BSF, Nationalized Banks, Educational Institutes, and so on.

either no mechanisms to track/monitor or the existing reporting systems be it under existing MIS, narrative reports, Detailed Project Reports (DPR) are susceptible to manipulation. There are also no reward/penalize if such processes are not being followed. Also, there are no independent studies available which map or assess the linkages between socio-economic profile and groundwater.

- **People's Participation**

- Participatory planning, mapping and monitoring: All schemes directly or indirectly related to use and management of groundwater talk about community participation but the institutional mechanisms to address the same are negligible. Representation and in addition, participation of women and excluded groups is further skewed in the few consultations that do take place for planning and monitoring.
- Farmers Participatory Action Research Program: While independent evaluation is yet to be conducted, the CGWB internal assessment is that such schemes have helped farmers in using water efficiently, increased the yield and their incomes due to which they are willing to adopt the technologies demonstrated.
- Community agencies such as Panchayati Raj Institutions (PRIs), Village Officers (VOs) and community leaders and individual users do not effectively participate in the aquifer mapping and management since the CGWB does not possess community skills and specialists who can mobilize communities, given their weak training and outreach capacity. The existing examples of training community in groundwater monitoring are far and few and there are no impact/outcome studies on the same available. Non-allocation of funds to State agencies are key factors for lack of progress of Participatory Ground Water Management (PGWM) activities

- **Citizen Engagement**

- CGWB prepares maps, atlases, brochures which can be used by planners, administrators and users.
- 384 mass awareness campaigns on groundwater conservation, protection and sustainability conducted so far. There is a need to assess the impact of these campaigns.
- To increase the outreach, in Uttar Pradesh an experiment has been done to organise Tehsil Divas (District Day) during which the scientist disseminate information.
- There are plans to tie up with All India Radio for mass awareness campaigns on groundwater
- Citizen Charter: As per guidelines of Department of Administrative Reforms and Public Grievances. The Citizen Charter of MoWR, RD&GR is available detailing its

services,<sup>30</sup> responsible persons, contact information and documents required (including GW). Citizen Charter of CGWB<sup>31</sup> is available on their website <http://www.cgwb.gov.in/citizencharter.html>.

- For RTI and Grievance Redressal there are institutional systems in place though the nature of complaints/grievances and kind of information sought is not available in print or online
- **Capacity Development**
  - In CGWB, against the sanctioned human power of 4160 personnel (884 scientific posts, 1893 engineering posts, and 1383 administrative posts) 2,968 positions are filled. There are no environmental or social specialist positions in the CGWB.
  - Rajiv Gandhi National Ground Water Training and Research Institute (RGNGWTRI) is the nodal agency for organizing trainings on themes related to groundwater. The Tier 1 trainings are more towards preparing Trainers, Tier 2 trainings are for Officers of State & Central Government Organizations and Students/Faculty from Academic Institutions (mainly professional practitioners) and Tier 3 are targeted towards those who are directly involved in implementing like Farmers, Panchayat leaders and field level staff. There is no outcome assessment of trainings available centrally.

## 4.2 State-level Assessment

### 4.2.1 Adequacy of Legislative Framework for Groundwater Regulation and Management

97. Only Karnataka and Maharashtra have enacted groundwater regulation and management acts, which were prepared based on the 2005 Model Bill. The Planning Commission's Expert Group on Groundwater Management and Ownership<sup>32</sup> has framed the legal environment as adequate for groundwater management:

- It acknowledges that there is sufficient basis for government action, in that "The recent court rulings have held that the Union State has got a duty to protect groundwater against excessive exploitation and the inaction in this regard will be tantamount to infringement of the right to life of the people guaranteed under the Constitution of India."

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<sup>30</sup> Main service includes: Recommendation for release of financial assistance to States for implementation of Accelerated Irrigation Benefit Programme (AIBP), Command Area Development & Management Programme (CAD & WM), Economic Appraisal of Externally Aided Projects (EAP) and Repair, Renovation & Restoration (RR&R) of Water Bodies. 2. Recommendation for release of financial assistance to States for implementation of Flood Management Programme (FMP). 3. Recommendation for release of financial assistance to States/UTs for conducting Minor Irrigation Census. 4. National Water Policy, 2012. 5. Conservation of water, minimizing wastage and increasing water use efficiency through integrated water resources development and management under 'National Water Mission' Action Plan. 6. Launching of National Aquifer Mapping and Management Programme & Participatory Groundwater Management.

<sup>31</sup> It states that CGWB does not provide direct services to citizens or any private agency. However, the users benefitted from the Board activities are: Central and State Government Organisations dealing with drinking water supply, environment and pollution control and planning commission, and so on; Various Universities and research Organisations of India and other countries; NGOs. which are engaged in groundwater profession and water pollution studies, and so on; Individual citizens engaged in groundwater profession

<sup>32</sup> Planning Commission. 2007. Report of the Expert Group on Groundwater Management and Ownership. New Delhi, Government of India, Planning Commission

- The “Central Government’s role emanates from the provisions of the Environment Act, because as overexploitation of groundwater is gaining momentum, environment is increasingly under threat.”
- It realizes the implementation constraints associated with regulatory measures: ‘Given the enforcement problems relating to prohibitive measures, greater reliance needs to be placed on community management of the resource, supported by adequate technical inputs, complementary institutional changes and appropriate incentives (such as a subsidy regime for micro-irrigation), rather than on ‘controls by State’”.
- It advocates selective regulation, establishing that “Should groundwater level fall below the replenishable level in a specific groundwater Block, the Central Government should intervene with command and control measures, under the provisions of the Environment Act, by declaring the affected area as ‘environmentally threatened’”

98. The regulatory framework in Karnataka and Maharashtra on groundwater development (Karnataka Ground Water Act, 2011 and Rules, 2012; Maharashtra Ground Water Bill 2009) has adequate measures for control of groundwater development in notified Blocks, though the enforcing these regulations will be challenging due to presence of millions of wells in these States. Also there is no system of coordination among the agencies involved in implementing the regulations. For example, Karnataka Ground Water Act specifies that permit for drilling new borewells is not given for water intensive crops like paddy and sugarcane; priority for permit is given for those who adopt sprinkler and drip irrigation system; and a person without a permit in a notified area is not eligible to receive subsidies, grants, loans from the Government or a financing institution to dig well and extract groundwater, power connection and electricity supply. Also, farmers not using sprinkler and drip irrigation in notified areas are not eligible to receive any subsidies or incentives from the Government. However, there is no system for coordination with the Agriculture or the Revenue Department for monitoring of crop selection, adoption of sprinkler or drip irrigation, access to subsidies, and so on. Rajasthan, Gujarat and Haryana will develop and enact the regulations under the NGMIP, and while developing these regulations, they should consider the implementation constraints as described above.

#### *4.2.2 Adequacy of Legislative Framework for Environmental Assessment*

99. As per the Pollution Control Board notifications, 2015 any construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the schedules of the Environmental Impact Assessment (EIA) notification dated 14/9/2006 requires prior environmental clearance. The EIA Notification, 2006 under the Environmental Protection Act (EPA), 1986 discusses the need for environmental clearances for a number of activities, either by the Central or State governments. As the NGMIP focuses on small-scale investments, it would be a rare instance where such investments would require a formal EIA report. However, there is a need for targeted studies in each State to assess cumulative impacts from any concentrations of structures.

#### *4.2.2 Adequacy of Legislative Framework for Social Safeguards*

100. As per the State Water Policy (draft or otherwise) there are provisions to ensure equitable distributions, protection of interest of the vulnerable, participatory planning, community monitoring, improved governance and transparency, and so on. In Karnataka, mainstreaming participation through transfer of O&M and management to user groups; system of ‘water rights’ for equitable and efficient distribution of irrigation water. In Rajasthan, the supply of drinking water has safeguards for those who cannot afford to pay; Panchayats take the responsibility of O&M for Janta Jal Yojna (drinking water); O&M of watershed related structures are given to watershed committees; WUAs are

constituted to ensure equitable distribution of water in command areas. In Gujarat, the infrastructure created for groundwater recharge and management are handed over to the Panchayat during O&M. In addition, all States provide for checks and balances, social inclusions, decentralized and participatory development, strengthening of community based organizations under the Irrigations Acts, Agriculture related Acts, Decentralizations Acts, Rehabilitation and Resettlement Acts.

#### *4.2.3 Effectiveness of Administrative and Organisational Environment*

101. Groundwater organizations are generally located at a relatively low level in the State hierarchy, often in the departments whose interest is focused on one of the main water uses, for example irrigation or water supply. Even where they are considered an independent department, they report either to the irrigation or water supply minister, and are a relatively minor part of the minister's charge.

102. The structure, functioning, and staffing of groundwater agencies conform primarily to the long-outdated mandate of surveying and developing the groundwater resource, and are not oriented to paying any attention to the users and the socioeconomic dimensions of groundwater use. Resource management functions currently receive very scant human and financial resources compared to surveying, monitoring, and development of groundwater.

#### *4.2.4 Effectiveness in Inter-departmental Coordination*

103. **Data sharing.** In all States, the existing avenues through which the Government departments share information on groundwater assessment with each other are periodic reports published on paper or on their websites. However, events or other means to make research/information/data sharing more dialogical does not exist. Similarly, there is no system of information sharing with the concerned community/PRI/ULB.

104. **Convergence.** There are examples of models such as PMKSY bringing opportunities for departments to work together as well as provide greater resource base to address water management in an integrated manner within the framework of equity and sustainability. Under the Integrated Watershed Management Program (IWMP), Detailed Project Report (DPR) are prepared which brings together groundwater department, Animal Husbandry, Rural Housing, Sanitation, and so on. Similarly, under MGNREGS, activities are converged with groundwater management schemes, where members from GW Department are involved. However, there are no examples where GW Departments in the State take lead or coordination role in bringing other Departments under an umbrella either for planning or designing or assessments of on-going Programs.

#### *4.2.5 Performance in Implementation and Support in Groundwater Management*

105. Groundwater Departments in the States do not have adequate staff at the District level to monitor compliance by groundwater users and to coordinate with the other relevant agencies on access to subsidies, grants, loans on digging/drilling, power connection and electricity supply. In States like Gujarat, in the absence of implementation of Groundwater Act in the State, there is no regulatory provision for drilling a well except for industries which need to take necessary permission from CGWA. The severe scarcity of water in notified areas makes it politically risky to regulate extraction for domestic and irrigation purposes – this could be one of the reasons behind the high number of permits given for new bore wells.

106. Also, the system of mapping and registration of existing users exists but the coverage is not comprehensive be it for users or for agencies providing services like drilling. In the absence of effective involvement of local bodies, the overall management is weak both top down and bottom up

#### 4.2.5.1 Performance in Environmental Issues

107. **Environmental clearances.** Mandatory environmental assessment and clearances are not required for the proposed investments related to the artificial recharge in the NGMIP. Generally environmental impact assessment preparation and environmental clearances are required for only major irrigation and hydropower projects. Hence any environmental baseline data is not collected during preparation of detailed project reports of these investments. Institutionally, the State environmental impact assessment authorities are responsible for review and approval of EIAs and State pollution control boards are responsible for monitoring of implementation of mitigation measures. However, neither of these institutions have reportedly been involved in any groundwater recharge or water shed related projects in the States.

108. **Environmental planning.** The planning on the supply side interventions on groundwater recharge are mostly based on the technical criteria. Generally environmental issues were not considered during planning process of the artificial recharge structures. There were also no environmental staff in the State groundwater agencies and also in the departments that deal with the watershed development in the State.

109. **Management of construction-related Impacts and post construction monitoring.** There are some shortcomings in the performance in the implementing agencies during construction supervision monitoring, which are primarily due to lack of environmental staff and adequate environmental clauses in the contract documents. However, the performance is generally good in the similar Programs funded by the external financing agencies such as World Bank due to setting up of specific project management units and placements of environmental staff in these units.

#### 4.2.5.2 Performance in Social Issues

110. **Social inclusion.** There is some change in the discourse on water which is shifting from individual right to a common property resource with increasing focus on groundwater as well as prioritizations of drinking water for human as well as livestock, and agriculture over industry. The needs of BPL, SC, ST, women, landless, and small and marginal farmers in flagship government Programs like MGNREGA,<sup>33</sup> Watershed are also being addressed. Also when there is regulation through water tariff, there are efforts to provide minimum quantity of potable drinking water to those who cannot pay.

111. **Community participation.** All States have Water User Associations (WUAs) constituted in the command areas to promote participatory water management and promote equity in water use. Similarly, Watershed Committees formed under watershed Program in each Panchayat support in planning and implementation of watershed development activities. The Associations and Committees draw membership from women, SC, ST, landless, and small and marginal farmers. In contrast, there were many sites visited during the assessment where WUA were either not there or not functional. In Gujarat, community participation under IWMP was observed as well as examples where NGOs have played a crucial role on village level aquifer mapping and groundwater monitoring by mobilizing communities. Besides government Programs, there are examples of community participation promoted by NGOs that have been active in mobilizing people for planning and implementation of

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<sup>33</sup> In contrast, a 2012 study on MGNREGS concluded that works such as check dams, percolation tanks and de-silting of water bodies had lead to increased groundwater recharge, improved water availability in borewells and open wells, leading to increase in area irrigated. However, of the 4 states sampled in the study, findings from Karnataka are the most modest – of the 67 percent beneficiaries owing borewells, 16 percent reported an increase in their irrigated area and in the number of days of water availability. (*Environmental Benefits and Vulnerability Reduction through MGNREGS – Synthesis Report*. IISc, MoRD, GIZ. 2013. Viewed at [http://nrega.nic.in/Netnrega/WriteReaddata/Circulars/Report\\_Env\\_Benefits\\_Vulnerability\\_Reduction.pdf](http://nrega.nic.in/Netnrega/WriteReaddata/Circulars/Report_Env_Benefits_Vulnerability_Reduction.pdf))

water conservation Programs including reviving the traditional community based water structures particularly in Rajasthan.

