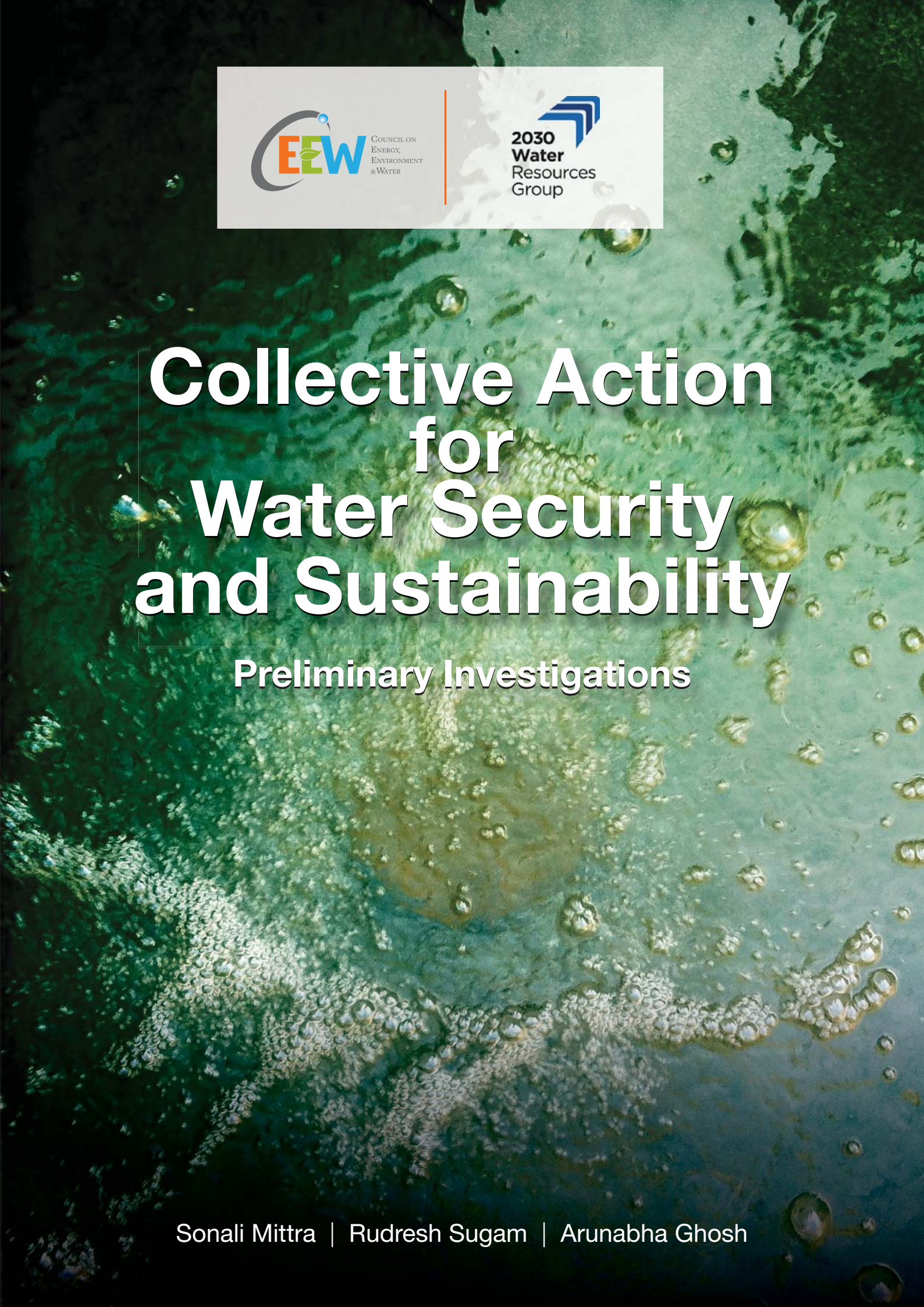

Collective Action for Water Security and Sustainability

Preliminary Investigations

Sonali Mittra | Rudresh Sugam | Arunabha Ghosh

COLLECTIVE ACTION FOR WATER SECURITY AND SUSTAINABILITY

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A Report on 'Collective action for water security and sustainability in India: Preliminary investigations'.
This report was prepared by the Council on Energy, Environment and Water for the 2030 Water Resources Group.

The Council on Energy, Environment and Water (CEEW) is an independent, not-for-profit, policy research institution. CEEW works to promote dialogue and common understanding on energy, environment and water issues in India, its region and the wider world, through high quality research, partnerships with public and private institutions, engagement with and outreach to the wider public. CEEW has been ranked as India's number one climate-related think tank for two years in a row. For more information, visit http://www.ceew.in.

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Organisational background

CEEW

The Council on Energy, Environment and Water (http://ceew.in/) is an independent, not-for-profit policy research institution. CEEW addresses pressing global challenges through an integrated and internationally focused approach. It does so through high quality research, partnerships with public and private institutions, and engagement with and outreach to the wider public.

Among its major completed projects related to water governance, CEEW has: published the 584-page National Water Resources Framework Study for India's 12th Five Year Plan; designed irrigation reform for Bihar; laid out the strategic roadmap for the India Water Platform; presented the case for responsible hydropower development in India; and developed a multi-stakeholder initiative to target challenges of urban water management.

The International Centre for Climate Governance has ranked CEEW as India's top climate change think-tank two years in a row. In 2014, the Global Go To Think Tank Index ranked CEEW 1st in India in three categories.

2030 WRG

The 2030 Water Resources Group (2030 WRG) is an innovative public-private platform for collaboration at global as well as national/local levels. It mobilises stakeholders from public and private sector, civil society, centres of academic expertise and financing institutions to engage in fact-based, analytical water security approaches and coalition building. Our aim is to support governments in their long-term development and economic growth plans by catalysing sustainable water sector transformations and accelerating reforms.

The 2030 WRG acts as an independent entity and offers no political, partisan or national nuance to its advice. The 2030 WRG was initiated in 2008 by a few multinational companies, donors and development banks. After an incubation phase within the World Economic Forum, it has become part of the World Bank Group (IFC) since March 2012. More information: www.2030wrg.org.

About the authors

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She co-edited a book: Perspectives on Water - Constructing alternative narratives in 2012 published by the academic foundation, delineating different case studies from South Asia to assess present socio-economic realities that surround water management. She has been a regular editorial contributor to the Energy News Monitor (Observer Research Foundation) on topics of hydropower and renewable energy. She has authored policy recommendation reports and academic papers on Ganga and Indus basin.

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Arunabha Ghosh is CEO of the Council on Energy, Environment and Water (CEEW), an independent, policy research institution in India. Arunabha conceptualised and has led CEEW (http://ceew.in), since its founding in August 2010, to the top-ranked climate think-tank in India for the last two years in a row. In January 2014 CEEW was ranked first in India across three categories in the Global Go To Think Tank Index. Arunabha has devoted his career to public policy. With experience in 35 countries and having previously worked at Princeton, Oxford, UNDP and WTO, he advises governments, industry and civil society around the world on: energy and resources security; renewable energy policy; water governance and institutions; climate governance (financing, technology, HFCs, geoengineering); energy-trade-climate linkages; and international regime design. In March 2013, the World Economic Forum selected him as a *Young Global Leader*. Arunabha's latest initiative is called the Clean Energy Access Network (CLEAN), a countrywide alliance of decentralised energy firms in India.

Dr Ghosh chairs the taskforce on economic relations for the India-US Strategic Dialogue; is member of Track II dialogues with the United States, Israel, Pakistan, Singapore and Bhutan. He formulated the Maharashtra-Guangdong Partnership on Sustainability. Dr Ghosh is associated with Oxford's Global Economic Governance Programme and its Smith School of Enterprise & the Environment. He was Global Leaders Fellow at Princeton's Woodrow Wilson School and at Oxford's Department of Politics and International Relations. He was Policy Specialist at the United Nations Development Programme (New York) and worked at the World Trade Organization (Geneva). He is on the Board of the International Centre for Trade & Sustainable Development.

His most recent publication is on the foreign policy imperatives for India's resource security. Others include: *Understanding Complexity, Anticipating Change* (India's first ever report on global governance, submitted to the National Security Adviser); National Water Resources Framework Study (for India's Planning Commission); *Strategic Industries and Emerging Technologies for a Future Ready India* (for the National Security Advisory Board); *India's Resource Nexus* (also for NSAB); *Governing Clean Energy Subsidies* (for Rio+20); *Laying the Foundation of a Bright Future* (on India's solar mission); RE+: *Renewables Beyond Electricity; Urban Water and Sanitation in India; Institutional Reforms for Improved Service Delivery in Bihar (on irrigation reform); Harnessing the Power Shift (on climate finance); International Cooperation and the Governance of Geoengineering (for the IPCC); and three UNDP Human Development Reports. He has also led research on trade, intellectual property, financial crises, development assistance, indigenous people, extremism and conflict.*

Dr Ghosh has presented to heads of state, India's Parliament, the European Parliament, Brazil's Senate, the Andhra Pradesh Legislative Assembly and other legislatures; trained ministers in Central Asia; and hosted a documentary on water set out of Africa, *Diary of Jay-Z: Water for Life, honoured at the Webby Awards. His op-eds have appeared in the Times of India, The Hindu, Business Standard, India Today, Indian Express, Financial Express, Mint, Seminar, and Tehelka*. He has delivered public lectures in several countries, and commented on All India Radio, ABC (Australia), BBC, NDTV (India) and Voice of America, among other broadcasters.