112. **Gender.** In India, nearly three-fourths of women in rural areas are engaged in agriculture as their primary occupation, but their ownership of total landholdings in the country is only about 13.48 percent. This is especially relevant since the burden of provisioning water in scarce regions almost entirely falls on women and girls, often at the cost of sacrificing their education and other productive engagements. Women farmers and landowners are largely smallholders and have further limited representation and role in decision making and management of local water resources and get marginalized in institutions like WUAs which men and large landholders tend to dominate.

113. **Accountability.** Experiences on existing similar Programs on watershed test effectiveness and inclusion through the use of accountability and community monitoring tools like Sujal Cards.

114. **Decentralized planning and management.** In the absence of overall development planning in the hands of Panchayats, there are sporadic roles that Panchayats play in the name of resource assessment, planning, management and monitoring. In case of MGNREGS, Panchayats manage and implement the scheme, IWMP works are ratified by Gram Sabha, in some cases O&M is in the hands of Panchayats, there are examples where sometimes that inputs are taken from concerned Gram Panchayats (after departmental approval of schemes) largely on site selection, and so on. However, since Panchayats continue to be seen as implementing agencies and not “governments” for overall planning and development, all the development schemes (related to groundwater or otherwise) are implemented as per the Annual Plans of the respective Department. Also, during the assessment it was observed that there are several villages where no consultation is done with the local PRI members/farmer groups/community (on site or size) while planning minor irrigation projects and the project design is based entirely on technical and economic considerations. Data on the nature of landholdings to be potentially benefitted, number and socio-economic profile of farmers possessing land in the command area/zone of influence is not captured while planning projects, though it is supposed to be done as part of command area survey. To summarize, due to limited capacity inputs, incomplete delegation of functions, parallel implementation plans of departments, there is poor ownership of water supply schemes among the elected representatives.

115. **Public grievance redressal.** There are a general few public grievance redressal mechanisms that cover the functioning of both national and State governments across sectors, however since groundwater has significant impact on both life, livelihood and is an important common resource, it is important to have instruments that specifically cover all State interventions on groundwater conservation, extraction, development and management. These mechanisms will need to cover all interventions that aim to create equitable access to groundwater or opportunity for participation in its management.

#### *4.2.5 Institutional Capacities to Address Environment and Social Issues*

116. Besides the larger technical issues of unoccupied staff positions, lack of systems to hire consultants and agencies, interim offices, limited number of laboratories, adhoc trainings, there are no expertise on social and environment in any of the participating States.

117. Huge capacity gap among local bodies in their understanding of water quality/availability issues, including on issues pertaining to groundwater particularly groundwater quality and surveillance.

118. While various schemes promote participatory water management, there has been little investment in creating capacity of the associations for taking over the management and maintenance of these schemes/water bodies.

119. Most institutional challenges are rooted in the lack of clear governance structure, limited inter-agency coordination, overlapping functions and lack of dedicated and single institutions to deliver and manage GW sector. Thus, institutional gaps (management, coordination, oversight, and enforcement) need to be addressed at the State level and action plans from States expected to give it a priority.

## 5. Assessment of Program System

### 5.1 *Potential Environmental Impacts, Risks, and Benefits of the Program*

120. The national and State governments have a well-developed environmental legislation, but the investments proposed under the Program do not require any environmental clearances from the State level Environmental Impact Assessment Authorities or national Ministry of Environment and Forests. However, necessary approvals may be required from the competent authorities if investments are located in reserve forests, protected areas or coastal regulatory zones. Investments that are expected to cause significant environmental impacts or the investments that would be categorized as A as per World Bank OP 4.01 will be excluded from the scope of the Program. Exclusion will be ensured through environmental screening of all proposed investments as part of the planning process.

121. Environmental Management Systems are in place, but require strengthening, for considering environmental issues in the selection of potential recharge sites and to address construction related impacts. There is a CGWB standard checklist on environmental screening criteria for selection of recharge structures, and the construction bid documents generally contain environmental clauses; but they are not being adequately implemented due to lack of capacity in the State level implementing agencies. Environmental staff is recommended in the State level implementing agencies to strengthen their environmental management capacity, and to address environmental impacts of the Program.

122. The main strength of the Program lies in its community based approach for groundwater improvement focusing on both supply side and demand side investments. However, for sustainability of these interventions, measures would be needed for continued community support and availability of adequate funds for operation and maintenance even after completion of the Program period. Environmental impacts associated with qualifying individual investments can be managed with known mitigation measures which are within the capacity of counterpart agencies to implement. However, systems are not currently in place to identify, minimize or manage potential cumulative risks.

123. Maharashtra and Karnataka have robust regulatory framework on groundwater abstraction and use in the over exploited Blocks. But enforcement of these regulations on the millions of wells is a challenging task. To address this issue, it is recommended that the State groundwater agencies should study various options such as community based management for enforcement of the regulation or limiting the scope of regulation to only few endangered aquifers.

#### 5.1.1 *Potential Environmental Benefits*

124. While the extensive groundwater development in the country has contributed positively to poverty reduction and economic growth, inadequate planning has resulted in numerous environmental problems. Many of these are linked to over pumping -- from reduction in base flows to rivers (with consequent ecosystem impacts) to intrusion of saline water into freshwater aquifers. States participating in the NGMIP will be taking important steps to mitigate some of these impacts and will improving the groundwater resources. The DLIs recognize such positive benefits of the Program as (i) improvement in the sustainable well yields in the areas where over-development has depleted the aquifer, (ii) rise in groundwater levels will result in lower cost of pumping and energy savings, and also greenhouse gas reductions (iii) improved agricultural yields for each unit of applied water - hence improved socio-economic conditions of the local people, and (iv) possibility of improved groundwater quality due to dilution.

125. Climate change could exacerbate current pressures on groundwater resources, particularly if users increasingly turn to this relatively more shielded resource with changes in the reliability of surface water supplies. On the other hand, groundwater can play an important role in adapting to

climate change, if it protected and managed in conjunction with surface water. One of the benefits of the Program will be mitigation of some of these impacts by improving the groundwater resources and provide increased resilience to climate change. The program will also contribute to lower greenhouse gas emissions as a result of more effective groundwater management. It is estimated that there will be about 10 percent reduction in groundwater pumping from the participating states due to improved groundwater management, and this will lower greenhouse gas emissions to the tune of approximately 5.6 million tons of CO<sub>2</sub> equivalents per year

126. Investments in improved water use efficiency through micro irrigation will promote lower fertilizer and pesticide application. Thus the other benefit of the Program will be reductions in the return flow from agricultural fields and thereby reducing pesticides and fertilizers in water resources.

### *5.1.2 Potential Environmental Impacts and Risks*

127. The potential environmental impacts and risks of the Program is summarized in Table 4 of the Executive Summary. Based on the team's evaluation, the environmental risks of the Program are largely low to moderate, but for some types of investments are considered Substantial, therefore elevating the overall Program environmental risk level to Substantial. While the risks and impacts associated with individual investments of the Program may be low to moderate, consisting of typical impacts from small scale civil works activities as well as impacts associated with inadequate maintenance, the cumulative impacts of the overall investments at a larger watershed scale may be more substantial. The impacts from both demand side and supply side measures along with mitigation measures are elaborated below.

#### **5.1.2.1 Potential Environmental Impacts and Risks of Demand Side Interventions**

128. Environmental impacts associated with demand side investments are very few compared to the supply side investments. Impacts from demand side investments will mainly result from minor civil works; health and safety risks associated with conversion of low voltage power distribution lines with high voltage lines; and disposal of drip irrigation pipes after completion of their useful life.

129. **Disposal of drip pipes and sprinklers.** The Program promotes the micro irrigation technology through drip and sprinklers. Generally good quality drip pipes and sprinklers usually have a life time of 6 to 8 years. Some States, particularly Karnataka, have also expressed interest in promoting polymer mulching for retaining soil moisture. All these plastic materials, after their useful life, need to be disposed properly.

130. **Construction related environmental impacts and occupational health and safety.** Conjunctive use of groundwater and surface water in canal command areas might include civil works related to some extension of canals works in groundwater scarce areas or drilling of discharge wells in the water logged areas. Constructing of farm ponds also require some earth works. These civil works may pose community and occupational health and safety risks. Environmental health and safety guidelines should be in place to mitigate any construction related impacts; and standard Environmental Code of Practices should be included in contractor bid documents.

131. **Impact from use of treated municipal waste water for irrigation.** The use of treated waste water for crop production will have significant benefits to the farming communities and also negative impacts on the communities and environment if not adequately treated. In terms of potential benefits, the waste water provides a reliable source of water supply to farmers, for crop production; conserves nutrients, thereby reducing the need for artificial fertilizers; increases crop yields and returns from farming; and provides source of income through its use. Potential negative impacts could include increased exposure of farmers, consumers and neighboring communities to infectious diseases;

groundwater contamination; and soil contamination (buildup of salts, heavy metals in the soils, which may reduce soil productive capacity in the long run). Degree of treatment of waste water prior to its use is a key criteria to minimize the negative impacts. There are Government of India standards for effluent quality on irrigation use and these standards are to be complied. Investments for recycle and reuse of municipal treated waste water has been proposed by Haryana and Gujarat. Haryana has already experience in supplying treated waste water for construction purposes.

132. **Health and safety impacts from high voltage distribution lines.** Under managing energy and irrigation nexus, the power connection to irrigation wells will be separated from domestic connections through separate feeders and converting low voltage distribution lines to high voltage distribution lines. These interventions may pose community health and safety impacts. Other interventions under energy and irrigation nexus are promotion of high efficient water pumps and solar pumps will be promoted. Adequate facilities should be made available for recycling of used pumping machinery.

133. **Overuse of groundwater with no net benefit in improvement of water levels.** The NGMIP will foster greater efficiency in groundwater use, increase supplies, and foster demand-side efforts to the extent possible. While these in theory should allow water levels to rise to support the same user needs, there is the risk that users will adopt greater efficiency measures but pump more to, for example, to exploit the increased resources for bringing more areas under irrigation. The water security planning process, and more frequent monitoring under the NGMIP will be mitigating factors.

134. **Sustainability of demand side interventions.** Experience from similar interventions in the past projects suggest that these kind of community driven groundwater management measures require continued community motivation and support for their long term sustainability even after completion of the Program period. The interventions under the NGMIP will be prepared with an eye towards sustainable operations.

#### 5.1.2.2 Potential Environmental Impacts and Risks of Supply Side Interventions

135. **Construction-related environmental impacts and occupational health and safety.** Construction activities for recharge structures in streams may affect the water quality in the streams. Excavation works by the earth moving equipment may pose community and occupational health and safety risks. Borrow material will be required for construction of check dams and to use as filter material in recharge shafts or in dug well recharge. Periodic removal of sediments behind the recharge structures, and also mud-cake from the filter material of recharge shafts will be required during maintenance. Improper disposal of sediments during maintenance and debris during construction could Block natural water courses and impact downstream beneficiaries.

136. **Water logging.** During high rainfall events, the fields and houses near the recharge structures may experience water seepage and water logging. The surface water bodies created by the recharge structures may act as mosquito breeding grounds. The recharge structures near the shallow water table areas could also lead to water logging of soils, and creation of undesirable wetlands.

137. **Failure of structures.** The gabions and earthen check dams will be susceptible to failure during higher storm events due to overtopping of stream flows. Failure of these structures will obstruct the water flows in the streams and may change the stream course if the material is not removed from the streams. As most of these check dams are under 2-3 meters in height (according to 2008 Bureau of Indian standards), they pose in general much less of a risk to populations, but regular inspection and repair efforts should be continued by communities with the support relevant government departments during operation and maintenance stages. Strengthening of capacity on structure maintenance will be required under this Program.

138. **Recharging water quality.** Storm water runoff from agricultural fields may introduce fertilizers and pesticides into recharge systems, in some cases contributing to groundwater pollution when they are used for direct injection in to recharge wells. There could be potential health impacts if these waters are used for drinking purposes. Similarly, if the untreated municipal or industrial waste water is disposed through injection, there can be serious risk of soil and groundwater pollution. Recharging through saline rich soils or contaminated soils will leach minerals naturally found in soils or anthropogenic contaminants in the soils in to the groundwater. Indian regulatory practices are not well advanced to control these issues. Differences in water properties between recharging water and native groundwater, such as pH or oxygen concentrations, could lead to dissolution of undesirable metals or minerals within the aquifer, or conversely, the immobilization of some elements or compounds. As these complex issues cannot be assessed on an individual structure-basis (unless of sufficient size as to require full environmental assessment), good practice would suggest further State-specific studies (perhaps at several locales in each State) to assess this issue be included in State NGMIP resource assessment efforts. Regular monitoring of recharging water and groundwater would be required. Where the storm water surface runoff or recharging water are expected to be polluted and are being used for artificial recharging purposes, the quality of these waters will need to be monitored for known contaminants in that area. If these waters are found to be contaminated, they should not be used for 'direct subsurface recharge through injection' and if the contaminants can be treated with simple sand and gravel filters, they could be used for surface recharge.

139. **Cumulative impacts of recharge structures.** Recharge structures such as check dams and percolation tanks trap almost all runoff generated low rainfall events, and overflow events occur during high intensity rainfall events. While individually, the recharge structures will have very localized impacts, the series of the recharge structures within in a single larger watershed, in combination with other major upstream irrigation projects, may have significant cumulative impacts on the downstream releases to rivers, lakes and wetlands; in cases affecting the downstream river morphology. According to initial proposals, each State is planning to build more than 3,000 recharge structures (check dams, percolation tanks, recharge shafts, recharge wells, and so on). Maharashtra has proposed more than 30,000 such structures. Exact locations and designs of these structures are not known at this stage, and hence cumulative impacts of these structures can be considered as significant. There is also risk that inflow to the major irrigation dams on the downstream will also be affected due to upstream recharge measures. On positive side, these recharge structures may contribute to flood control and protect the downstream areas from flash floods. The investment planning process for recharge structures need to include cumulative impact assessments, to be carried out at the State level, every year, to assess, minimize and manage these impacts.