Arunabha has been consulted by the Asian Development Bank, DFID (UK), IDRC (Canada), International Energy Agency, International Finance Corporation, IPCC, Commonwealth Secretariat (London), Oxfam International, Transparency International, UK Ministry of Justice, USAID, and the World Bank. He co-chaired the international governance working group for the UK Royal Society's Solar Radiation Management Governance Initiative. He has been an Editor of the *Journal of Human Development and Capabilities. In 2011, the Asia Society named him an Asia 21 Young Leader. He is also fellow of the Aspen Global Leadership Network*.

Arunabha holds a doctorate and M.Phil. in international relations from Oxford (Clarendon Scholar and Marvin Bower Scholar); an M.A. (First Class) in Philosophy, Politics and Economics (Balliol College, Oxford; Radhakrishnan Scholar); and topped Economics from St. Stephen's College, Delhi University.

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Executive summary

Over the years, water resources in India have witnessed quality deterioration, volumetric reduction, business risks, and worsening equity, social costs and ecological degradation. The current arrangements and principles of water management are reductionist. In other words, most of the initiatives involve one or two stakeholders, such as government and multilateral donors, or private sector and civil society. Seldom are initiatives inclusive of all stakeholders. The underlined institutional frameworks are fragmented and not synchronised, resulting in ineffective governance, mismanagement and wastage of water resources. In order to build a structure for water management, which can adhere to socio-economic realities, collective action is an imperative. Examples of collective action for water management do exist at the micro-watershed level in India, presenting opportunities for further learning. The principle problem, however, is the lack of such initiatives at basin and sub-basin levels. The study asks:

- How could successful interventions for water security be scaled up?
- Under what conditions do seemingly disparate groups, with conflicting interests, come together to resolve water problems?
- How could one-off motivations be sustained over time and across geographies?

Motivation

In order to address the aforesaid questions, the Council on Energy, Environment and Water (CEEW) collaborated with the 2030 Water Resources Group (2030 WRG) to study the factors for collective action in India at different hydrological scales. This study derived its motivation from the preliminary investigation conducted for the National Water Platform in India, published by CEEW and 2030 WRG in 2013. An assessment of existing water networks confirmed the absence of a structured and systemic multi-stakeholder dialogue in India to bring together different partners, specifically for demand-side management. Detailing how water decisions are structured in India, the study highlighted the role and relationship between four major actors in the country's water ecosystem—the government, the civil society, the industry sector, and bilateral and multilateral donors. Interdependencies and insecurities among these four actors at varying hydrological scales have obstructed collective cross-sectoral efforts for sustainable water management. It is against this backdrop that the emphasis for the current study was laid on analysing the factors for successful collective action practices in India for achieving water security and sustainability.

Methodology

An intensive literature review was conducted to extract the dominant factors responsible for the success and failure of collective action. These factors were further explored and contextualised to assess their relevance in the Indian water security discourse. Subsequently, a logical decision tree was used to develop an analytical framework to be tested against a set of national and global case studies. Thereafter, global and national case studies (the Gundar Basin, the APFAMGS project, Phagi Tehsil, Neemrana, the Mara River Basin, and the Clear Creek Watershed projects) were carefully selected based on 'boundary' conditions, and the interpretation of 'success' adopted for this study. Cases that involved at least more than two stakeholder groups (government, industry, civil societies, communities, bilateral and multilateral donors), and functioned at basin, sub-basin, and macro or micro-watershed levels were selected on that basis.

Case selection and analysis was preceded by a discussion with subject matter experts and global 'thought leaders'. An

additional focus was added to the study for examining the detailed process of collective action and identifying multi-user cases, as suggested by a consultation in the draft report. The cases were analysed on the basis of project monitoring and evaluation reports, background information shared by stakeholders and face-to-face interviews. Field visits were conducted for two major national cases—the Neemrana project and the Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project—to triangulate research findings. A coding schedule was created to evaluate the significance of different factors in fostering collective action across all the cases studied. Finally, each significant factor was categorised in terms of its relevance at different stages of a collective action intervention. The study concludes with recommendations for programme initiators, facilitators and managers of collective action.

Selected factors for collective action

- Presence of common threat/opportunity
- Incentives and penalties structure
- Defined rights and entitlements for resource use and access
- Strong leadership
- Social ties and networks among stakeholder groups
- Critical mass (pilot/demonstration projects for trust building)
- Social identities (socio-economic stratifications)
- Communication and coordination
- Monitoring and accountability

Findings

Various national and global cases (the Gundar Basin and Mara River basin, the APFAMGS project, the Neemrana project, and Clear Creek Watershed project, etc.) were studied in detail with reference to the analytical framework. The subsequent rating of factors was assigned on the basis of subjective interpretation and available factual details for each of the cases. The following three categories help explain the significance of these factors at various phases of collective action:

Triggers

The intensity of the threat and its severe impact on stakeholders has a rising effect on the likelihood of organising collective action.

The presence of stringent incentives and penalties—mainly imposed by government rules, norms and policies—seem to have a similar effect on triggering collective action.

Social ties and networks (previous working relationships, preceding projects, social and professional contacts) is a critical attribute in bringing stakeholder groups together. The essence of leadership was seen in several cases, especially at the micro and macro watershed level.

Facilitators

The critical mass of stakeholders who are resourceful enough to produce noticeable impact is, for most of the cases, a facilitator for collective action.

When rights and entitlements for water use, management and exclusion are well defined, conflicts are reduced, subsequently facilitating collective action.

Sustainers

Communication and coordination among interested parties and stakeholders is the backbone of any water management project.

Lastly, rigorous monitoring and accountability systems are an imperative for collective action to become self-sustaining and resilient to changing socio-environmental conditions.

The above mentioned categories do not necessarily prescribe set conditions or any particular sequence of events. The process of collective action is location and context specific; and this study has aspired to highlight the fundamental elements required for collective action to occur.

Key recommendations

Recommendation 1: Analyse Threats/Opportunities
In order to trigger collective action by presenting threats and/or opportunities, programme initiators should deploy analytical tools such as water risk assessment tool, water footprint, life cycle assessment, environmental impact assessments etc. to understand the type, intensity, characteristic of threat and the affected population.

Recommendation 2: Convene Stakeholders
Programme initiators should convene scientific and technical bodies, water users groups and other relevant stakeholder groups to undertake participatory data collection. A combination of traditional knowledge and technical scientific skills, employed via participatory mechanisms, should be used for assessments.

Recommendation 3: Establish Voluntary Standards and Codes
In the absence of credible and effective incentives or penalties, programme initiators should act as a convening body for industries and other major water users to establish voluntary standards and rules for water management. Certification and standards such as Alliance for Water Stewardship could be referred as templates for designing region-specific standards and codes of conduct.

Recommendation 4: Transform Collective Decision-making
Programme initiators should identify stakeholders with wider reach, diverse skills and dense networks through various initiatives. One idea is to identify 'Jalbandhu'('water friends') organisations, i.e., existing institutions, which could spread information and create awareness about a project's objectives. Another idea is to organise local 'Pani Mela'('water fairs'), whereby participatory approaches could be used to generate ideas from communities, civil society organisations, government agencies and other interested parties to collectively decide on which projects to initiate.

Recommendation 5: Identify and Nominate Leaders
Programme facilitators should use their convening power to evaluate and nominate specific institutions to lead on initial stages of a planned intervention, based on the interest, capacity and capabilities of the institutions available.

Recommendation 6: Build Leadership Skills at Local Levels
Programme facilitators should build technical, financial, organisational and management capacities of local representatives to create village level leaders, through training workshops and modules for continuous skill improvement. Such a base of local water leaders could ensure that projects are properly executed at a community level, rather than remaining reliant on external.

Recommendation 7: Build Critical Mass for Different Programme Stages
Programme facilitators should convene key representatives from each of the relevant stakeholder groups to be involved in project design to form a critical mass. Specified roles for each of the groups should be determined, as per their skills and expertise, for executing different phases of the project such as design, piloting, review and debugging, and scaling up the programme's operational footprint.

Recommendation 8: Formulate Rights and Responsibilities through Participatory Means
Where rights and entitlements are unclear or ambiguous, programme facilitators should convene stakeholders at an early stage to define clear rules and norms for water allocation and distribution in an inclusive participatory manner.

Recommendation 9: Formalise Rights with Local Governments and Stakeholders
Once the stakeholder-generated rights and responsibilities demonstrate more effective collective action, programme facilitators should work with the relevant government departments and ministries to institutionalise these rules and norms in order to end unsustainable practices and transform local relationships among various water stakeholders.