140. **Sustainability of the supply side interventions.** Past practices have not focused on the sustainability of the recharge structures. Many of the existing recharge structures are not operating as they have not been maintained; often due to a lack of operation and maintenance funds. This is a special problem in recharge structures such as check dams, recharge shafts and village tanks. The local water user committees would normally be responsible for maintenance of these structures and adequate budgetary provisions are to be made at the time of project preparation to cover the expenses related to maintenance also. Periodic removal of sediments behind the recharge structures, and also mud-cake from the filter material of recharge shafts will be required during maintenance. Improper disposal of sediments during maintenance and debris during construction could Block natural water courses and impact downstream beneficiaries. These sediments can be used for agricultural use. New structures under the NGMIP will be prepared with an eye towards sustainable operations, as will overall investment planning for existing structures.

141. **Significance of OP 7.50 (Projects on International Waterways in Operation Context).** Some of the Program activities relate to tributaries of the Indus River and Ganges River (in Haryana and Rajasthan); and some of the activities are also relate to tributaries of rivers flowing into the Rann of

Kutch and the Indus River Plain Aquifer (AS78); all of which are international waterways under the Bank's Operational Policy 7.50 Projects on International Waterways. The tributaries of the Indus that may be affected are the Ravi and the Sutlej (and its tributary the Beas) and the Ghaggar River, which terminates before reaching the main stem of the Indus River. The river flowing into the Great Rann of Kutch that may be affected is the Luni River. The tributaries of the Ganges that may be affected are those in the Chambal and Upper Yamuna sub-basins. The potential effects are described below. A notification was issued to all riparian countries (Afghanistan, Bangladesh, China, Nepal and Pakistan) in conformance with OP 7.50.

142. The interventions under the proposed Program are expected to cause minor changes to the water balance of the above waterways. The main water balance change will be to capture (as groundwater recharge) a very small fraction of the monsoon runoff in the upper watershed areas of these rivers. This will cause a small reduction in monsoon flow in the upper reaches of these rivers. This may cause minor reductions in flood peaks or volumes downstream. However, the monsoon flow reductions in lower reaches of downstream riparian countries are expected to be so small as to be indiscernible. The increased groundwater recharge is meanwhile expected to increase lean season base-flow in these rivers. The increased recharge, together with demand-side management interventions, is expected to improve the overall groundwater balance (including of the transboundary AS78), and will enable over-exploited aquifers in India to be returned to sustainable levels of use, with incremental recovery of depleted groundwater levels. The Program will not support any investment that may lead to an increase in water use. Rather, the proposed demand-side interventions aim to improve the efficiency of water use through incentivizing physical and policy aspects of irrigation efficiency, power system management, crop diversification and conjunctive use strategies.

## *5.2 Potential Social Impacts, Risks, and Benefits of the Program*

143. On one hand, groundwater has played a very significant role in the socio-economic development of several regions in India. On the other hand, 30 percent of the groundwater assessment Blocks in the country classified as semi-critical, critical, or overexploited with the situation deteriorating rapidly. This has severe consequences for the poor and adds to the drudgery of women and already marginalized communities, which is further compounded by weak policies, institutional capacities and systems to manage groundwater management. As the NGMIP recognizes these gaps and aims to support interested States to address them through effective management, the Program is expected to have an overall positive impact on the communities and participating States which can provide valuable lessons for nationwide application. The States of Karnataka and Maharashtra have an enabling policy environment to undertake progressive and transformational action on groundwater while in others States,<sup>34</sup> the right impetus to adoption of new policies can help improve groundwater management. Some of the key Program strengths are its holistic approach, focus on institutional strengthening, focus on both urban and rural locations, impetus to building/collecting and sharing of knowledge and information, and importance given to participatory planning, community based development and monitoring of groundwater resources. In all States, existence of several departments (Groundwater Directorate, RDWSD, Watershed, Minor Irrigation, and so on) with experience and institutional mechanisms for using groundwater can be used as an opportunity to capitalize on good practices.

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<sup>34</sup> The State Water Policy (2010) of Rajasthan has put in practice a model of integrated water resource management. This has received added impetus through MJSa (2015) that aims to fast-track the planning and management of water resources including groundwater.

### 5.2.1 Potential Social Benefits

144. **Institutional strengthening.** The current Program is designed to support the CGWB in improving management of groundwater but in the initial phase itself States have been taken on board so the institutional capacities for implementation can be strengthened at all levels, and support inter-sectoral linkages between key agencies dealing with groundwater- the CGWB, State Ground Water Departments and local institutions such as the Panchayati Raj Institutions (PRIs). The funding modality is geared towards incentivizing good performance, allowing for flexibility in operations such that a results based culture for groundwater management is developed, and promoting new and innovative approaches that have the potential to make a transformational impact.

145. **Conjunction with SDGs.** By supporting sustainable management and use of groundwater resources in India, the Program is also closely aligned with the achievement of Sustainable Development Goal 6 on Water and Sanitation; specifically goal number 6.6 'By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

146. Opportunities to build on effective systems and good practices:

- At the State level, there are some examples where existence of a State Groundwater Act and Rules for governing and regulating the extraction of groundwater are of a significant benefit along with existence of strong sectoral policies governing all uses of water - drinking, irrigation, industry, and so on.
- The States under NGMIP have more than two decades of community-centered legal framework which promotes decentralized and inclusive governance- Panchayat Raj Act. States like Karnataka and Gujarat have other benefits of *Irrigation Act 2002, Karnataka SC Sub-Plan and Tribal Sub-plan (Planning, Allocation and Utilization of Financial Resources) Act 2013, Gujarat Irrigation and Drainage Act 2013, Participatory Irrigation Management Act 2007* and presence of strong *Panchayats* and Municipalities to ensure community interests- with functions devolved at various levels on different aspects of water-drinking and irrigation.
- In addition, States show an effective targeting of socially vulnerable groups with small-holdings under agriculture, employment, irrigation, drinking water and sanitation schemes.
- The States have experience with traditional methods of water conservation and recharge. In Rajasthan there is a scope for revival and rejuvenation of traditional water harvesting structures (tanka, johad, khadin, chauka, and so on) on a wider scale, and the current programs such as MGNREGS and IWMP have been reviving traditional water management systems; MJSA has the provision for upscaling traditional water management through renovation of old structures and construction of new structures. There are very effective in groundwater augmentation and local communities are familiar with them.
- These States have also seen the benefits of micro-irrigation (sprinkler and drip), which economizes the use of water and increases productivity per unit of water. This technology also arrests water logging and salinity problems associated with canal irrigation. Micro-irrigation coupled with crop-diversification (for example, drought and salt resistant crops) will enhance agricultural water use efficiency and agricultural productivity.

147. **Adaptation to climate change.** Protection and management of groundwater is more cost effective and can play an important role in adapting to climate change, if it is protected and managed in conjunction with surface water.

148. **Impact on overall development indicators.** As access to water for drinking, sanitation, irrigation and industrial development has links with other development indicators like sustainability, livelihood, income levels, health, and so on, the Program is likely to have a positive effect on the overall efficiency, capability and well-being of the population. Improved levels of groundwater and improved quality of water will have positive impact on the community particularly the vulnerable who are dependent on commons for their livelihood and sustenance.

149. **Strengthening existing processes of decentralization.** Due to the linkage with local governance institutions,<sup>35</sup> the Program can contribute in enhancing participation, inclusion, transparency, accountability and improved gender impacts.

### 5.2.2 Potential Social Risks

150. A critical element in the current legislative framework is the original Model Bill which does not address issues of equity, access and community based planning and management and the revised Model Bill which, while it does cover all these social aspects, is not in and of itself implementable as the authority rests with the States. Institutional conflicts between programs that encourage groundwater pumping are woefully deficient in coordinated monitoring and information-sharing add to the difficulties. Pollution caused by industrial effluents particularly in industrial estate zones as well as tourist locations has health consequences for people but lack of data and institutional mechanisms for regulation, penalization allows for such practices to persist.

151. Perception towards groundwater, though part of hydrological cycle and a community resource, is still perceived as individual property and is exploited inequitably and without any consideration to its sustainability leading to its over-exploitation in several areas.

152. Bottom up approaches, participatory planning, and community monitoring are increasingly recognized as viable and sustainable solutions. However, there are a number of challenges:

- Few scalable examples available
- Negative attitudes and perspectives towards community processes within administration prevail
- Low and scarce capacities to facilitate community processes at the local level
- Low investments in the capacities of important stakeholders-officials/functionaries/Elected Reps, and User-Groups- Water User Associations, Village Water, Sanitation Committees, Watershed Development Committees on groundwater issues and for promoting inclusion, participation (including those of women) and equity in implementation of interventions.

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<sup>35</sup> All states have well established three tier PRI, with Gram Panchayats experienced in managing developmental schemes related to employment and drinking water. Additionally, the strong emphasis in new flagships like PMKSY on community involvement may ensure capacity building of community institutions/user groups and elected leaders. Established systems of using community monitoring tools in the context of groundwater like the tested Sujal Cards create an opportunity for ensuring equitable and inclusive access to benefits. The strengths and challenges in implementing Central programs can be assessed to ensure that the right institutional support is provided to Panchayats.

- Poor involvement of communities and community institutions-PRIs/WUAs during planning and implementation despite policies/acts promoting it.

#### 153. Risks of exclusion

- There are inherent exclusion mechanisms in some of the GoI Programs where farmers get subsidies. For instance, for drilling farmers can avail the subsidy only once but often they require support to meet the cost of drilling further if the water table is low. This makes the small and medium farmers dependent upon the rich farmers who can afford to drill deep and then charge for water from the former.
- Limited awareness on notification of Blocks and the implications of such notification in communities as well as in PRIs. There is a poor sharing of information on groundwater (levels and quality) with communities. In addition, there is a tendency of poor engendering of schemes in terms of beneficiary selection
- On the one hand, there is a need to levy charges for developing a strict and strong regulation but on the other hand this can pose risks of further excluding the poor/small and marginal farmers or economically vulnerable if adequate safeguards<sup>36</sup> are not in place.
- Linking of representation in Water User Associations/ Watershed Development Committees with land ownership rights, which tends to exclude women farmers and their needs / priorities from planning and implementation process.
- On the one hand, transparency in data collection and information sharing is important to help effective planning. On the other hand, data can also be misused like if the water level are rising and quality is very good then it can lead to in-migration or lobbying for industrial use. Also, if data is inequitably available or available in formats/language/forums that cannot be accessed by all, then it can be misused.
- The Program commits to contributing in improved access to water supply and sanitation services as well as increased agricultural productivity. But there are risks of these benefits not reaching to the marginalized if checks and balances like strategic targeting and social indicators in the monitoring processes are not in place.

154. Risks of social and political conflicts. In water scarce areas, in some cases sourcing urban drinking water on large scale from rural areas may lead to rural-urban resource conflicts. Further, Medium and Minor Recharge measures in border Districts that affect water availability in downstream areas falling in neighboring States may become a potential source of conflict.

### 5.3 Program Consistency with Pfor Core Principles

#### 5.3.1 General Principle of Assessment and Management

##### 5.3.1.1 Core Principle # 1

*Environmental and social management procedures and processes are designed to (a) promote environmental and social sustainability in the Program design; (b) avoid, minimize, or mitigate against*

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<sup>36</sup> The resourceful tend to dominate and appropriate the water sources (in one village the team was told that upper caste Rajputs fill tankers from the common source and sale water to village residents.)

*adverse impacts; and (c) promote informed decision-making relating to a Program's environmental and social effects.*

155. Environmental and social management procedures and processes are in place for the selection of the proposed investments and to some extent their sustainability. However, there is no environmental and social staff in implementing agencies to follow these processes and procedures. Environmental screening criteria for site selection needs to be strengthened to avoid any adverse impacts associated with site selection and recharging water.

156. In order to ensure sustainability, minimize risks and promote informed decision making, people's participation in planning, implementation and monitoring is crucial. While the legislative framework and government Programs identify Panchayats as the unit of governance, making provisions for representation of the vulnerable, the challenge lies in implementation in its true spirit. To be able to translate these visions on ground, at the national level, there has to be strong institutional and human capacities as well as monitoring systems that provide such processes the right impetus, timely rewards and penalties. At the State level, there needs to be strong coordination mechanisms to address inter-departmental overlaps and avoid parallel systems of implementations as well as responsive administration to emerging needs and challenges on the ground. Finally, at the local level, there is a need for support systems for Panchayats to be able to manage the Program effectively as well as ensure inclusion, participation, transparency, accountability and timely redressal of grievances. Therefore, in all State level plans, it has been proposed that adequate capacity building inputs as well as human resource support at the Gram Panchayat level is provided.

#### **5.3.1.2 Core Principle # 2**

*Environmental and social management procedures and processes are designed to avoid, minimize, or mitigate adverse impacts on natural habitats and physical cultural resources resulting from the Program.*

157. All State governments have procedures for avoiding any construction activities in the natural habitats; and approvals from the relevant departments are required for any construction activities in protected areas or forest lands. In general, the scope and nature of the investments under the Program will not impinge on critical natural habitats. The adverse impacts on the physical cultural resources also can be easily avoided through following national and State regulations governing construction in the vicinity of protected monuments and for management of chance finds. Such provisions will be strengthened through checklists developed under the NGMIP. The environmental screening criteria for site selection should include the proximity of natural habitats and physical cultural resources to the proposed interventions.

#### **5.3.1.3 Core Principle # 3**

*Environmental and social management procedures and processes are designed to protect public and worker safety against the potential risks associated with: (i) construction and/or operations of facilities or other operational practices under the Program; (ii) exposure to toxic chemicals, hazardous wastes, and other dangerous materials under the Program; and, (iii) reconstruction or rehabilitation of infrastructure located in areas prone to natural hazard.*

158. Some States (Karnataka and Maharashtra) have specifications in the contract documents on the protection of worker's health and safety, and the NGMIP will strengthen provisions in all States. The nature and scope of the proposed interventions will not result in to exposure to any toxic chemical or hazardous wastes. Incorporation of legal requirements into contracts and closer monitoring of construction activities will mitigate the above risks.

#### **5.3.1.4 Core Principle # 4**

*Land acquisition and loss of access to natural resources are managed in a way that avoids or minimizes displacement, and affected people are assisted in improving, or at least restoring, their livelihoods and living standards.*

159. Construction of small-scale recharge and restoration works as envisaged in the Program would mainly involve the use of government lands and Commons. If it is a government land, it will be free from all encumbrances related to land acquisition and will not be a challenge. The program does not foresee any requirement of private lands and most restoration works will be taken on common lands, including drainage line treatment and creation of small water harvesting structures. , In cases where the program supports limited investment on private lands, as identified through the Water Security Plans, they will be entirely voluntary in nature since they would generate private benefits for the landowner. Hence, land donation is not envisaged in the program.

#### **5.3.1.5 Core Principle # 5**

*Due consideration is given to cultural appropriateness of, and equitable access to, Program benefits giving special attention to rights and interests of Indigenous Peoples and to the needs or concerns of vulnerable groups.*

160. The socially vulnerable groups which are severely affected due to depleting quantity of groundwater include small and marginal farmers as they neither have the resources to drill deeper as the available subsidies under government schemes are not enough nor are they allowed to access such subsidies more than once. Also, the most progressive schemes on water conservation focus on creating private water sources within the farm- irrigation borewells or farm ponds. As a result, marginal cultivators with limited land and lower risk appetite get excluded. Thus, there is a need to establish water sharing mechanisms which keep into account the limited resources of the most vulnerable. Similarly, existing schemes that promote group/community irrigation need to be prioritized over beneficiary oriented schemes. Active participation of women and other vulnerable groups in decision making on water resources through targeted mobilization of women and women's groups and their representation in planning and decision-making needs to be encouraged.

161. Improved regulation through water pricing, if not designed keeping in mind the economic vulnerabilities of the small and marginal farmers, the poor, and the landless can lead to further drudgery despite the promise of improved management. So, pricing should be done through a consultative process determining the equilibrium at which the poorest can pay while ensuring resource sustainability. Alternately, with substantial resources available to local bodies under the Fourteenth Finance Commission, provisions can be made for covering the user-charge of most vulnerable households

162. Limited impetus and opportunity for community based planning and monitoring means that water management will be a top down process reducing ownership and a sense of collective responsibility which is crucial for effective use and sustainability. At national level, efforts towards decentralization of groundwater through schemes that are designed to work on community based planning.

#### **5.3.1.6 Core Principle # 6**

*Avoid exacerbating social conflict, especially in fragile States, post-conflict areas, or areas subject to territorial disputes.*

163. The NGMIP will not be financing the types of major resource development infrastructure that introduces or exacerbates these issues. By advancing water security planning and strengthening mechanisms for public engagement, attention to equity and benefits-sharing, and grievance redress, the NGMIP will clearly be a position to reduce risk. While investments will be located in some international waterways, impacts to neighboring countries will be insignificant. Compliance with the World Bank's policy on international waterways (OP 7.50) has been assured through appropriate notification as per Bank policies.

164. While water dispute<sup>37</sup> management is not expected to be a significant issue with the NGMIP, and would only be expected in few instances and following steps can be taken to mitigate such risks:

- Strong enforcement of water use regulation complemented by efficient and timely provisioning of services (drinking water and irrigation) can minimize this risk in the medium term.
- A strong media/communication strategy highlighting the difference between free but erratic services vs priced/regulated/efficient services will help in bringing about a collective change in perception about regulation.
- Water sharing agreements between local bodies; for example, to jointly undertake a valuation of the eco-system services provided and suitably compensate the local body

165. While not required to mitigate risks introduced by the NGMIP, mitigation measures could include:

- Strong enforcement of water use regulation complemented by efficient and timely provisioning of services (drinking water and irrigation) can minimize this risk in the medium term. A strong media/communication strategy highlighting the difference between free but erratic services vs priced/regulated/efficient services will help in bringing about a collective change in perception about demand-side incentives and regulation.
- Formalization of water sharing agreements between the concerned local bodies. An economic solution would be for the two local bodies to jointly undertake a valuation of the eco-system services provided and suitably compensate the local body.
- One of the mandates of Central Water Commission (Monitoring Office) is also to provide approval to minor irrigations projects in border Districts after determining whether the project falls in a region already facing inter-state water dispute

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<sup>37</sup> Groundwater can be a source of conflict under such circumstances as - amongst people in the same geographical boundaries when there is an acute shortage; across villages or urban localities when source is common; across upstream and downstream areas; and between rural and urban areas. Another source of conflict and unrest can be when water, a free resource is priced.

## 6. Recommendations

166. Key findings of this assessment are used to make a series of recommendations that need to be included (i) in the scope of the NGMIP to improve its overall environmental and social performance and (ii) in the Program Action Plan.

### 6.1 Environmental Recommendations

167. Institutional strengthening and capacity building measures are already part of the scope of the Result Area 2 of the NGMIP. The following recommendations will have an added emphasis on the environmental performance of the Result Area 2:

- (a) **Environmental staff in State-level Project Implementation Agencies.** There are extensive unfilled positions across all groundwater departments and other related departments in the States; a key deficiency being addressed by the NGMIP. Staffing needs to span environmental capabilities required for Program planning and implementation. The implementing agencies in the States should have adequate environmental staff. These specialists will be responsible for overall planning and implementation of the Program in environmental aspects. To begin with these positions can be consultancy based with the eventual plan of making them cadre based so that the experts engaged are of good caliber as well as remain motivated to perform.
- (b) **Capacity building in environmental and social issues related to the Program.** The technical staff of implementing agencies and the village water user committees should be provided with training related to environmental issues associated with the Program activities.

168. The participating States have adequate environmental systems in place to address the environmental impacts associated with the Program activities. However, the following recommendations are made to ensure that they are adequately implemented in the field by including them in the Program operation manual:

- (a) **Environmental screening process for identification and selection of recharge structures.** The environmental screening process should be strengthened to avoid any potential impacts associated with selection of potential sites for recharge and identification of recharge structure. The screening process should consider impacts on the downstream water users, ecological flows, flooding and submergence, water logging and stream erosion, community acceptance, chemical quality of recharging water and need for any treatment, availability of borrow material for construction, sites for disposal of spoils, and so on.
- (b) **Monitoring of recharge water quality and ground water quality.** Where the storm water surface runoff is expected to be polluted and is being used for subsurface recharging purpose (through recharge wells or injection wells), the quality of this is to be monitored for the known contaminants in that area. The monitoring frequency should be increased during monsoon season. The groundwater quality of the nearby water wells also should be monitored. If monitoring results show high levels of pollution, management measures should be in place to prevent such waters from being injected for groundwater recharge, and to ensure their treatment.
- (c) **Management of water quality laboratories.** All participating States would benefit from water quality testing laboratories updated to respond to NGMIP and related needs.

These laboratories should have laboratory safety and waste management standards into their operations.

- (d) **Adequate budgetary provisions for maintenance of recharge structures.** The recharge interventions to build under this Program require regular inspection and maintenance activities (for example, repair of cracks in check dams, removing of siltation from the check dams and percolation tanks, cleaning of filter material in the recharge shafts, and so on). The implementing agencies in the States should include adequate budgetary provisions for repair and maintenance activities as part of the Detailed Project Reports (DPR) of each structure. Environmental management measures for operation and maintenance should be available.
- (e) **General environmental health and safety guidelines in construction contracts.** The specifications in the contract documents of all construction works under the Program should include conditions to mitigate impacts related to occupation health and safety; pollution from wastes; and air, soil and water pollution. The participating States should develop environmental code of practices to manage all construction related impacts. There also should be measures to promote community participation construction monitoring. There have been many World Bank Group supported projects in India that have included the preparation of such codes which could be used as a starting point.
- (f) **Some potential investment categories that are to be excluded** from NGMIP support includes: (i) construction of major dams and new large scale irrigation systems, and (ii) major industrial wastewater collection, treatment and recharge systems through injection. These could fall under paragraph 9 of the PforR Policy as: *“Activities that are judged to be likely to have significant adverse impacts that are sensitive, diverse, or unprecedented on the environment and/or affected peoples are not eligible for the Financing and are excluded from the Program.”*
- (g) **Cumulative impact assessment.** The investment planning process for recharge structures need to include cumulative impact assessments, to be carried out at the State level to assess, minimize and manage these impacts. During the first year of implementation, the participating States will compile baseline data and carryout a cumulative impact assessment study; and the assessment will be updated every year during the entire Program period. The study may require, for example, a limit on total volume of water to be retained through new structures proposed for any given sub-watershed, or may recommend design modifications to proposed new or existing structures to reduce cumulative effects on downstream flows.

169. The above recommended actions are summarized in Table 8. A Program Operational Manual (POM) has been developed and includes guidance to States on the scope of work involved to implement these recommendations. These recommendations are also briefly summarized below:

- Develop procedures for environmental screening for siting and selection of proposed investments and monitoring of environmental impacts: Procedures need to be developed or strengthened for selection of potential sites for recharge and identification of recharge structure to minimize environmental impacts. The screening criteria should consider impacts on the downstream water users, ecological flows, flooding and submergence, water logging and stream erosion, community acceptance, chemical quality of recharging water and need for any treatment, availability of borrow material for construction, sites for disposal of spoils, and so on. Standard environmental code of practices also will be developed to include in the contractors bid documents. Procedures

for monitoring of environmental impacts during construction activities, and also recharging water quality and water quality of nearby wells.

- Undertaking Cumulative Impact Assessment study to assess cumulative impacts of the overall investments on the downstream hydrological flows and river morphology: A cumulative impact assessment study needs to be carried out at the State level to assess, minimize and manage potential impacts associated with the proposed investments. Baseline data collection and mobilization of consultants will be completed in the first year to carry out a cumulative impact assessment study; and the assessment will be updated every year during the entire Program period.
- Institutional strengthening and capacity building of implementing partners: Environmental specialists will be mobilized in the Project Implementation Agencies (PIA) and technical support organizations. These specialists will coordinate with the line agencies for implementation of environmental procedures during screening, monitoring and construction activities; and implementation of recommendations proposed in the ESSA.

**Table 8: Implementation Plan for Environment Actions**

| <b>Environmental Action</b>  | <b>Responsible Party</b>      | <b>Proposed Timeline</b>   |
|--|-------------------------------|--|
| Develop procedures for environmental screening for siting and selection of proposed investments and monitoring of environmental impacts                          | MoWR, RD&GR<br><br>State PIAs | Year 1 (first half): Prepare procedures and monitoring framework<br>Year 1 (second half) onwards: Implementation of the above  |
| Undertaking Cumulative Impact Assessment study to assess cumulative impacts of the overall investments on the downstream hydrological flows and river morphology | MoWR, RD&GR<br><br>State PIAs | Year 1: Establish Baseline Data and Prepare Terms of Reference (ToRs) for carrying out the cumulative impact assessment study. Mobilisation of consultants for carrying out the study.<br>Year 2: Undertake cumulative impact assessment study<br>Year 3 onwards: Update of the assessment every year, and monitoring changes in the baseline conditions |
| Institutional strengthening and capacity building of implementing partners.  | State PIAs                    | Year 1: Prepare ToRs, mobilize environmental specialists at all implementing agencies and technical support organisations.<br>Year 2: Training Needs Assessment and develop training calendar for implementing partners, roll out training plan.   |

## 6.2 Social Recommendations

170. Institutional strengthening and capacity building of the implementing agencies including the Gram Panchayats; and hiring of NGOs/CBOs to support the Gram Panchayats for participatory planning have already been included scope of the NGMIP. The following recommendations are made to strengthen these aspects to ensure that the desired outcomes are achieved.

- Strengthening and supporting Gram Panchayats for inclusive planning and accountable water governance.** The Program carves a central role for the Gram Panchayats in

developing local groundwater Water Security Plans and makes them responsible for their implementation and monitoring. This requires clearly assigned/devolved functions to the Gram Panchayats and investments in their institutional capacities for social mobilization, inclusive planning, implementation and monitoring, local systems for citizens engagement, conflict resolution and grievance redressal. In addition, technical capacities related to groundwater management are also needed. It is crucial that the Gram Panchayats have the right institutional support, in terms of funds, functions and availability of functionaries to carry out effective water security planning.

- (b) **Collaboration with civil society for participatory planning, implementation and monitoring.** Following from the above, it is important that the facilitation skills and experience on participatory methodologies are available locally to the Gram Panchayats. The available experience of NGOs across the country has demonstrated better inclusion, longevity, sustainability and better development outcomes when processes are consultative, inclusive and communities are involved in the design and management of groundwater interventions. Local and credible civil society institutions can provide the requisite technical and institutional support to the Gram Panchayats. In addition, expert agencies (civil society, NGOs, development consultants) also need to be consulted at the national and State level while streamlining Program activities and invited for support in implementation. The models adopted by existing flagship Programs like MGNREGA of having a network of Support organizations can be useful in this regard.
- (c) **Social inclusion and equitable benefit sharing.** Depleting groundwater tables add to the drudgery of small and marginal farmers in general and specifically womenfolk both as farmers and in managing domestic chores. Thus, the Program needs to be sensitive towards accessibility as well as specific challenges of the marginalized groups such that they are included and eventually benefit from the implementation process. Special emphasis on engendering interventions and planning actions considering the needs of landless and small/marginal cultivators will be important to make them serious stakeholders in community led groundwater governance
- (d) **Demand side management.** Addressing the judicious use of water yields far more substantive results in terms of raising groundwater levels in comparison to working only on the supply side. Thus, awareness campaigns and support in adopting demand side measures need to be inbuilt in the Program. Care has to be taken that the awareness generation efforts are dialogical, and use principles of behavior change communication, and are designed as per the target group.
- (e) **Mainstreaming gender concerns.** The Program needs to pay particular attention to women's participation in groundwater management by ensuring their representation in community institutions mandated with planning and implementation of groundwater interventions. The Program will need to undertake targeted mobilisation of women to ensure that impacts are inclusive and engendered and offer positional role to women in the local committees to 'voice' their demands.
- (f) **Grievance redressal mechanisms.** Grievance redress mechanisms need to be established by the District level implementing agencies to address issues related to the program. Grievance redressal systems can only be effective if there is awareness of their existence and there are procedures which can be easily understood and used by people at large. Timely redressal and penalties for delays should also be there. In addition, there is also a need to establish dedicated ICT-based grievance redress mechanisms at the national

and State level for greater transparency and responsiveness. Also, types of grievances and their responses should be documented, clustered and made available online.