Recommendation 10: Establish Forums for Communication and Learning
Programme managers should maintain a continual and interactive process between funders, technical and scientific bodies, programme participants and partners by creating both formal and informal channels of communication and coordination. This can be achieved by establishing forums, committees or federations as per the requirements of the programme to provide a platform for continual learning and improvement.

Recommendation 11: Formalise Communication and Coordination Channels
Programme managers should facilitate the involvement of government organisations, departments and ministries necessary for legal, administrative and political support for formalising the communication and coordination processes.

Recommendation 12: Commission Independent Third Party Evaluations
Programme managers should commission independent third party evaluations to monitor and analyse successes/failures of the interventions at different phases, through periodic reporting and demanding disclosure statements.

Recommendation 13: Facilitate Collective Review and Accountability Procedures
Programme managers should convene all relevant stakeholders to review the evidence provided by the independent monitoring report and create accountability measures for addressing the concerns.

Recommendation 14: Formalise Legal Accountability
Programme managers should facilitate involvement of government organisations, departments and ministries necessary for legal, administrative and political support for formalising the monitoring and accountability measures.

Recommendation 15: Develop and Communicate Exit Strategies
Programme managers should ensure that all relevant stakeholders devise their respective exit strategies, in consultation with all other stakeholders. This would ensure that the exits of one or the other party is well communicated, predictable, contingent on building the capacity of other stakeholders to carry forward the programme, and to ensure that rights and responsibilities are institutionalised, monitored, reviewed and every party is held accountable for its commitments.

Section I
Background

India's water security challenge is characterised by a contradiction between soaring demand, competing uses and finite availability of water. Top-down and isolated planning, reductionist and exclusive participatory approaches have all contributed much to the current state of water resources in the country. Over the past two decades, however, an emerging discourse has been observed towards integrated water resource management and inclusive participatory models that highlight the roles and responsibilities of different actors, including public, private, civil society and communities. While there are numerous evidences of the success of community-based collective action on water, involving either one or two main stakeholders (instead of all), scaling up such efforts at the basin or sub-basin level is absent. If water security and sustainability is to be achieved, a more holistic, inclusive and integrated approach needs to be devised at the basin level. A key challenge facing policy makers, technocrats, private and public sectors is, therefore, to ask what produces and what hinders collective action for water security and sustainability at the basin or sub-basin level. How could successful interventions be scaled up? Under what conditions do seemingly disparate groups, with conflicting interests, come together to resolve water problems? How could one-off motivations be sustained over time and across geographies?

In order to address the aforesaid questions, the CEEW collaborated with the 2030 WRG to study the factors for collective action in India at different hydrological scales. This study derived its motivation from the preliminary investigation conducted for the National Water Platform in India, published by CEEW and 2030 WRG in 2013. An assessment of existing water networks confirmed the absence of a structured and systemic multi-stakeholder dialogue in India to bring together different partners, specifically for demand-side management. Detailing how water decisions are structured in India, the study highlighted the role and relationship between four major actors in the country's water ecosystem—the government, the civil society, the industry sector, and bilateral and multilateral donors. Interdependencies and insecurities among these four actors at varying hydrological scales have obstructed collective cross-sectoral efforts for sustainable water management. It is against this backdrop that the emphasis for the current study was laid on analysing the factors for successful collective action practices in India for achieving water security and sustainability.

This report is presented in eight major sections, with Section II defining the boundaries, success factors and collective action for this study; and Section III summarising the key findings of the literature review that was conducted. This is followed by Section IV, which discusses the significance of factors for collective action in the Indian context (selected from the literature review). Section V describes the analytical framework (decision tree) and methodology for the case selection and analysis; while selected national and global case analyses are discussed in Sections VI and VII—leading to the discussion on the report findings in Section VIII. Finally, Section IX draws broad recommendations for promoting collective action in India to achieve water security and sustainability.

Section II

Introduction

The pieces of the collective action puzzle are many; and at the core of this lie two fundamental concepts—'boundaries' and the 'interpretation of success'. An understanding of the extent to which boundaries play a role in defining the scope, content and success of interventions vis-à-vis water resources is the first pre-requisite. The second step is the interpretation of success, i.e., the effectiveness of collective action for providing that much-needed clarity and motivation for convening different stakeholders to act collectively.

Boundaries

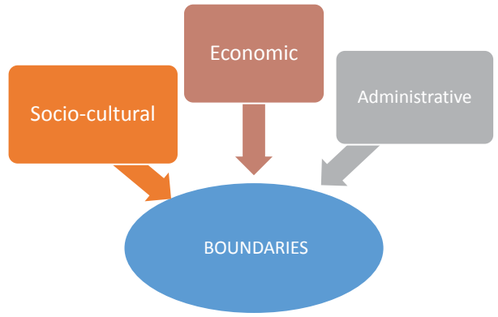
Rivers basins transcend political, economic and social boundaries, creating their very own hydro-ecological units. The implications of this insight are, however, not followed through in the planning and management of water resources by regions, states and countries that share river basins; and as a result, ineffectiveness and failures abound. It is necessary, therefore, to investigate the fundamentals of river management, and question the need to establish clear boundaries in water resource management.

There are multiple boundary concepts that cater to different motivations; and the fact that a cohesive definition is missing, is one of the important reasons why boundaries are so hard to observe. Moreover, boundaries help in explaining rights and entitlements, while building the foundation for a 'sense of belonging' towards a shared water resource. Furthermore, clear demarcation facilitates effectiveness and practicality of action and interventions. In this light, a 'boundary' becomes a critical attribute, which needs to be understood for its multi-functional role in river basin management.

In the Indian context, we define 'boundaries' as physical hydrological demarcations (derived from hydrological divisions recommended by the All India Soil and Land-use survey 1988—namely, water resources, basin, catchment, sub-catchment, and both macro and micro watershed). Each boundary is also further defined by its economic, socio-cultural and administrative components, which vary at different hydrological scales:

- Economic aspects: Required for highlighting divergence or convergence of sectoral interests and growth objectives
- Socio-political aspects: Essential for ease of implementation of any intervention
- Administrative aspects: Important for considering laws and rights governing the water of any given unit for effective governance

Figure 1: Boundaries



Source: CEEW analysis

For the purposes of this study, the following four hydrological boundaries were considered:[2]

- Basin: Catchment/drainage area of a river of the size range of 30,000,000–5,000,000 ha

- Sub-basin: Catchment/drainage area of the main river's tributaries of the size range of 5,000,000–200,000 ha
- Macro-watershed: Area drained by a single water stream/ tributary within the size range of 200,000–20,000 ha
- Micro-watershed: Area drained by a single water stream/ tributary within the size range of 5,000–9,000 ha

A generic account of the three characteristics — administrative, economic and socio-cultural—of a standard boundary prototype is mentioned in Table 1, followed by an illustrative example in Table 2. The following boundary conditions for the project were further laid down, based on this preliminary description:

- Projects with scale/unit of intervention above the community level will be considered. Collective action at higher hydrological levels are uncommon or almost absent in India, especially at basin and sub-basin level.

With the increasing focus on integrated basin level management, it is critical to understand the positive and negative dynamics of bringing interested parties and stakeholder groups to act collectively.

- Collective action practices that involve more than two key stakeholders—i.e., the private sector, the government, non-governmental organisations (NGOs), communities and bilateral and multilateral organisations—will be selected for analysis. More often than not, it is observed that due attention is not given to all relevant stakeholders within a project. We are interested in understanding the subtleties that would come into play once all relevant groups are given their equitable share in decision making; and how this would that impact project outcomes. Cases where at least more than two main stakeholders are involved in decision-making or execution will, therefore, be preferred for analysis.

Table 1: Detailed explanation of 'boundaries' set for this study

Boundaries/Unit	Administrative Characteristics			Economic Characteristics	Socio-cultural Characteristics
	Numbers	Area (Avg. ha)	Administrative units	Sectors	Social aspects
Water Resource	6 major rivers	5,50,00,000	Regions (country)	Industry (large, small–medium); Agriculture, Hydropower, Fisheries, Navigation, Domestic consumption	Income classes, Gender disparity, Religious groupings, Literacy rate
Basin	35 basins	95,00,000	Multiple states	Industry (large, small–medium); Agriculture, Hydropower, Fisheries, Navigation, Domestic consumption	Income classes, Gender divisions, Religious groupings, Literacy rate
Sub-Basin	550 sub-basins	7,00,000	Multiple districts	Industry (medium, small), Agriculture, Hydropower (medium, small), Fisheries, Domestic consumption	Income classes, Gender disparity, Religious groupings, Literacy rate, Caste divisions, Religious and Cultural practices
Watershed					
Macro	3,257	7,000	Multiple sub-districts	Cottage industries, Agriculture, Small–Micro Hydels, Sustenance Fisheries, Domestic consumption	Income classes, Gender disparity, Literacy rate, Caste divisions, Religious and Cultural practices, Vulnerable communities, Livelihood impacts
Micro		1,000	Blocks, Villages, Tehsils	Cottage industries, Agriculture, Sustenance Fisheries, Domestic consumption	

Source: Adapted from AISLUS (1988) Watershed Atlas of India, All India Soil and Land Use Survey