- (g) **Social staff in State-level Project Implementation Agencies.** Staffing needs to span social capabilities required for Program planning and implementation, applying the principles of equity, inclusion, transparency and citizens engagement. The implementing agencies involved in the Program should have adequate staff with social competencies. These specialists will be responsible for overall planning and implementation of the Program in social aspects, including preparation of IEC materials and overseeing the NGOs hired for implementation of the community engagement activities. Specific capacities that need to be deployed are on-community development/ gender and social mobilization, Information Education and Communication (IEC), participatory development, community monitoring and grievance redressal.
- (h) **Capacity building on social issues related to the Program.** The technical staff of implementing agencies, Gram Panchayat representatives and WUAs should also be trained on social issues associated with the Program activities for demystifying groundwater management that include the promotion of participatory planning, use of community monitoring tools like Sujal Score-cards and use of grievance redress mechanisms established under the Program. Capacity building efforts, content and training methodologies have to be customized as per the level, roles of prospective trainees.
- (i) **Land management.** The Program does not foresee any requirement of private lands for the Program investments and program interventions will mainly be on public, government, Panchayat or common land. It is expected that private lands will be identified for investments only in cases where they generate private benefits for the landowner, as a part of demand side management.

171. In order to implement identified actions discussed in this section, implementing actions and a plan has been identified and is given in the table below

**Table 9: Implementation Plan for Social Actions**

| <b>Social Action</b>   | <b>Responsible Party</b> | <b>Proposed Timeline</b>  |
|--|--------------------------|---|
| <i>Establish robust systems for Citizen Feedback in the Program</i>                | MoWR, RD&GR<br><br>PIA   | Year 1: Decide on nature of citizen feedback system to be chosen<br>Year 1: Design the system specific to the program and pilot in one/two states<br>Year 2: Roll out a periodic system for capturing and integrating citizen feedback                              |
| <i>Strengthen Grievance Redressal Management systems</i>                           | MoWR, RD&GR<br><br>PIA   | Year 1: Assessment of existing systems to, develop ICT based protocol.<br>Year 2: Tracking and Analysis of grievances, redressal to strengthen Program.   |
| <i>Institutional strengthening and capacity building of implementing partners.</i> | PIA                      | Year 1: Prepare Terms of Reference (ToRs), mobilize social specialists at National and State level and Support Organizations (SOs) in States.<br>Year 2: Training Needs Assessment and develop training calendar for implementing partners, roll out training plan. |

172. The following is proposed to support the implementation of the recommended Social Actions:

- Develop processes and procedures for Participatory Water Security Planning, and Community monitoring
  - The Program will develop frameworks for supporting Participatory Water Security Planning by developing step-wise guidance on developing decentralized groundwater management/safety plans, ensuring resource convergence with related schemes and consolidating these plans at a higher level (cluster, District and State) by integrating principles of inclusion, participation and accountability in the planning process. To create effective opportunities for citizen's engagement, a participatory monitoring framework will be proposed for the Program based on which tools for community monitoring of Water Security Plans will be developed.
- Strengthen Grievance Redressal Management Systems
  - The Program will help to create dedicated grievance management systems around groundwater for the participating States that would be inclusive and ICT based. For this, multiple points of access to the GRM will be created - offline (tele-helplines, written petitions) as well as online (portal, application based) for receiving and handling complaints around groundwater. An IEC plan will be developed to create community awareness about the GRM system in place. Systems for regular tracking and analysis of number of grievances received, addressed and closed will be developed and the performance of the State GRM systems would be part of the annual reports.
- Institutional strengthening and capacity building of implementing partners.
  - In order to get desired competencies within the State and District/cluster/Panchayat level implementation teams, recommendations have been made for deployment of social development specialists to facilitate participatory processes. Scope of work and competencies desired in such experts at different levels of Program management will be detailed in the terms of reference developed for the purpose. The social competencies for social mobilization and demand generation expected in the Support Organisations will also be detailed in these ToRs. For assessing the social capacity gaps in the national and State level implementing agencies, a detailed Trainings Needs Assessment (TNA) will be done based on which a capacity building strategy will be developed, training modules developed and rolled out as part of the larger capacity building exercise undertaken for the Program.

## 7. Annexes

### 7.1 Annex 1: State and District Selection Criteria

1. Three participating States have been selected for carrying out field visits and consultations by the ESSA team. A comparative assessment is shown below.

|                               | Parameter   | Haryana     | Rajasthan          | Gujarat                    | Maharashtra     | Karnataka   |
|-------------------------------|---|-------------|--------------------|----------------------------|-----------------|-------------|
| Groundwater Characteristics   |   |             |                    |                            |                 |             |
| 1                             | Hydro-geology   | Alluvial    | Alluvial/Hard Rock | Alluvial/Coastal/Hard Rock | Hard Rock       | Hard Rock   |
| 2                             | State of GW development-%-higher value denotes higher vulnerability | 109         | 125                | 76                         | 48              | 70          |
| 3                             | Categorisation of GW Blocks as critical/OE                          | 59 percent  | 80 percent         | 19 percent                 | 2 percent       | 39 percent  |
| Socio-Economic Considerations |   |             |                    |                            |                 |             |
| 4                             | Levels of Poverty (%)   | 11.16       | 14.71              | 16.63                      | 17.35           | 20.91       |
| 5                             | Per capita income as percent of National average income             | 129 percent | 66 Percent         | 114 Percent                | 125 Percent     | 84 Percent  |
| 6                             | Percent of marginal to medium landholdings (inequality)             | 77          | 60                 | 89                         | 93              | 89          |
| 7                             | Percent of GCA dependent on GW for irrigation                       | 29          | 60                 | 63                         | 50              | 34          |
| 8                             | Presence of Water Intensive Industries                              | High        | Low                | High                       | High            | High        |
| 9                             | Examples of community management of GW resources                    | Low         | Low/Medium         | Medium                     | High            | Medium/High |
| 10                            | Percent of Socially Vulnerable Groups (SC+ST+Minorities)            | 32.2        | 42.3               | 32.5                       | 41.2            | 40.14       |
| 11                            | Share of agriculture in total rural employment                      | 59.8        | 63.3               | 78.3                       | 79.4            | 75.7        |
| 12                            | Proportion of Urban Population                                      | 35          | 25                 | 43                         | 45              | 39          |
|                               | Predominant nature of Agriculture                                   | Irrigated   | Rainfed            | Irrigated/Rainfed          | Largely rainfed | NA          |

2. Thus, in order to ensure a diversity of both environmental and socio-economic attributes around groundwater 6 key criteria were used to get a representative mix of States. These were presence of different hydro-geological characteristics, very high and moderate stage of groundwater development, low/moderate/high proportion of critical and exploited groundwater Blocks to ensure that environmental vulnerability around groundwater was duly considered during the assessment. Similarly, characteristics like different per-capita incomes vis-à-vis national income average, presence of good examples on participatory groundwater management and presence or absence of large water

intensive industries were also considered to understand the issues of financial and physical access and equity in groundwater use in different regions including those with competing demands on groundwater (agriculture and industry). Thus Karnataka, Gujarat and Rajasthan were identified based on these parameters to understand the diversity of social and environmental issues in groundwater management in different narratives.

**Sampling Criteria for District onwards selection:**

3. Two Districts per State, two Blocks per District, and two local bodies per Block (urban/rural) will be selected for the State assessment. Thus a total of 2 Districts, 4 Blocks and 8 local bodies (4 GPs and 4 ULBs) will be visited as part of the social assessment exercise.

- (a) Provided below is the indicative list of parameters that will be used for District and Block selection, depending on availability of comparable national level data:
  - (i) Location in a basin important for the State
  - (ii) Presence of critical or over-exploited groundwater Blocks
  - (iii) Proportion of population belonging to socially excluded groups (SEGs)
  - (iv) Proportion of small/marginal farmers as a proportion of total cultivators
  - (v) Levels of Poverty (Poverty Headcount)
  - (vi) Rural-agrarian vs. Urban-industrial vs. Mixed local economy
  - (vii) Districts/Blocks reporting water quality issues
  - (viii) Presence of community-led groundwater management systems or other community based governance structures managing water related issues.
  - (ix) Presence of large surface water sources (to see community/habitat-level arrangements/possibilities for conjunctive use)

## 7.2 Annex 2: Detailed Note on Consultations

1. During preparation of ESSA, environmental and social teams of the World Bank carried out field visits and consultations in the States of Gujarat, Karnataka and Rajasthan during February and March 2016. Consultations were held at the State, Districts, Blocks and community level. At the State level, consultations were held with nodal Ground Water agencies/departments, Regional Offices of CGWB, State Pollution Control Board, and various other government departments that are involved in groundwater management such as Departments of Agriculture, Water Supply and Sanitation; Water Resources; Watershed and Soil Conservation; Rural Development; Urban Development; Minor Irrigation; and so on. Three categories of government agencies were selected for individual consultations-those that either directly and indirectly contribute to recharge activities, those that extensively use/extract groundwater for various purposes- drinking, agriculture, and so on and those agencies that have a environmental regulatory and social oversight role in enforcing existing policy-legal framework around groundwater.
2. At the District level and Block level, consultations were held with the District administration (Deputy Commissioners/District Collectors, and CEO Zilla Parishad) Block Development Officers, PRI representatives, Urban Local Body representatives, Farmer Groups/Clubs, different Water User Groups (Water User Associations/Watershed Development Committees, Village Water and Sanitation Committees, and so on), Women’s collectives, members of vulnerable and marginalized communities, and staff of NGOs working on participatory water resources management.
3. After completion and disclosure of draft ESSA on MoWR, RD&GR’s website, a national level stakeholder consultation workshop was held on 30th June 2016 at New Delhi. Nearly 30 participants from MoWR, RD&GR, CGWB and representatives from participating States, and team from the World Bank, joined the meeting.
4. Details of the above consultations are described in the following sections.

### Consultations During Preparation of ESSA

#### Details of Consultations in Gujarat

- *Consultations with State Level Government Agencies*

| Date       | Department/Location                               | Name of Officials Consulted  | Discussion Summary   |
|------------|---|--|--|
| 22.02.2016 | Gujarat State Watershed Management Agency (GSWMA) | Mr. U.D.Singh, IFS CEO<br>Mr. Shyamakant Pradhan,<br>Research Professional | Watershed projects are taken up under Integrated Watershed Management Program (IWMP), after conducting survey based on predefined parameters which also includes environment and social parameters. Detailed Project Reports (DPRs) are prepared based on the survey data the type of water harvesting structures to be implemented under the project is decided. A committee at the State level approves the DPR and the plan prepared is shared with Gram Sabha for concurrence. Village Level Committee is formed having 9-11 members from all the sections of the society which has representation from vulnerable and backward classes also. A Multidisciplinary team is also formed at District level to guide the |

| Date       | Department/Location                                    | Name of Officials Consulted   | Discussion Summary   |
|------------|--|---|--|
|            |  |   | <p>implementation of the project. The project is implemented by the Gram Sabha and Operation and maintenance is also their responsibility. Technical assistance is provided by IWMP team. CGWB identifies over-exploited/critical Blocks and these identified Blocks are considered by GSWMA while planning any new project. There is convergence of department/schemes during the implementation of IWMP projects. The major convergence is with MNREGS.</p>  |
| 22.02.2016 | Gujarat Water Supply and Sewerage Board (GWSSB)        | <p>Mr. Mahesh Singh, CEO, GWSSB and WASMO<br/>           Mr. D.K.Pandya, Hydrologist and his team<br/>           Mr. Sonia Murary, Environmentalist</p>   | <p>75% of the area of the State has water supply facilities. WASMO facilitates the water supply in the villages. Percolation tanks, recharge wells are constructed for groundwater recharge by GWSSB.</p>  |
| 22.02.2016 | Water and Sanitation Management Organisation (WASMO)   | <p>Mr. Siddharth Patel, Manager Technical<br/>           Ms. Sarita Kumari, Manager Board and Funding<br/>           Mr. T.A.Siddiqui, Senior Manager Technical<br/>           Mr. R.N.Shukla, Geo-Hydrologist (Consultant)</p> | <p>WASMO facilitates GWSSB in reaching the village area through IEC and awareness Programs. Provides water quality monitoring training to the community representatives and also provide them with water quality monitoring kit.</p>   |
| 23.02.2016 | Gujarat Water Resource Development corporation (GWRDC) | <p>Mr. K.B. Rabadia, Managing Director<br/>           Mr. R.K. Thakkar, SE, Gandhinagar<br/>           And their team</p>   | <p>CGWB and GWRDC has a common platform for data sharing and this activity was planned under the National Hydrology Project. Both these departments has monitoring wells. GWRDC has 4 laboratories for quality check on only 13 parameters as per National Drinking Water Quality Monitoring Protocol. The department faces manpower shortage due to many as vacant positions which is situation is affecting the functioning of the department. Aquifer mapping has been completed for only two Districts namely, Porbandar and Mehsana. As aquifer mapping is in progress, there is a need for appointment of technical staffs especially GIS experts. There is no monitoring framework for the irrigation wells but Central government is discussing on the preparation of a general monitoring framework which can be followed by all the States. Sujalam Suflam canal has helped in maintaining the quality of groundwater.</p> |

| Date       | Department/Location   | Name of Officials Consulted  | Discussion Summary   |
|------------|---|--|--|
| 24.02.2016 | Agriculture Department  | Mr. J.S. Solanki, Joint Director   | Use of Micro Irrigation System is promoted by the department and power subsidy is given to its users.  |
| 24.02.2016 | MGNREGS   | Mr. Gadhvi, Additional Commissioner  | MNREGS has convergence with various other schemes/Programs, mainly with IWMP. Many groundwater recharge structures have been constructed near the Narmada Canal and improvement of existing structures with convergence with GWSMA and MNREGS.   |
| 24.02.2016 | Urban Development and Urban Housing Development Department (UD&UHD) | Mr. Ashoksingh Parmar, Deputy Secretary  | The urban department is not involved in any activity related to groundwater recharge.  |
| 24.02.2016 | Gujarat Pollution Control Board                                     | Mr. Hardik Shah, IAS, Member Secretary<br>Mr. Praful Vachchani, Sr. Env. Engineer<br>Mr. Parthik Soni, Assistant Engineer                | Industries along the sea coast use surface water to meet their demands. Other industries require clearance from CGWB to use groundwater. Critical/notified areas include – (i) Ankaleshwar for dyes, pesticides, pharmaceutical and chemical industries; (ii) Vatwa for dyes and textiles industries; and (iii) Vapi where no new industrial setups are permitted. Specific industries have in-house ETPs. CEPTs have been provided as well for treatment of industrial wastewater. The treated wastewater is then routed through dedicated channels and pipelines into the Gulf of Cambay. The discharge point has been identified by National Institute of Oceanography. Ground water quality monitoring is conducted on monthly basis |
| 25.02.2016 | Mehsana Municipal Corporation                                       | Mr. Navneet Patel, Chief Officer   | With the supply of canal water in the District, the dependency on groundwater has reduced. The Municipal Corporation is not involved in any major groundwater recharge and management activities. The Corporation collects water quality samples and shares it with GWRDC laboratories in Ahmedabad. The analysed data is shared with the Mehsana Municipal Corporation on request basis only.   |
| 25.02.2016 | District Rural Development Agency (DRDA), Mehsana District          | Mr. S.K.Langa, District Development officer<br>Mr. Arun Adhikari, Technical expert, DWDU<br>Ms. Megha Patel, MDT (Eng), DWDU<br>Ms. Asha | Projects have been implemented by IWMP for groundwater management. Under these projects many new infrastructure has been created and the existing structures has been restored. The drinking water wells which have gone dry are being used as recharge wells. There have been industrial development in the District and most of the industries are pharmaceuticals, cotton. Chemical, steel, ceramic, processing plant of agricultural produce.  |

| Date       | Department/Location | Name of Officials Consulted   | Discussion Summary   |
|------------|---------------------|---|--|
|            |                     | Choudhary,<br>Team Leader,<br>DWDU<br>Mr. K.K.<br>Wakhariya,<br>Executive<br>Engineer,<br>WASMO<br>Mr. S.M. Dubhi,<br>Coordinator,<br>WASMO<br>Mr.<br>H.V.Gadhavi,<br>Coordinator,<br>WASMO<br>Mr. A.M.Dada,<br>Executive Engineer,<br>Irrigation<br>department | <p>These industries use groundwater and have their own Effluent treatment Plants (ETPs). WASMO has implemented projects in the District and have even distributed water quality monitoring kits to the villages.</p> <p>There has been some difficulty in the implementation of various schemes due to the new Land acquisition Act and restriction on the use of Gauchar Land (common land in the village) as per the new policies.</p> <p>The requirement for approvals from Forest department to use forest land and delays in getting these approvals has affected the construction of water harvesting structures like check dams. Such a situation is being faced at Dang District. But at the same time the construction of Lakrora check dam on Sabarmati river has benefitted 30-40 villages.</p> <p>Dharoi, Sujalam Suflam and Narmada Canals have helped in reducing the dependency on groundwater.</p>   |
| 27.02.2016 | CGWB                | Mr. Anoop<br>Nagar, Regional<br>Director<br>Dr. A. K. Jain, Scientist-<br>D<br>Mr. B.<br>Mohapatra,<br>Scientist-C<br>Dr. Sanjay<br>Gupta, Scientist-B<br>(Chemist)<br>Mr. A.K. Sinha, Asst.<br>Hydrogeologist  | <p>CGWB is doing groundwater monitoring from 820 monitoring wells. Water samples are also collected to check the quality of water against 14 pre decided parameters.</p> <p>The data related to groundwater is shared with GWRDC.</p> <p>Software has been developed under National Hydrology Project under which CGWB and GWRDC can access the groundwater related data.</p> <p>The data sharing has helped in the decision making for any new monitoring activities taken up by both the departments.</p> <p>Aquifer management plans for two Districts, namely Porbandar and Mehsana, has been prepared on the existing data and has been shared with GWRDC for their suggestions.</p> <p>Details for water usage for irrigation purpose are available with the department but for industries, CGWB is still in the process of estimation.</p> <p>The department faces manpower shortage and there is an urgent requirement for recruiting technical staffs like GIS expert, and so on. The department also needs monitoring devices like automatic water level recorder, water sampling units (handy), Modelling devices, automatic recorder for water quality.</p> <p>CGWB has six laboratories in the State. The State level laboratory has capacity for testing 1500 samples/month. Considering the quantum of work currently being undertaken by CGWB, strengthening of the lab facilities by procuring advanced instruments and</p> |

| Date       | Department/Location  | Name of Officials Consulted         | Discussion Summary  |
|------------|--|-------------------------------------|---|
| 29.02.2016 | District Development Office (DDO) and District Collectorate (DC), Kuchchh District | Mr. C. J. Patel, DDO and his team   | <p>Kuchchh District has 5 overexploited Blocks namely, Bachan, Anjar, Mandvi, Bhuj and Nakhadrana and irrigation is mainly dependent on groundwater.</p> <p>Irrigation department has plans for checkdams and pond deepening activities to provide water for irrigation. These activities have been planned by the department independently and not in convergence with IWMP.</p> <p>Narmada water has reached only upto Rapar and the canal work beyond Rapar was interrupted due to need of approval from the forest department as the canal needs to cross through Wild Ass sanctuary.</p> <p>Seven minor canals are planned to be linked with the main canal to provide water facility to areas which do not have access main Canal. This will provide better irrigation facility to the rural areas having groundwater scarcity.</p> <p>Kuchchh has a traditional water management system in which a well is located inside the pond for groundwater recharge. Such traditional systems are being promoted.</p> <p>Aquifer mapping is done by many agencies at different level.</p> <p>Arid Communities and Technologies (ATC) is one of the prominent NGOs which is actively involved in aquifer mapping and preparation of aquifer management plan.</p> <p>Many thermal, steel, timber, cement and packaging industries are located in the District. Industries are recycling water and have their own desalination plants. Industries have also taken initiatives in rainwater harvesting. Many industries are also using treated wastewater.</p> |
| 29.02.2016 | Bhuj Municipality, Kuchchh District  | Mr. Patel, Chief officer (Incharge) | <p>The water requirement under the Bhuj Municipality is met by using both Tube well water and Narmada water.</p> <p>Water quality is affected by high level of Fluoride, Iron and TDA.</p> <p>Government buildings have recharging structures and while approving any new building plan (both public and private), provision of rainwater harvesting system is also checked in the plan.</p> <p>Awareness Programs are carried out by the Municipality for water conservation.</p>  |
| 29.02.2016 | District Rural Development Agency (DRDA), Kuchchh District                         | Mr. Imdad Bang, Technical Expert    | <p>Many IWMP projects are being implemented in Kuchchh and these projects includes construction of check dams, new ponds, pond deepening, recharge wells, percolation tanks.</p> <p>Micro Irrigation System is used in the District but this depends on the cropping pattern. It is mainly used in cumin cultivation.</p>   |

| Date | Department/Location | Name of Officials Consulted | Discussion Summary   |
|------|---------------------|-----------------------------|--|
|      |                     |                             | MIS is more favourable to the farmers who can afford to have borewells. Main problem in the use of MIS in Kuchchh District is that the pipes gets choked due to salt content in water and needs regular maintenance and replacement. |

○ Consultations at District, Block and Gram Panchayat level (Mahsana and Kuchchh Districts)

| Date       | Village/Block/District   | Name of Officials Consulted  | Discussion Summary   |
|------------|--|--|--|
| 25.02.2016 | Village- Motidau,<br>Block- Mehsana,<br>District- Mehsana                                  | Mrs. Saroj Ben<br>Bhavesh Bhai<br>Patel, Deputy<br>Sarpanch                | The irrigation facility has drastically improved with the Sujalam Sufalam canal in the District. Farmers are using lift irrigation.<br>Water sharing is a normal practice in the village. Farmers whose plots are located far from the canal have formed a group and contributed in laying of pipeline to their fields and are sharing the expenses for the pipeline and the charges for lift irrigation. Sujalam Sufalam canal has helped in groundwater recharge and there is rise in groundwater table within one kilometre radius of the canal. The water quality has also improved.<br>Even with the better irrigation facility, farmers are also opting for MIS. |
| 25.02.2016 | Village- Bhandu,<br>Gram Panchayat-<br>Bhandu,<br>Block- Vishnagar,<br>District- Mehsana   | Mrs. Ami Ben,<br>Sarpanch<br>Dalsangh<br>Bhai<br>Chaudhary,<br>Ex-Sarpanch | Sujalam Safalam has helped in increased agricultural production<br>With the availability of water, the fodder production for the cattle has also increased which has helped in rise in milk production in the village.<br>'Laxmipura Doodh Utpadak Sahkari Mandli' is buying the milk produced in the village and has become an alternate source of income for the villagers.<br>There are 10 ponds in the nearby villages out of which 2 ponds are used for groundwater recharging. These ponds are recharged with Narmada water.   |
| 26.02.2016 | Village- Samoja,<br>Gram Panchayat-<br>Samoja,<br>Block- Kheralu,<br>District- Mehsana     | Farmers  | IWMP has taken up various projects in these villages. Under these projects, many new recharge structures have been created and the existing structures have been restored like deepening of ponds, construction of check dams, and so on.  |
| 26.02.2016 | Village- Ambavada,<br>Gram Panchayat-<br>Amvanada,<br>Block- Kheralu,<br>District- Mehsana | Farmers  | Assistance is also provided for the use of MIS. There has been convergence of IWMP and MNREGS. Employment opportunities have been provided under MNREGS in the implementation of the IWMP projects. Convergence with WASMO, Dairy department, Swachh Bharat Mission, Indira Aawas Yojna, Mission Mangalam has also been worked out in IWMP projects.   |
| 26.02.2016 | Village- Godisana,<br>Gram Panchayat-<br>Godisana,<br>Block- Kheralu,<br>District- Mehsana | Residents of the<br>village  | Rainwater harvesting structures has been implemented under IWMP projects. Rooftop rainwater harvesting has been facilitated to the Primary schools under IWMP projects and UV plant  |
| 26.02.2016 | Village- Kuda,   | Mr. Raju Ji  |  |

| Date       | Village/Block/District   | Name of Officials Consulted                                       | Discussion Summary   |
|------------|--|---|--|
|            | Gram Panchayat- Kuda, Block- Kheralu, District- Mehsana                            | Thakur, Sarpanch  | has been installed at the school by WASMO under Jal Mani Program and the water is being used after filtration and treatment.   |
| 26.02.2016 | Village- Chada, Gram Panchayat- Chada, Block- Kheralu, District- Mehsana           | Mr. Dharmendra Bhai Bharot, Sarpanch                              | This village is a pilot project for water budgeting. Under this initiative, the villagers were made aware about the concept of water budgeting. WASMO has initiated awareness Programs in the village and now people are aware of the issues and the importance of water budgeting. Paani Samities (Water Committee) has been formed and the metering system is in place. Farmers have also started adopting MIS and are using drip irrigation.  |
| 26.02.2016 | Village- Agol, Gram Panchayat- Agol, Block- Kadhi, District- Mehsana               | Residents of the village- particularly farmers                    | Checkdams has been constructed and farmers are using lift irrigation. Pond deepening has also been done in the exiting village pond. With these initiatives, there has been a considerable rise in water table. Most of the beneficiaries in this area belong to SC and Backward class.  |
| 26.02.2016 | Village- Indrad, Gram Panchayat- Indrad, Block- Kadhi, District- Mehsana           | Residents of the village- particularly farmers                    | Due to heavy industrialization in the area, the groundwater has got contaminated. Villagers complained of reddish water in their borewells. This has also affected crop production. The type of industries located in the area includes chemical, pharmaceuticals, steel, and so on. Narmada water is supplied in the village for drinking purpose. Water availability in the bore wells is at 500 ft. but drinking water is available from 1000 ft. only. Not much effort has been taken for groundwater management in the village.                                   |
| 01.03.2016 | Arid Communities and Technologies (ACT)  | Mr. Yogesh Jadeja, Director<br>Mr. Sham Davende<br>And their team | ACT is doing aquifer mapping at the village level with community participation. The community representatives are trained in aquifer mapping and are also paid for their services. ACT has its own monitoring wells and monitors groundwater level and quality regularly. Villagers are trained in monitoring activities and are also paid for their services.   |
| 01.03.2016 | Village- Makarsiwant, Gram Panchayat- Makarsiwant, Block- Abdasa District- Kachchh | Mr. Osman Jamar Mukarse Attak, Sarpanch                           | Water pipeline work is completed by WASMO for drinking water supply. This is a group water supply system where a single pipeline supplies water to 7 villages. This leads to uneven distribution of water, those villages which are at extreme end or are at elevation gets less water supply. The village faces scarcity of water due to no rainfall in the last 4 years and as there are no IWMP projects running in the area, so very little initiatives have been taken for groundwater recharge for such dry seasons/years. The villagers can take water from the |

| Date       | Village/Block/District   | Name of Officials Consulted                         | Discussion Summary  |
|------------|--|---|---|
|            |  |   | wells for one hour in a day only due to depleting groundwater and no recharge.<br>Only 10% of the households have Sanitation facility.<br>The village do not report any health issues due to water quality.   |
| 01.03.2016 | Village- Gadwara,<br>Gram Panchayat-<br>Gadwara,<br>Block- Abdasa<br>District- Kachchh       | Residents of the village                            | There is community participation in the groundwater monitoring. The villagers have chosen a representative to monitor the groundwater level and quality. The person responsible for monitoring is paid by ACT.  |
| 01.03.2016 | Village- Mota Layja,<br>Gram Panchayat-<br>Mota Layja,<br>Block- Mandvi<br>District- Kachchh | Mr. Prakash Bhai and other residents of the village | Farmers are dependent on groundwater for irrigation and mostly have their private bore wells. 50% of the farmers are doing irrigation through MIS. Drinking water supply is through pipelines and water is supplied 5-6 times in a month.<br>To check the water quality, WASMO has provided monitoring kit which reportedly was not used by the villagers.<br>For the recharge of groundwater, Checkdams, recharge structures have been built by NGOs (mainly ACT), Salinity departments and few upcoming industries as part of their CSR initiatives.<br>There are 9 monitoring wells in the village which includes 3 bore wells and 6 open wells.<br>The cost line is 7 kms away and as informed by the Sarpanch there must be around 100 bore wells along a river going into the sea. This has resulted in rise in TDS in groundwater.<br>As the wells are used by many farmers so each farmer has their own bore well. The landholding per farmer is 4 Ha.<br>Around 70% of the household has soakpit and 30% of them discharge the waste in the nearby river which is used by the villagers. This also leads to contamination. |