Table 2: Example illustrating the boundary concept

Boundaries/ Unit	Characteristics				Stakeholders
	Administrative		Economic	Socio-cultural	
	State/Area		Sectors	Social aspects	
Ganga Basin	States: Uttar Pradesh, Madhya Pradesh, Rajasthan, Bihar, West Bengal, Uttarakhand, Jharkhand, Haryana, Chhattisgarh, Himachal Pradesh and Union Territory of Delhi	1,086,000 sq.km	Cultivation (75%), Mineral exploitation, Industries (paper pulp, leather), Hydropower (8 projects)	Average population: 300 million; Population density: 520 persons/ sq.km; Rural population: 72%; Urban population: 27.82%; Literacy: 64.8%; Per capita income: INR 24,295	**Government:** National Ganga River Basin Authority, Central Water Commission (CWC), Government officials including representatives from Ganga Pollution Control Unit, and Public Health Engineering Department **Research institutes:** IIT Kanpur **NGOs and CSOs:** Ganga Sewak Samaj, Allahabad, Maa Shakuntla Devi Shikhsha evam Vikas Samiti, Kanpur, Eco Friends Kanpur, WWF India **Industry:** Confederation of Indian Industry (CII), Representatives from Department of Industries (State) and Private sector representatives such as Jindal Saw Pvt. Ltd., Jaiprakash Associates, Jaypee Infratech Pvt. Ltd., etc.
Bhagirathi Sub-basin	State: Uttrakhand; Districts: Uttar Kashi, Tehri	6,921 sq.km	18 hydropower projects at Tehri, Agro-food processing, Forest and herbal products, Tourism	Population: 16.6 million; Rural population: 79.21%; Urban population: 20.78%; Literacy: 57.36%; Per capita income: INR 11,939	**Government:** Officials including representatives from Uttarakhand Payjal Nigam, PHED, ward members **Research institutes:** IIT Roorkee, WWF India, G.B. Pant Institute of Himalayan Environment and Development **NGOs and CSOs:** People's Science Institute, Dehradun, Disha Foundation, Shree Hari Ganga Samiti, Samaj Sewa Sansthan, Dharam Gramin Uthan Sansthan, Himalayan Organisation for Progress and Empowerment **Industries:** Association of Uttrakhand, Directorate of Industries, UK (DOI), Krishna Vanaspati Industries Pvt. Ltd.
Gomti Macro-watershed	State: Uttar Pradesh; Cities: Lucknow, Lakhimpur Kheri, Sultanpur and Jaunpur	1,165 sq. km	Handloom and handicrafts, Sustenance agriculture, Mineral industries, Metal works, Electronics	Population: 6.8 million (approx); Vulnerable communities: Chamas, Pasi, Kol and other generic tribes	**Government:** Jal Sansthan and Nagar Nigams (cities), Gram Panchayats **NGOs:** Paryavaran Mitra, Hazarat Ali Educational and Welfare Society **Industries:** Satharia Industrial Development Authority, Pepsico India Holdings Pvt. Ltd., Jaunpur, SP Constructions Pvt. Ltd.

Source: CEEW analysis

Success of collective action

The second fundamental concept for collective action is the definition of 'success'. Success is generally measured in terms of economic effectiveness of a project or intervention. In the water resources sector, it would be insufficient to rate success merely by means of its objective/outcome ratio. With a more all-inclusive approach, we define the **success of collective action in water sustainability to be achieved if—project objectives are met; collective action is self-sustaining; there is continual learning and improvement; and processes are formalised.**

of success has been adopted; while collective action has been defined as '***a process of economic, physical and social value creation by addressing institutional imperatives in an inclusive, participatory manner to meet the common goal of water security and sustainability.***'

An example of successful collective action according to the above definition would be a case, where water-related intervention led to—i) the development of a sustainable economic model for a self-sustaining action; ii) physical changes in the water quantity, quality and conservation

Figure 2: Conditions for Success of Collective Action

Source: CEEW analysis

If these factors (Figure 2) are met, it would not be too optimistic to hope that success would be replicated at other hydrological levels, and for varying action arenas to achieve water security.

Defining collective action

Traditionally, collective action is defined as an action taken by a group of people to achieve a common objective.[3] Increased global attention on inclusive multi-stakeholder participation has evolved the concept of collective action. For instance, the CEO Water Mandate, a public–private initiative, defines collective action as—'*coordinated engagement among interested parties within an agreed-upon process in support of common objectives.*'[4] This definition has been adopted by the Pacific Institute and Alliance for Water Stewardship (AWS) for all their collective action projects and strategies.

For the purposes of this project, a broader definition based on the aforementioned boundary conditions and definition of the resource; iii) an improvement in social capabilities in terms of knowledge management and practices; and iv) the development or modification of institutional support mechanisms aiming towards systemic changes. Lastly, all relevant stakeholders and interested parties would be involved during the intervention (as per their respective roles and responsibilities) for achieving the common goal.

Before beginning to review the literature on collective action, it is necessary to differentiate between different terms used interchangeably for collective action—co-operation and collaboration. Roschelle and Teasley (1995) describe co-operative work as a task that is accomplished by dividing it among participants, where 'each person is responsible for a portion of the problem solving'.[5] They define collaborative work as 'the mutual engagement of participants in a coordinated effort to solve the problem together'. In other words, co-operation can be achieved if all participants do their assigned parts separately, contingent at times on the actions of others; while collaboration, by contrast, implies direct interaction among individuals to produce an outcome.[6]

Section III
Theory and evidence

With the definition of collective action in mind, an extensive literature review was conducted to investigate the factors necessary for it. The research included understanding the subject for the provision of public goods and management of natural resources.

Most of the theoretical underpinnings and empirical studies on collective action are structured from Mancur Olson's seminal work, *The Logic of Collective Action*.[7] According to the theory presented in this text, rational and self-interested individuals will not act to achieve their group interest due to the temptation to free-ride. One of the most important attributes leading to free-riding is the impossibility of exclusion of a public good like water.[8] Water being a human right and a common pool resource cannot be denied to individuals, leading to the challenge of free-riding. Olson mentioned the size of the group and the presence of external forces, such as incentives, penalties, and coercion to be responsible elements of collective action.[9] Although Olson asserted that self-interested members have more incentive to co-operate in smaller groups,[10] scholars criticised the size argument based on empirical evidences that propose collective action to be more complex than a simple function of group size.[11,12] The size argument wasn't completely refuted, however, but was re-interpreted with a focus on the **heterogeneity of interests**.[13] Heterogeneity has been a factor of consideration for collective action both in economic and social theories.

On the other hand, material (resource) **incentives and penalties** have been invariably accepted as a factor contributing to collective action.[14] The limitations of economic incentives and coercion to mitigate free-riding problems led scholars to explore other inducements that facilitated collective action. Social and moral incentives, social status, social acceptance and encouragement were some of the factors which seemed to have worked in either one context-setting or the other.[15,16]

Game theorists have tried to explain collective action through the prisoner's dilemma, shedding further light on the rational behaviour of individuals.[17,18] In essence, they suggest that in the presence of a common threat, defection would dominate co-operation, given that there is a lack of **communication and coordination** among the players. Since interactions are not a one-time phenomenon, however, the consideration of future interactions (shadow of the future)[19] would induce collaboration among different players.[20,21,22] When applied to common pool resources, such as water, the prisoner's dilemma had its own limitation, especially the assumption of a static environment and homogeneity of the group. In a nut shell, game theorists offered predictions for collective action, emphasising the role of communication and coordination among different players.

Further accentuating the claim of rational choice theorists, Hardin's *The tragedy of the commons* emphasised that those who share usage of a natural resource, will, in time, over-exploit and degrade it.[23] Ostrom's influential work on '*governing the commons*' produced critical principles for collective action.[24] She established eight success factors for collective action over common property resources (CPR) which centred on ownership, **rights and entitlements**. Her explanations were critiqued for the lack of attribution to social factors, however, such as trust and leadership[25] (later recognised by Ostrom herself).[26,27]

The awareness of shared grievances, i.e., negative emotions experienced due to the deprivation of just and desirable resources is said to bring about collective action.[28,29] This relative deprivation is a critical aspect in the face of social inequalities that exist in access, availability and ownership of water resources. It can be reasoned that **relative deprivation** is a form of threat, which unites different groups to act together. Goldstone and Tilly (2001) described **threat** as a social cost

that is incurred by groups in the absence of a collective action.[30] If the threat is dynamic, immediate and lethal, it can also impact mobilisation.[31] Put simply, the nature and context of the threat is of primary importance in achieving collective action. There is, however, little dispute that with the advent of climate change, increasing demand and competing uses of water, water security is anything less than an immediate threat. It is absolutely necessary to investigate, therefore, how this 'lethal' water threat mobilises resistant and dormant groups to act collectively.

The **critical mass** theory provided insights on the emergence of collective action. It postulated that actions of individuals depend upon the actions of others.[32] It implied that a sufficient number of individuals, who work to achieve a common good, is critical to self-sustain the action and create further growth.[33] Depending on the resource type/public good, the number of members in a collective group would be directly proportional to group benefits; and in other cases, such benefits would begin to taper off with the addition of more members.[34] This theory too, however, has its limitation in failing to explain how this critical mass comes together in the first place.