### **Details of Consultations in Karnataka**

- *Consultations with State Level Government Agencies in Karnataka*

The consultations in Karnataka were carried out during 15 to 19, February 2016.

| S. No. | Department                        | Personnel  |
|--------|-----------------------------------|--|
| 1      | Karnataka Pollution Control Board | Chief Environmental Officer – Mr. Nandakumar   |
| 2      | Agriculture                       | Deputy Director (MI) – Mr Vidhyanand and Team  |
| 3      | Groundwater Directorate           | Additional Director – Ms Sannaboramma Subramani<br>Deputy Director – Mr Sidhappa<br>Chief Geophysicist – Mr Basvaraj<br>Chief Geologist – Mr Nagrajan<br>Chief Chemist |

| S. No. | Department  | Personnel   |
|--------|---|---|
| 4      | Central Groundwater Board – Regional Office                               | Regional Director – Mr K M Vishwanath<br>Dr. K. R. Sooryanarayana   |
| 5      | Karnataka Rural Water Supply and Sanitation Authority                     | Chief Engineer – Mr C Mruthunjay Swami<br>Director KRWSSA – Mr M Ravi<br>IEC HRD Consultant – Mr Krishnappa<br>DP(OP) WSSO – Mr Hamid Ahmed<br>Geologist – Mr K Prasanna Kumar<br>Geologist – Ms Vimla TN<br>Senior Geologist WSSO – Nangendra Sharma |
| 6      | Minor Irrigation (Water Resource)   | Secretary – Mr Prabhakar H Chini  |
| 7      | Urban Development and Bengaluru Water Supply and Sanitation Board (BWSSB) | Additional Chief Secretary – Mr Vijay Bhaskar<br>Chief Engineer KUWSDB – Mr M Rangadhamaiah<br>Deputy Chief Engineer BWSSB – Mr Somashekhar   |
| 8      | Watershed (Agriculture)   | Commissioner & Secretary – Mr HG Shivananda Murthy<br>Deputy Director Sujala – Ms Reema<br>M&E Consultant – Mr M Nagraj<br>Other team members   |

- Consultation at District, Block and GP level (Kolar and Bidar Districts of Karnataka)

#### Kolar District

|   | Place Visited               | People Met   | Discussion On  |
|---|-----------------------------|--|--|
| 1 | Kolar District Headquarters | Deputy Commissioner – Dr KV Trilokchandra  | Groundwater status in the District, sustainability issues, steps taken for GWA implementation and GW regulation  |
| 2 |                             | CEO Zilla Panchayat – Mr NM Panali<br>IAS Probationer – Mr Raghu Murthy  | Groundwater status in the District, sustainability issues, steps taken for GWA implementation and GW regulation  |
| 3 |                             | Departmental Representatives<br>Executive Officer Mulbagala Taluka Panchayat – Mr C Srinivas<br>EE RWSSA – Mr Vishwanath Setty<br>Assistant Director Srinivaspur Taluka – Mr D Shivashankaran<br>Manjunath Prasad – PDO Mastenhalli<br>Kasturi Narsimha Naidu – PDO Pulagorakote<br>AEE RWSSA – M Manjunath<br>Geologist RWSSA – K S Manjunath<br>Chemist KRWSSB – D C Dempagowda<br>Sultan Aziz PDO<br>V Krishnappa PDO<br>AHO Horticulture – Mr GR Vishwanath Kumar<br>JE KRWSSA – Mr Srinivas<br>AE KRWSSA – Mr N Appi Reddy<br>AEE KRWSSA – Mr H Srinivas<br>EE KUWSDB – Mr KH Manjunath<br>AE KRWSSA – Mr BR Murali<br>JE KRWSSA – Mr Mahendra KV | Groundwater status, , schemes implemented, impact on groundwater, steps for GWA implementation and GW regulation<br>Civil Society experience of working on groundwater issues in the State |

|    | Place Visited   | People Met   | Discussion On   |
|----|---|--|---|
|    |   | AE Minor Irrigation – Mr P Papei Gowda<br>AE Minor Irrigation – Mr N Anand Kumar<br>Assistant Director RE – Mr M Chandrappa<br>RURES – Mr B Prabhakar<br>RURES – Mr GR Shanthakumar<br><br>NGO Representatives<br>DHAN Foundation – Mr M Ramesh<br>MYRADA – Mr Shivashankar<br>FES – Mr SA Partha<br>AFPRO – Mr Siete Immanuel<br>PRAKRUTHI – Mr P Narayanappa<br>FES – Mr DR Suresh<br>FES – Mr P Vijay Kumar |   |
| 4  | Village Bangavadi, Mastenhalli Gram Panchayat, Srinivaspur Taluka     | Gram Panchayat Members, Panchayat Waterman<br>Panchayat PDO – Manjunath Prasad<br>Farmer Committee Member – Virbhadra Gowda<br>Farmer Committee Member – Baiche Gowda<br>Farmer Committee Member – Ishwar Gowda<br>Residents of Bangavadi village  | Situation of groundwater quantity and quality, RO plants in the village   |
| 5  | Pulagorakote Gram Panchayat, Srinivaspur Taluka                       | Members of the Gram Panchayat<br>GP President – Shivarna<br>PDO – Kasturi Narsimha Naidu   | Groundwater issues, quality testing, GP involvement in Act implementation, PRI roles, capacities to manage groundwater  |
| 6  | M Vyapalapalli Village, Mudimadugu Gram Panchayat, Srinivaspur Taluka | President Gram Panchayat – Mudimadugu<br>Member of the village institution and watershed development committee,<br>Representatives of Foundation for Ecological Security   | Situation of groundwater availability, role of community institutions   |
| 7  | Mudiyannuru Gram Panchayat, Mulbagal Taluka                           | Gram Panchayat members<br>President – Ms Varalakshamma<br>Member – Mr Shankar Gowda<br>Member – Mr Ramesh<br>Mr Krishnappa – village Bertharhalli<br>Mr Kamalanna – village Mudiyannuru<br>Mr Narayana Swami – village Kuthandahalli<br>Mr Ventakesh – village Krishnapura<br>Ms Sujatamma Ramesh – village Bertharhalli   | Situation of groundwater availability and quality, Implementation of schemes around groundwater, water sources in the Panchayats, their status, capacity building of PRIs, committees |
| 8  | Tree Plantation adjoining a MI tank                                   | Chairperson and members of the watershed committee protecting the 250 acre plantation  |   |
| 9  | RO Plant Utthanur Gram Panchayat                                      | PDO and members of the village   | RO plant and its O&M, quality issues  |
| 10 | MI Tank Utthanur  | District level staff of Minor Irrigation Department  | Work status, impact, coordination among agencies  |

|    | Place Visited               | People Met  | Discussion On |
|----|-----------------------------|---|---------------|
|    | Gram Panchayat              |   |               |
| 11 | Kolar Municipal Corporation | EE District Urban Development Centre (DUDC) – Mr B M Ramanath   |               |
| 12 | Various locations           | Beneficiaries of Micro-irrigation, Ganga Kalyan, Krishi Bhagya/Krishi Bhagya (Special Package), recharge structures, sites of Minor Irrigation Tanks, Traditional Tanks and RO Plants |               |

#### *Bidar District*

| S N | Place Visited                             | People Met   | Discussion On  |
|-----|---|--|--|
| 1   | Bidar District Headquarters               | CEO Zilla Panchayat – Mr Pavan Kumar Malapati  | Groundwater status in the District, sustainability issues, steps taken for GWA implementation and GW regulation  |
| 2   |   | PD DRDA Mr Ramakrishna   | Groundwater status in the District, sustainability issues, steps taken for GWA implementation and GW regulation  |
| 3   |   | AEE KRWSSA Mr Khalid Ali<br>AEE Minor Irrigation<br>Assistant Director Agriculture<br>EE KUWSDB – Mr Veerena Gowda<br>AEE CMC – Mr Vinayak Patil<br>Senior Geologist – Geology and Mines   | Groundwater status, , schemes implemented, impact on groundwater, steps for GWA implementation and GW regulation |
| 4   | Chimkod Gram Panchayat, Bidar Taluka      | Vice President Mr Ravi Chenappa  | Groundwater issues, quality testing, GP involvement in Act implementation, PRI roles, capacities                 |
| 5   | Halkheda B Gram Panchayat Humnabad Taluka | Community members  | Groundwater issues, quality testing, GP involvement in Act implementation, PRI roles, capacities                 |
| 6   | Chitagupa Gram Panchayat, Humnabad Taluka | Watershed Project, interaction with implementing agency staff and select beneficiaries   |  |
| 7   | Bidar City Municipal Corporation          | Discussion with staff of KUWSDB, elected representatives, operators, visit to drinking water supply sources in different wards and pumping sites, traditional groundwater conservation measures<br>President CMC – Ms Fatima Anwar Ali | Groundwater issues, quality, testing, CMC involvement in implementation, ULB roles, capacity development         |
| 8   | Various locations                         | Beneficiaries of schemes Micro-irrigation, Watershed, recharge structures, sites of Minor Irrigation Tanks   |  |

#### **Details of Consultations in Rajasthan**

- *Consultations with State Level Government Agencies in Rajasthan*

| S. No | Name            | Designation/Department                            |
|-------|-----------------|---|
| 1     | P.K. Parchure   | Regional Director, CGWB                           |
| 2     | B.K. Maheshwari | Superintending Hydrologist, GWD                   |
| 3     | Binay Bharadwaj | GWD, Jaipur                                       |
| 4     | Subir Kumar     | Secretary, PHED                                   |
| 5     | K.P. Mishra     | Superintending Hydrologist, GWD & In-Charge, MJSA |
| 6     | Parvesh Gupta   | Executive Engineer, SWRPD/WRD                     |
| 7     | Kailash Shrama  | Junior Chemist, GWD Lab                           |

- Consultations at District, Block and GP level (Alwar and Barmer Districts of Rajasthan)

*District: Alwar*

| S. No. | Name                | Designation/Department  |
|--------|---------------------|---|
| 1      | Mahendra Chauhan    | Technical Assistant, GWD  |
| 2      | K.L.Meena           | Superintending Engineer, Watershed and Soil Conservation Department |
| 3      | Omkar Barnwal       | Executive Engineer, WRD   |
| 4      | Manohar Singh       | Executive Engineer, PHED  |
| 5      | Mahendra Singh      | WDT, Thanagazi Block  |
| 6      | Dinesh Kumar        | WDT, Thanagazi Block  |
| 7      | Suresh Verma        | WDT, Thanagazi Block  |
| 8      | Bharti Shrama       | WDT, Thanagazi Block  |
| 9      | Chaman Singh        | Tarun Bharat Sangh (NGO)  |
| 10     | Durga Singh         | Upkar (NGO)   |
| 11     | Priyanka Sharma     | Upkar (NGO)   |
| 12     | Premchand Bairwa    | BDO, Panchayat Samiti, Thanagazi                                    |
| 13     | Ramdhan Meena       | Sarpanch, Ajabgarh Gram Panchayat, Thanagazi Block                  |
| 14     | Mr.Khan             | Secretary, Watershed Committee, Harner                              |
| 15     | Ramvilash Sharma    | Chairperson, Watershed Committee, Harner                            |
| 16     | Sunita Devi         | WDT, Tijara Block   |
| 17     | Sarojwala Sharma    | WDT, Tijara Block   |
| 18     | Deepesh Sharma      | WDT, Tijara Block   |
| 19     | Jinendra Kumar      | WDT, Tijara Block   |
| 20     | Narayan Singh Yadav | Sarpanch, Isroda Gram Panchayat, Tijara Block                       |
| 21     | Satish Soni         | Secretary, Watershed Committee, Isroda                              |

*District: Barmer*

| S. No | Name                | Designation/Department  |
|-------|---------------------|---|
| 1     | Mahendra Kumar      | Junior Hydrologist, GWD, Jodhpur Division & In-Charge, Barmer       |
| 2     | Hiralal Ahir        | Superintending Engineer, Watershed and Soil Conservation Department |
| 3     | Ahsan Muhammad Khan | Assistant Engineer, WRD   |
| 4     | Bharat Singh        | Executive Engineer, PHED  |
| 5     | Hazari Ram          | Executive Engineer, PHED  |
| 6     | Subodh Sharma       | District Collector  |
| 7     | Gopi Kisan Paliwal  | BDO, Panchayat Samiti, Balotra                                      |
| 8     | Hanuman Chaudhry    | WDT, Chohtan Block  |
| 9     | Govardhan Singh     | WDT, Balotra Block  |
| 10    | Rakseh Majra        | WDT, Balotra Block  |
| 11    | Mr. Hasthimal       | WDT, Balotra Block  |
| 12    | Parvat Singh        | Ex-Sarpanch, Thob/Bijrad  |

| S. No | Name           | Designation/Department   |
|-------|----------------|--------------------------|
| 13    | Mohan Chaudhry | Sarpanch, Jagsa/Budiwada |

#### **Details of Consultations in Madhya Pradesh - Bhopal**

| S.No. | Name                 | Designation                    | Department                      |
|-------|----------------------|--------------------------------|---------------------------------|
| 1     | M.K. Acharya         | Chief Engineer                 | Water Resource Department (WRD) |
| 2     | V.K.Chaurasia        | SE, Groundwater Department     | WRD                             |
| 3     | Sanyak Kumar         | Sr. Geophysicist, GWD          | WRD                             |
| 4     | R.K. Sahu            | Sr. Geohydrologist, GWD, Sagar | WRD                             |
| 5     | Praful Saxena        | Sr. Hydrogeologist             | WRD                             |
| 6     | R.K. Rajuk           | Asst. Hydrogeologist           | WRD                             |
| 7     | GourabSahu           | Geotechnical Assistant         | WRD                             |
| 8     | Praveen Sharma       | Engineer                       | WRD                             |
| 9     | Dr. Asha Singh       | Social Consultant              | WRD                             |
| 10    | N.R. Malivia         | CGM                            | Jal Nigam, PHED                 |
| 11    | Praveen K Guru       |                                | Jal Nigam, PHED                 |
| 12    | Devendra Joshi       | Scientist D                    | CGWB                            |
| 13    | BP Singh             | Scientist D                    | CGWB                            |
| 14    | Dr, Subash C Singh   | Scientist D                    | CGWB                            |
| 15    | Dr. Nanda Kumaran P. | Reginal Director               | CGWB                            |
| 16    | P. Singh             | Regional Director              | CGWB                            |

#### **National Consultation Workshop on Draft ESSA**

##### **Introduction**

5. The World Bank, with the support and collaboration of the Ministry of Water Resources, River Development & Ganga Rejuvenation (MOWR, RD&GR) conducted a National Level Stakeholder Consultation Workshop on May 30, 2016 at New Delhi, on the Environmental and Social Systems Assessment (ESSA) of National Groundwater Improvement Program (NGMIP). Nearly 30 participants from MoWR, RD&GR, Central Ground Water Board (CGWB) and representatives from participating States, and team from the World Bank, joined the meeting. The purpose of the consultation workshops was to: (a) brief participants on the approach adopted for Environmental and Social Systems Assessment under the proposed Program for Results operation; (b) solicit feedback on the key findings and recommendations of the ESSA; and (c) identify possible recommendations for the proposed Program action plan.

6. During the workshop, intensive discussions were held with the participants, especially focusing on the ESSA and its recommendations. In advance of the workshop, invitations were sent to State representatives who were involved while preparation of ESSA (government and civil society). The draft ESSA had also been disclosed on the Ministry's website one week prior to the workshop. Presentation handouts were provided by World Bank to all the participants during the workshop.

##### **Presentation**

7. The workshop was divided into two parts, presentations followed by discussion. The presentations made by the World Bank team included: introduction to the Program Development Objective (PDO), Program implementation and verification mechanism, as well as rationale for ESSA. This was followed by separate presentation on the ESSA (process, key findings, benefits and risks, and recommendations). The team emphasized on the social and environmental actions to be considered in the Program design to address gaps in capacity of the Government's existing system in managing

social and environmental issues; mitigate environmental and social risks; and to improve the Program's overall environmental and social performance.

### ***Discussions***

8. The Bank's team had an opportunity to get both verbal and written feedback from the participants. Participants were also encouraged to raise comments during the presentation. In general, stakeholders expressed their strong support for the implementation of the proposed Program. The view was that the proposed investments would bring longer term socio-environmental and economic benefits to the local communities.

### ***Detailed Comments Received at the Workshop***

9. Comments related to environmental issues are described below.

- Environmental screening criteria should be strengthened? more consistently implemented? for assessment of impacts of the Program investments.
- Demand side interventions should be promoted to minimize environmental impacts. Changes in farming practices will also reduce the groundwater use. Public awareness campaigns and incentive Programs need to be developed for bringing behavioural changes in the local communities and government.
- Protection of drinking water supplies through sewerage treatment plants in the urban areas is needed. 'Major industrial wastewater collection, treatment and recharge systems' are excluded from the scope of the NGMIP, but pilots on decentralized waste water systems may be considered, to check the efficacy of the same.
- Institutional strengthening and capability building on environmental issues are required. Additional staff should be hired for these positions instead of burdening the existing technical staff of the State groundwater agencies.
- State groundwater agencies should be consulted for field visits by the Bank team during preparation of the ESSA.
- NABARD's Programme for Artificial recharge as investment in rural areas may also be mentioned in the ESSA as similar Programs can also be taken up the State groundwater agencies
- Water quality monitoring of the recharging water and groundwater to monitor the impacts will be needed.

10. Comments related to social issues are described below.

- Behavioral change is crucial for the groundwater sector as experience has shown that working on the demand side yields much more effective results. The success of this Program depends on effective public involvement, people's participation and local ownership with a stress on behavioral change.
- Institutional strengthening and capability building on social issues are required. Additional staff to be hired for these positions instead of burdening the existing technical staff of the State groundwater agencies. Regular and quality support to local governments is crucial as that is where the implementation thrust is planned.

- There was a discussion on how can community monitoring, participatory planning and behavioural change make a difference in areas which face extreme groundwater depletion. The question was raised in the context of desert areas in Rajasthan where technical options as well as traditional alternatives to extract water have exhausted. While local solutions to local problems may be the best approach but in such circumstances, external interventions and diversion of resources to such areas become the only solution. The team explained that the community processes can still be useful in ensuring that the precious groundwater resource is used efficiently through collective action/regulation and changing practices around groundwater use (rationing, shift in agricultural practices) to at least arrest the rate of depletion.
- There was a doubt that while activity mapping may be an ideal solution to ensure that roles and responsibilities at all tiers of governance are allocated as per principles of subsidiarity to ensure efficiency in implementation, who will undertake this exercise in the States. The ESSA team shared that intensive technical capacities and resources are required for this exercise but looking at examples and best practices from other sectors and States where such processes have taken place can provide inputs in terms of how roles and responsibilities can be allocated and how capacities to fulfil these mandates can be developed. State training institutions like the State Institutes of Rural Development (SIRDs) and Panchayat Training Centers (PTCs) can be involved by the State governments for breaking down the activities and processes related to groundwater management for actual devolution to the Gram Panchayats.

11. Comments on other general issues are described below.

- Indicators for DLI should be jointly developed and they should be easily measurable
- There should be clarity on deliverables and mutual agreement on assessment parameters
- There is a need for paradigm shift in farming practices supported by inputs and market services to ensure that water is judiciously used

#### ***List of Participants in the National Workshop***

|    | <b>Names</b>      | <b>Agency</b>                | <b>State/City</b> |
|----|-------------------|------------------------------|-------------------|
| 1  | Manish Tripathi   | MoWR, RD&GR                  | New Delhi         |
| 2  | Ashok Lente       | MoWR, RD&GR                  | New Delhi         |
| 3  | K.B. Biswas       | Chairman, CGWB               | New Delhi         |
| 4  | E. Sampath Kumar  | Member, CGWB                 | New Delhi         |
| 5  | P. Nanadakumar    | CGWB                         | New Delhi         |
| 6  | Anoop Nagar       | CGWB                         | New Delhi         |
| 7  | PK Naik           | CGWB                         | New Delhi         |
| 8  | GC Pati           | CGWB                         | New Delhi         |
| 9  | KC Naik           | CGWB                         | New Delhi         |
| 10 | P. Somasehkar Rao | ACIWRM                       | Karnataka         |
| 11 | Madhava           | ACWRM                        | Karnataka         |
| 12 | MS Ravi Prakash   | WR Dept.                     | Karnataka         |
| 13 | KB Rabadoa        | Ground Water Resources Dept. | Gujarat           |
| 14 | I.I. Shah         | GWSD                         | Maharashtra       |
| 15 | JC Mohanty        | Principal Secretary          | Rajasthan         |
| 16 | Vinay Kumar       | Ground Water Dept.           | Rajasthan         |
| 17 | Dahir Singh Rana  | Ground Water Cell            | Haryana           |

|    | <b>Names</b>      | <b>Agency</b>              | <b>State/City</b> |
|----|-------------------|----------------------------|-------------------|
| 18 | MS Lamba          | Ground Water Cell          | Haryana           |
| 19 | Pankaja Mahala    | GWC                        | Haryana           |
| 20 | Abed Khalil       | The World Bank             | Washington        |
| 21 | Sayta Priya       | The World Bank             | New Delhi         |
| 22 | Priti Jain        | The World Bank             | New Delhi         |
| 23 | Laura Inha        | The World Bank             | Washington        |
| 24 | Saumya Srivastava | The World Bank             | New Delhi         |
| 25 | Jorge Ava Wterdi  | The World Bank             | New Delhi         |
| 26 | M.K.Goyal         | Consultant, The World Bank | Jaipur            |
| 27 | Puneet Karar      | The World Bank             | New Delhi         |
| 28 | Venkata Nukala    | Consultant, World Bank     | Toronto           |
| 29 | Amit Anand        | Consultant, World Bank     | Bhopal            |
| 30 | Swati Dogra       | Consultant, World Bank     | New Delhi         |

### State Level Consultations on Draft ESSA

#### *Discussions at the ESSA Consultation*

12. State-level consultations were held with the nodal department for discussing the ESSA Draft reports, including the major risks, gaps and strengths emerging from the assessment as well as the key social and environmental findings and recommendations. Feedback of the State level counterparts was elicited on the findings and the Program Actions being proposed for the States. There was an overall agreement that the Program will have positive social and environmental impacts and the Program design needs to ensure equitable access and inclusive management of groundwater.

13. The participants at the State level consultations were in agreement with the findings and recommendations and sought support from the ESSA team in planning and implementation of the recommended Program Actions.

#### *List of Participants in State Consultations*

| <b>Date</b>              | <b>State</b>        | <b>Participants</b>  | <b>Organisation</b>                              |
|--------------------------|---------------------|----------------------|--|
| <b>12 September 2016</b> | Chandigarh, Haryana | Mr. Lambad           | Chief Hydrologist, Ground Water Cell             |
|                          |                     | Mr. Pankay Mahla     | Water Development Specialist, Ground Water Cell  |
|                          |                     | Mr. Gaurav Gupta     | Auditor, Irrigation Department                   |
|                          |                     | Mr. Suresh Gauda     | Executive Director, Irrigation Department        |
|                          |                     | Mr. Dalvir Rana      | Senior Hydrologist, Ground Water Cell            |
|                          |                     | Ms. Swati Dogra      | Social Development Consultant, World Bank        |
|                          |                     | Mr. Venkata Nukala   | Environmental Consultant, World Bank             |
|                          |                     | Ms. Laura Inha       | JPO, World Bank                                  |
| <b>14 September 2016</b> | Jaipur, Rajasthan   | Mr. Suraj Bhan Singh | Chief Engineer, Ground Water Department          |
|                          |                     | Mr. BK Maheshwari    | Superintendent Engineer, Ground Water Department |
|                          |                     | Mr. KM Jaiswal       | Executive Engineer, Water Resource Department    |
|                          |                     | Dr. Vinay Bhardwaj   | Senior Hydrologist, Ground Water Department      |
|                          |                     | Mr. Ambuj Kishore    | ARAVALI NGO                                      |
|                          |                     | Dr. Sanjay Agrawal   | SATYA NGO  |

|                          |                      |                            |   |
|--------------------------|----------------------|----------------------------|---|
|                          |                      | Ms. Priyanka Maheshwari    | SATYA NGO   |
|                          |                      | Mr. Arun Yadav             | Rambu Prabodhini Malghi NGO   |
|                          |                      | Mr. Avdhesh Mathur         | Arpan Seva Santhan NGO  |
|                          |                      | Mr. Prince Purohit         | Arpan Seva Santhan NGO  |
|                          |                      | Mr. Rajesh Jain            | Arpan Seva Santhan NGO  |
|                          |                      | Mr. M K Goyal              | Infrastructure Design Specialist,<br>World Bank                                       |
|                          |                      | Mr. Venkata Nukala         | Environmental Consultant World Bank   |
|                          |                      | Mr. Amit Anand             | Social Development Consultant, World Bank   |
| <b>15 September 2016</b> | Bengaluru, Karnataka | Dr. PS Rao                 | Technical Director, Advanced Centre for Integrated Water Resource Management - AICWRM |
|                          |                      | Mr. M S Raviprakash        | Principal coordinator Engineers Capacity building, ACIWRM                             |
|                          |                      | Mr DHM Veerashekhara Swamy | Groundwater Specialist, ACIWRM  |
|                          |                      | Mr. Madhava                | Superintendent Engineer, ACIWRM   |
|                          |                      | Mr R Doraiswamy            | Principal Coordinator Farmers WUCS Capacity Building , ACIWRM                         |
|                          |                      | Mr Anil Das                | Institutional Expert, World Bank  |
|                          |                      | Mr Nishith Dwivedi         | Financial Consultant, World Bank  |
|                          |                      | Mr. Veda                   | Procurement Consultant, World Bank  |
|                          |                      | Mr. Venkata Nukala         | Environment Consultant, World Bank  |
|                          |                      | Mr. Amit Anand             | Social Development Consultant, World Bank   |