Social theories on collective action emphasised the social and political inspirations for collective action.[35, 36] Models on social identity and collective action propose that individuals act collectively, motivated by perceived efficacy, identity and injustice, to obtain group interest.[37] In a nutshell, therefore, self-conscious individuals would act collectively depending on their position within the societal power structure to gain political advantage.[38] It would be safe to assume, therefore, that **social identity**—i.e., the perception of 'self' derived from a membership to the group—is critical in fostering collective action,[39, 40] and that it is an important factor in predicting collective action.

Additionally, the evolution of the concept of 'social capital' tried to encompass varying motivations and rationales for individuals to act together and produce a collective good, focussing on existing social structures.[41,42,43] The core of their argument suggested that individuals join groups to accrue benefits achieved from member actors and their resources. Besides social norms and trust, therefore, network and resources attached to each individual are of critical importance.[44] The stronger the **social ties and network of association**, the greater will be the social capital; and consequently, the easier it will be to facilitate collective action.[45]

Certain empirical studies highlight the role of **leaders**[46,47]—motivated by encouragement, altruism and moral consciousness—to produce collective action by mobilising the crowd.[48] They may be political entrepreneurs[49] or morally motivated individuals, with resources and influence to co-ordinate decisions[50] and actions among different members of the group.

Once the collective group is formed, sustenance of collective action has been argued to be even more challenging. Ostrom (2007) suggested that locally-owned **accountability and monitoring** mechanisms, devised through inclusive interactive processes is required.[51] This interactive process can be understood with the help of participation theories. Inspired by community development movements,[52] empirical evidences revealed that low participation and the act of ignoring contextual realities hamper growth and outcomes of collective action.[53] The inclusive participatory approach, on the other hand, is now well recognised as being imperative for the sustainable development of natural resources at all levels.[54] For instance, the inclusive participation of various stakeholders—such as the industry, government, civil society and community—cannot be overlooked if water security is to be achieved sustainably. It is clear, therefore, that it is only through such participation that sustainable decision making for monitoring, assigning accountability, conflict resolution and resource management might be achieved.

Table 3: Summary of the literature review

Theory	Logic of Collective Action	Prisoner's Dilemma and Collective Action	Commons Dilemma
Main Argument	Rational self- interested individuals will not act to achieve their common or group interest	In the presence of a common threat, co-operation would be rational, but defection dominates due to lack of information and coordination.	Absence of rights, rules and norms leads to freedom to use common pool resource, which in turn ruins it.
Dilemma	Free-riding	Dependence on others' decision and actions	Depletion of common pool due to selfish interested individual actions (short term thinking)
Factors	Size of the group, incentives and penalties.	Coordination and communication	Rights and entitlements
Theory	**Social Identity Theory of Collective Action**	**Relative Deprivation Theory and Collective Action**	**Critical Mass Theory and Collective Action**
Main Argument	Inter-relationship between injustice, efficacy and identity predict collective action behaviour.	Unjust disadvantage fosters collaborative actions	Actions of individuals depend on actions of others
Dilemma	Creation of social identity and its politicisation	Restricted to self-beliefs	Formation of the critical mass in the first place
Factors	Social identity	Threat/opportunities	Critical mass
Theory/Research	**Social Capital Theory**	**Leadership**	**Institutional framework for Collective Action**
Main Argument	Strong relationship between different actors (and their resource capacities) within a social structure fosters collective action.	Leaders driven by strong enough economic and social motivation can direct and influence coordination, efficiency and continuity of collective action.	Rules, rights and entitlements are fundamental to production and sustenance of collective action.
Dilemma	Highly dependent on face-to-face exchanges and social structure	Leadership is subject to economic incentives or high moral values	Monitoring requires capacity, and accountability is difficult to assign.
Factors	Social ties and network	Leadership	Monitoring and accountability

Section IV

Factors for collective action for water security and sustainability

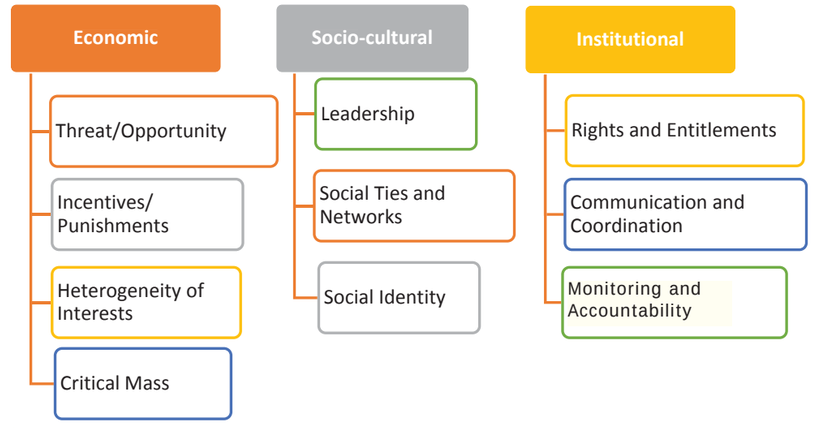
From the literature review of the preceding section, the following 10 factors were shortlisted based on their importance in predicting collective action, and were further categorised under the broad disciplines they adhere to. Factors selected from the economic theories—such as threat/opportunity, incentives/punishments, heterogeneity of interests and critical mass—were categorised as economic factors, while factors from socio-psychological theories were labelled as socio-cultural factors—namely, leadership, social ties, and network and social identity. Institutional factors included governance, management, strategies, rules and norms-related factors, such as rights and entitlements, communication and coordination, and accountability and monitoring. It is important to mention here that these factors often tend to overlap, and, therefore, these categories have been left porous so as not to limit the understanding of the actual behaviour of these factors.

Each of these selected factors were further explored for their behaviours, and contextualised with respect to the Indian water security discourse. For the purpose of this project, major stakeholders were assumed to be the government, civil society (local, national and global), industries, multilateral and bilateral development organisations and communities.

Presence of common threat/opportunity

The threat created due to competitive uses of water, increasing prices, declining availability, inadequate data, and other factors, create risks for businesses, communities and governments. Water scarcity due to over-exploitation, overpopulation and urbanisation, isolated planning, decreasing resilience of the soil-water system, inadequate infrastructure, rising pollution, natural causes and climate change is a severe threat. It is assumed that the higher the physical, economic and social dependency on water resources, the higher would be the risk

Figure 3: Factors for success/failure of collective action



Source: CEEW analysis

and threat perception leading to group mobilisation. Business risks stemming from the reducing availability of water, social conflicts, and other environmental reasons threatening the supply chain, management or operations of businesses are a growing concern. Such risks have led industries to take proactive steps to mitigate them through long-term planning and the involvement of local users. In the Phagi Tehsil case, for instance, factories threatened by declining groundwater supplies, collaborated with the Advit Foundation to maintain sustainable supply of water for the entire region.

Opportunities, on the other hand, may range from business solutions for infrastructural and technological interventions to adhering to Corporate Social Responsibility (CSR) mandates, aiding collective action.

Wade (1984) studied the conditions for collective action in irrigation in the state of Karnataka, collecting qualitative data from 41 villages. He found that water scarcity and the resulting risk of crop failure led some villages to collectively act to set up an association for managing their irrigation system. According to Wade, villages at the tail-end of the irrigation system, where water was most scarce, were most likely to have farmers acting collectively.[55] In such instances, the potential net benefits from collective action were clear, substantiating the significance of the 'presence of threat' as an important factor for collective action to transpire.

Incentives and penalties

Incentives and penalties add to the perception of either an opportunity or threat/risk, respectively, providing the impetus for collective action. It is understood that members with high interest in economic, normative and social inducements are more likely to contribute their time, effort and commitment in collective action. For instance, under the laws on water pollution control and environmental protection, fear of penalties may contribute to bringing different actors together. The Environmental Protection Act 1986 and the Water Pollution Control and Prevention Act 1974 are the two foremost statutory provisions present for penalising acts of disobedience. Moreover, incentive structures have been suggested in the National Water Policy 2012, with the said potential to attract collective action. The government of Gujarat, for example, provides certain monetary benefits for water-energy conservation at the farm level. Other small and discrete incentive structures are also present in different sectors to promote conservation and efficiency. These arrangements, however, are targeted at sectoral consumption and demand patterns. Nevertheless, there is much scope of incentives and punishments for non-compliance to bring stakeholders to act collectively towards the common goal of water management.

Heterogeneity of interests

This aspect is synonymous with Olson's size factor, but has been re-interpreted to focus on the divergence of interests of different groups for this study. The wider the interests of group members, the more difficult it would be to build consensus on common group objectives or acceptance of the most appropriate assemblage of interests.

The most convincing case in this regard was presented by Varughese and Ostrom (2001) through their forest-user group case studies in Nepal.[56] They suggested that heterogeneity is more of a challenge, and might not be the strongest predictor of collective action. It can, however, be overcome by locally-owned institutional designs and intensive communication mechanisms.

Heterogeneity in India gains importance due to the linkages between rivers and their economic, political, and religious sentiments. For instance, a wide disparity in interests is evident among government authorities, civil society and communities in the case of the proposed dams on the Alaknanda and Bhagirathi rivers. The Ganga holds particular religious significance with respect to Hindu culture and its perception of water.[57] The past few years have seen religious leaders standing in protest for saving the river Ganga by mobilising masses to protect holy rivers. On one hand, the re-invigorated drive to protect and conserve nature, religion and culture was considered a positive development; while on the other, the government's plans to construct dams and water storage structures on 'sacred' rivers were severely hampered. This relationship between water and religion has been contemplated to have the potential for both aiding and disrupting collaborative efforts on water management in India. Nevertheless, if homogeneity of interest is achieved among different stakeholders, collective action can be brought upon with relative ease.

Critical mass

Critical mass is the minimum number of stakeholders required to effect mobilisation, which in turn produces collective action. In principle, critical mass is said to be fundamental to providing start-up cost and other critical resources in inducing wide-spread collective action. The composition and size of critical mass may differ from case to case, and is said to be dependent upon the scale of intervention.

To give an example, in Andhra Pradesh, the Hyderabad Urban Development Agency (HUDA), in partnership with local village committees, NGOs and Coca-Cola India, helped 16,000 villagers of Saroor Nayar to restore existing 'check dam' water catchment areas.[58] This intervention could not

have been possible without Coco-Cola's funding or HUDA's legal and administrative support—and most importantly, without the involvement of representatives from Saroor Nayar. Had either of the stakeholders' dropped off from the project, the outcomes would never have been achieved effectively. This project also worked as a demonstration project for Coco-Cola in the region, which instigated various other upscale initiatives involving more partners and stakeholders to improve the area's water situation. In other words, critical mass is the number of stakeholder groups involved in conducting the demonstration effect to attract all other relevant stakeholders to act and meet the overall objectives. It is important to mention, however, that this project is not a collective action, but has been used to highlight the significance of 'critical mass' in the context of India's water management discourse.

Leadership

Leaders driven by strong enough economic, environmental and social motivation can direct and influence coordination, efficiency and continuity of collective action. Therefore, leaders who are resourceful, resilient to external pressures and powerful (politically and socially) are an important factor in producing collective action.

In one of the collective action cases in India, the project for providing water to the slum area of Nehraka Nagla, Agra, portrayed the significance of leadership quite effectively. The NGO, CURE India, undertook the lead in planning, managing and implementing the project. It liaised with the government for providing the required No Objection Certificate (NOC) to establish a plant, it facilitated a three-phase electricity connection for the project, conducted ground research for market and public opinion/needs, found land for the plant, and selected the Self-Help Group (SHG) for managing/operating the plant. It also helped in the capacity building of the SHG for making them capable of running the plant themselves. Other stakeholders were FEMS3, Eureka Forbes, the Municipal Corporation of Agra, and the SHG Nai Asha. This was clearly one of the cases where leaders and their network and ties fostered collective action for achieving water security in an area.

Social ties and networks

Social ties and networks between different stakeholders predict collective action as a function of network size and density. The more centralised, dense and diverse the social network and ties, the more effective the collective action is likely to be.

For instance, the World Wildlife Fund for Nature Conservancy (WWF-India), having worked on the Ganga basin since 1997, established strong ground networks and ties with various stakeholders in the basin, including religious leaders, government departments, industries and NGOs. The project, 'For a Living Ganga', 2007 (a partnership between WWF-India, HSBC Climate Partnership, The Climate Group, Earthwatch Institute and Simthsonian Tropical Research Institute) gained additional acceptability among partners and beneficiaries due to WWF-India's strong connections with partners and grassroots organisations. Needless to say, this made scaling up fairly convenient for the project.

Social identity

For the purpose of this study, social identity is defined as a group's self-concept derived from perceived membership in a relevant social group. It is assumed to predict certain inter-group behaviours on the basis of socio-economic stratifications (based on income inequality, caste disparity and relative access to resources). It is, therefore, an important factor—especially for the understanding of why collective action might fail.

The *Narmada Bachao Andolan*, a social protest movement started by the civil society against the giant hydropower dam construction on the River Narmada, the injustice towards the displaced population and towards ecological concerns is argued to be a response to subjective states of disadvantage vis-à-vis physical and social reality. The movement picked up pace, gathered momentum and became a symbol of civil society movements in India against large dams. Groups associated with this symbol are today unable to liaise with the government or industries to work collectively towards water management. Quantitatively, it is difficult to ascertain how social identity fosters or inhibits collective action, but the fact that it features constantly in social and psychological theories underlines its significance.

Rights and entitlements

The lack of clarity on rights and entitlements concerning resource access, its use and management may result in conflict among groups, resulting in the breakdown of trust and co-operation. Clearly defined rights (property, management, exclusion, etc.) are believed to support collective action.

In the late 1970s, a successful joint forest management strategy was established in Sukhomajiri, Haryana. Fodder production increased and grazing reduced as a result of the project. This in turn led to reduction in pressure on nearby forests, reducing sedimentation of a nearby reservoir. With this success, the project was expanded throughout the region between 1990 and 1998. The areas where replication was successful had clearly defined social (informal) rules, and often used a private contractor to allocate water resources

and collect user-fees. In other cases, loosely defined rights failed to produce effective results of collective action. It would be safe to assume, therefore, that clearly defined and locally owned allocation and distribution rights are a positive pre-condition for collective action.

Communication and coordination

Communication and coordination among different stakeholders for information sharing, decisions and management of a common resource is considered to be vital in inducing and sustaining collective action. Both are usually known as a domain of either formalised or informal organisation (depending on the command and control of decision making arrangements) in a given setting, and therefore, differ from case to case. Communication is critical to how a risk is framed—whether it stems from penalty or incentive structures, or from the shared threat that exists with respect to the resource. Developing a common understanding of such risks among stakeholders is inherently dependent on communication.

A classic example of a failed opportunity for collective action in the absence of communication and coordination was seen in the case of the Kishenganga dispute between India and Pakistan. To establish a 'prior appropriation' principle on the Indus waters, India and Pakistan started building the Kishenganga and the Neelum–Jheelum hydropower project on either side of the border, respectively. As a result of the lack of a proper communication strategy, however, not only was a dispute filed in the International Court of Justice under the provisions of the Indus Waters Treaty 1960, but that these closely placed projects are also predicted to cause disastrous ecological consequences, if commissioned.

Monitoring and accountability

Accountability and monitoring are the essence of the institutional framework for collective action. Monitoring is essential to ensure that management of water resources is resilient and adaptive to a complex and rapidly changing environment. Furthermore, it is required to provide feedback for a continual improvement and learning process. In the absence of monitoring and accountability mechanisms, many multi-stakeholder initiatives have either become redundant (after a certain period of time) or have completely collapsed due to their inflexibility to adapt to altering environmental circumstances.

In India, little attention is paid to accountability; and wherever present, it is measured through financial monitoring, especially for urban water and sanitation services.[59] In principle, accountability to bring transparency in the system is obstructed by corruption in the water sector, which is largely a part of the broader governance problem. Given the lack of understanding of type and incidence of corruption, it is difficult to assess the impact of corruption on the success or failure of a particular intervention. However, by encouraging inclusive participation, decentralisation models and monitoring and accountability measures, corruption can be implicitly addressed. In the Water Policy and Action Plan 2020 (Planning Commission study), it is emphasised that monitoring and accountability mechanisms need to be strengthened to accomplish effective water management.[60] It specifically mentions the role of private participation in bringing discipline and accountability to users.

Section V
Analytical framework

The literature review, assortment of factors for success or failure of collective action, and the Indian contextualisation was then followed up by the selection of a methodology that would validate these factors and provide a detailed assessment of how they might behave in reality. Case study methodology was thought to be the most appropriate for a deeper understanding. Merely a narrative of the process, however, was felt to be insufficient without accounting for the nuances and the myriad factors, which were expected to have an impact on collective action. To ground the case analysis within the literature and existing theories of collective action, an analytical framework was developed.

The main purpose of the analytical framework was to test the relevance of the factors for collective action in the changing socio-economic and environmental realities present at different hydrological scales across India. Given the complexity of the action being dealt with and its context specificity, a decision tree approach was adopted to simplify the process. Simplification allowed for diverse cases to be analysed in a uniform manner and to give a comprehensively acceptable depiction of collective action. To give an example, a certain factor like 'threat' could now be explained in terms of varying degrees of intensity—severe threat, significant threat, non-lethal threat, insignificant threat or negligible threat. The decision tree approach accepts these varying degrees into one final group—threat—therefore, permitting a coherent comparison with other factors, while illustrating its dominance in the entire process of collective action.

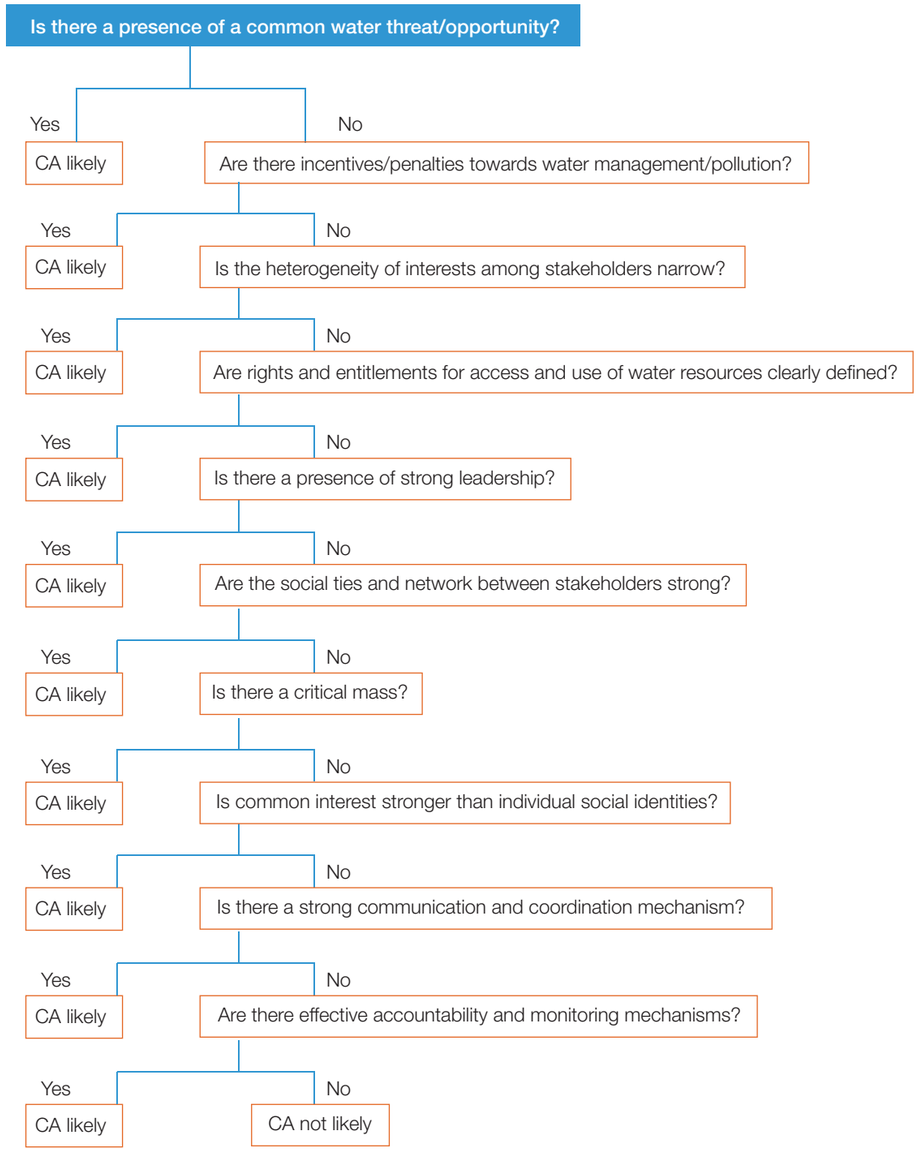
A simulation case study was used to construct the decision tree. The case study, in reference, involved four major stakeholder groups—namely, the government (two departments), NGOs (a local organisation), communities (10 villages) and industries (two industries). A hypothetical scenario asserted that the threat of low water availability had led the two major industries in a sub-basin to approach the local NGO, which in turn liaised with the government departments and local communities to act collectively for achieving water security. Given this scenario, all factors for collective action were debated for their contribution in fostering collective action among the aforementioned actors. Each factor's prognostic behaviour was then converted into a query format to enable quantitative (binary coding) analysis. After multiple brainstorming sessions, the decision tree was finalised (figure 4). The particular order in which it has been presented is not to suggest any linearity or causality of factors in the process of achieving collective action, but only to ask certain questions in a logical manner during a case study analysis.

Once the decision tree was formulated, both national and global cases were screened to fit the purpose of this study. The definition of collective action and boundaries, together with the interpretation of success, as discussed in the introductory section of this study, enabled our selection of cases in a progressive manner. Firstly, water management cases at different hydrological levels were given preference. For example, projects at macro-watershed, sub-basin and basin levels were identified. Secondly, cases where more than two stakeholder groups (the government, civil society, communities, industries, and multilateral and bilateral development organisations) involved were screened. Thirdly, cases with broader mandates—such as sustainable livelihood development, climate change mitigation, and hydro-ecological conservation—were shortlisted. The reason for the third step was to understand the functioning and operation of collective action with multiple objectives. This also helped to add variety and divergence to the particular cases under consideration.

However, it is important to mention the limitations in the final selection of cases. Due to time and resource constraints, only well-documented cases were reviewed. Moreover, the cases where interviews could not be scheduled with at least one stakeholder group were dropped from the assessment too. Nonetheless, the evaluation of six national cases were accomplished, with four detailed studies and two illustrative examples of best practices, along with two major global water management projects.

Once the lists of national and global cases were finalised, a thorough background information assessment and in-depth interviews with the stakeholders of the respective projects were conducted. Interviews followed qualitative discussions with the help of a semi-structured questionnaire.

Figure 4: Analytical framework – decision tree to determine influence of factors



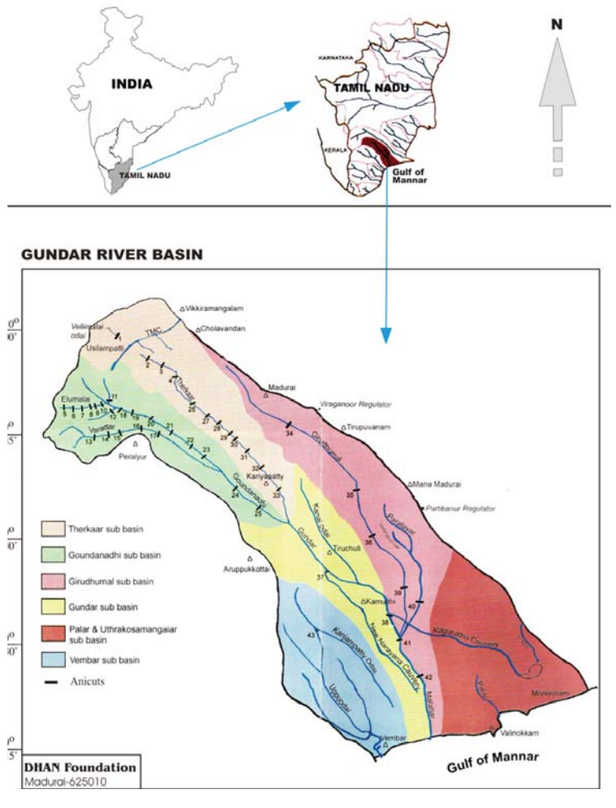
Source: CEEW analysis

Section VI
National case studies

The following section will present the aforementioned decision tree to investigate the cases, and test the relevance of each of the shortlisted factors.

Case study 1: Gundar Basin, Tamil Nadu

Figure 5: Gundar Basin's location, extent & characteristics



Source: Hindustan Unilever Foundation report on Gundar Basin, 2014

Basin area: 5,660 sq.km

Districts: Madurai, Sivagangai, Ramnathapuram, Virudhunagar & Tuticorin

Population: Nearly 500,000 families

Major community: Marginal farmers

Major water use: Irrigation

Source: 2,276 tanks

Status of tanks: Poor

Problem: Low irrigation water availability leading to failure of crops

Project objective: Rehabilitation of tanks to improve livelihood

Stakeholders: HUF, DHAN, NABARD, farmers, local banks, panchayats, etc.

Project area: 13 tank cascades with 250 panchayat union tanks distributed in 9 blocks across 4 districts of Madurai, Sivagangai, Ramnathapuram, & Virudhunagar

Background

Gundar is a dry river basin that receives an average rainfall of ~600–900 mm/year. The river originates in Madurai, Tamil Nadu, and crosses the five districts of Madurai, Sivagangai, Ramnathapuram, Virudhunagar and Tuticorin. The basin area spans about 5,660 sq.km, with agriculture being the major land-user. Out of the total population of nearly 500,000 families, more than 70% are dependent on agriculture and allied activities. Tanks are the major source of irrigation for these agricultural fields. There are approximately 2,300 tanks classified under the Public Works Department (PWD) and the Panchayat Union (PU). The priority for maintenance is given to tanks with large capacities, leading to neglect of smaller tanks. Moreover, the PWD tanks (511) are in better condition as compared to the PU tanks (1,765) because of the maintenance work undertaken by the PWD. The poor condition of PU tanks has a direct implication on the water availability for irrigation, which in turn affects crop productivity and ultimately the farmers' income. The programmes addressing the tank rehabilitation issues are mostly focussed on individual tanks rather than at a cascade level.[61] Farmers, the major stakeholders, were hardly involved in any of the tank rehabilitation programmes. There was also a complete lack of coordination among the farmers themselves to address this livelihood challenge, despite the fact that the maintenance of tanks would have benefitted them the most. A deeper analysis of the case highlighted the significance of an incentive structure or mechanism that could have provided the trigger for farmers to act together to maintain the tanks. The initiation of collective action remains a challenge in all common pool resources management, as evident in this case, unless incentives or penalties are applied.

Due to poor crop productivity and low income, issues like declining agricultural productivity, high weed infestation, increasing permanent fallow lands and out migration started in the Gundar Basin. To address these concerns, the Development of Humane Action (DHAN) Foundation, a NGO, the Hindustan Unilever Foundation (HUF), the National Bank for Agriculture and Rural Development (NABARD), and the farming community began a collaborative project in April 2010, named '*Tank Cascades Development for Livelihood Security*'. This project targeted the rehabilitation of 250 tanks present in 13 cascades, with an aim to be a 'model with scalability' for other regions in India.[62,63]

Project objectives

To build a social capital of farmers, including women and landless farmers, through the formation of farmer groups, such as Vayalagam (tank farmer group whose members are directly benefitted from repairing tank structures).

To rehabilitate and sustain tank irrigation management through grass roots action

To conserve and develop 13 tank cascades with 250 PU tanks distributed in nine blocks across the four districts of Madurai, Sivagangai, Ramnathapuram and Virudhunagarin, based on the requirement and need of primary stakeholders.

To set up endowments, and improve agricultural productivity in the project area through partnership with NABARD, banks and government departments.

Case analysis

The analysis intended to investigate the process that took place for bringing together different stakeholders to undertake this collective action. This was not to validate the output of the project, but to explore the prevailing factors and processes that led stakeholders to collectively act. To understand the process in detail, two detailed interviews with Mr Pramod John (Programme Coordinator, HUF) and Mr. A. Gurunathan (Programme Leader, DHAN) were conducted, in addition to reviewing project documents. The sequence of analysis followed the analytical framework described earlier.

In the Gundar Basin, farmers (constituting 70% of the population in that area) were struggling to attain adequate crop production due to poor rainfall and deteriorating irrigation facilities. While working for the improvement of the livelihood of the communities in the area, the DHAN Foundation noticed these challenges, and the dire need for an irrigation improvement intervention in the area within their organisational mandate. They lacked the financial capacity to undertake any meaningful action, however, and began to seek a funding partner. On perceiving the high impact investment opportunity, HUF agreed to fund the intervention. With the opportunity provided for technical and financial assistance, local farmers too agreed to join in the efforts.

Additionally, NABARD and local banks provided their support for a successful intervention. Overall, this collective action was triggered because all stakeholders realised this to be a **common opportunity** for improving the livelihood of marginal farming communities in the area.

The basin, as described earlier, is dominated by the farming community and the major land-use is agriculture. The targeted beneficiary group of the project were marginal farmers, who suffered due to lack of irrigation facilities and did not have enough funds to invest in an expensive ground water extraction system. Even the non-farming population—for instance, those involved in livestock production—were interested in the project, as they too struggled to procure fodder for their cattle, and had to travel long distances for the same. Although coming from different backgrounds, the stakeholders involved in this collective action decided to collectively work on improving the status of marginal farmers through tank rehabilitation. There was, thus, a **homogenous interest** of increasing the livelihood status of the marginal farming community.

Multi-user competition did not exist in the area owing to the complete absence of industries and urban clusters. Hence, there were no conflicts from competitive users, which was considered to be a positive factor for collective action to arise. Furthermore, the rights of farmers to use the available tank water were well defined. The problem, however, was not that of access, but of availability.

Due to issues such as weed infestation, siltation, blockage of feeder channels, and leakage of sluice gates, capacity was greatly reduced. When the tank rehabilitation project began, several challenges came to the forefront. To give an example, clearances from the mining department were required for de-silting the tanks, which was a daunting task in itself, given that the government had no involvement in the project. For clearing weeds from the tanks and moving people who had illegally settled on the feeder channels required support from the land revenue department. In addition, there were resistances from local politicians and other villagers during the implementation of conservation works. The DHAN Foundation was instrumental in meeting all these challenges through their coordination among all stakeholders and government departments. By conducting a background study of the area; conceptualising a cascade level tank rehabilitation programme; procuring funding—and achieving the most difficult task of convincing farmers, the Panchayat Union and the government departments—DHAN easily stood out as a **leader** in this project. This conclusion was further confirmed by the HUF representative interviewed for the project.

The stakeholders (HUF, DHAN, NABARD, and most importantly, the farming community) seemed to share a good relationship; although it was a gradual process that had led to such a healthy network. In the initial phases, as reported during the interview with the HUF and DHAN representatives, there was mistrust among farmers regarding the intentions of the private bodies, as well as the overall goal. The Panchayat Union was also not supportive, because no pilots had been done in that area to demonstrate the success of the designed methodology. Despite DHAN enjoying a strong presence and good track record in the southern Indian states, it had been difficult for them to convince the farmers any differently. The government departments also doubted their intervention process, making the initial phase very difficult. It took months for them to initiate mining silt from the tanks due to clearance issues from the mining department. However, the steady focus of HUF and DHAN to achieve the project target, combined with regular interaction with the stakeholders helped them in developing **good ties and networks** with the farmers, and later with the government departments as well. It was largely due to the pressure from farmer associations on the government that the project received clearances from all the concerned departments.

Another important event that provided the key momentum to this project was the achievement of the initial success—overcoming the challenges. One of the conditions of the project dictated that farmers who joined the initiative had to contribute 10% of the project cost incurred in the respective tank rehabilitation. This had been deliberately designed to screen free-riders and build a sense of ownership among the farmers. Despite being a necessary clause, it actually became an immense challenge for the project as farmers were unwilling to pay, claiming it to be the government's responsibility to do so. Traditionally, it had been the government's (Panchayat Union's) responsibility to maintain the tanks, but it had failed to do so owing to several reasons, such as lack of funds, manpower issues and lack of attention towards the management of small tanks. Finally, farmers associated with some of the tanks decided to participate in the project for the lack of any other option available to them; and fortunately for them, their faith paid off. There was an increase in water availability in these particular tanks, which led to an increase in crop productivity. This demonstrated success for other farmers, who then began to willingly invest in the project and formed tank associations. This small group of farmers, HUF, DHAN and NABARD now formed the critical mass of the project that led to mobilisation, and a wider acceptance for the project, inducing other stakeholders to join the initiative.

A surprising fact reported by the DHAN representative pointed at a lack of social stratification in the basin area. Farmers in this basin did not distinguish themselves very strongly on the basis of religion, caste, income, etc., and hence, **social identity did not inhibit** collective action in this case. According to the HUF representative, however, it was not that social identity was completely absent, but that it was a dormant factor in view of the larger challenge of livelihood security that required more immediate attention, leading to the formation of associations. Although the project was designed for the basin level, the actual intervention was at the level of individual tanks. Associations were formed at three levels—the tank level (*Vayalgams*), the cascade level and the block level (these federations were a registered body)—but on-ground operations occurred at the tank level alone. This unique characteristic of the project might have helped its progress, as farmers sharing water from a tank were usually related and mostly belonged to the same caste/community.

All these factors taken together were successful in triggering off the initial mobilisation process, but for the project to become sustainable in the long run, a *strong communication and coordination mechanism* was imperative. The stakeholders,

DHAN and HUF, ensured that the communication with farmers remained regular, along with a continuous sharing of knowledge and the effective settlement of disputes. The stakeholders established field offices to achieve these objectives; and their field staff were regularly trained to understand local issues and adopt the right strategy for conflict resolution. Given the varying nature of arising conflicts, contextual interventions were required. Issues such as the mutual disagreement on tank water sharing, for example, could be dealt with at the *Vayalgam* level; while issues such as encroachment, political interference, and Panchayat Union disturbance needed the intervention of staff right at the federation level. As the association at all the three levels regularly interacted with farmers, Panchayat-level officials and government departments, a mutual trust gradually developed within the system and found efficient ways of conflict resolution. Knowledge sharing and capacity building were also undertaken at all the three levels. For instance, awareness training programmes were organised for farmers on alternative economic activities such as fishing and horticulture, issues such as micro-pension, operating bank accounts, and other social security schemes were also addressed. Cross learning was encouraged by co-ordinating with institutions such as the Krishi Vigyan Kendra (KVK) and the agriculture department. It may, therefore, be concluded that a fairly strong communication and coordination mechanism was a major factor for the success of this particular collective action.

An analysis of the project monitoring and evaluation aspect throws up two good practices. The first of these was that HUF and DHAN had created Vayalagams for every tank, cascade level associations at the cascade level, and a registered association at the block level (federation). This ensured effective internal accountability and monitoring at all levels. The second good practice was that of third-party verification and validation. External experts were called in to validate achievements and check the accounting system for any discrepancies. Project monitoring at both internal and external levels, therefore, made the system transparent and accountable.

Finally, it would be very interesting to observe how effectively these associations operate once the project ends in 2015. Looking at the mix of stakeholders and their roles, it is also recommended that there should be more government involvement to ensure that such good practices remain sustainable.

Key takeaway points

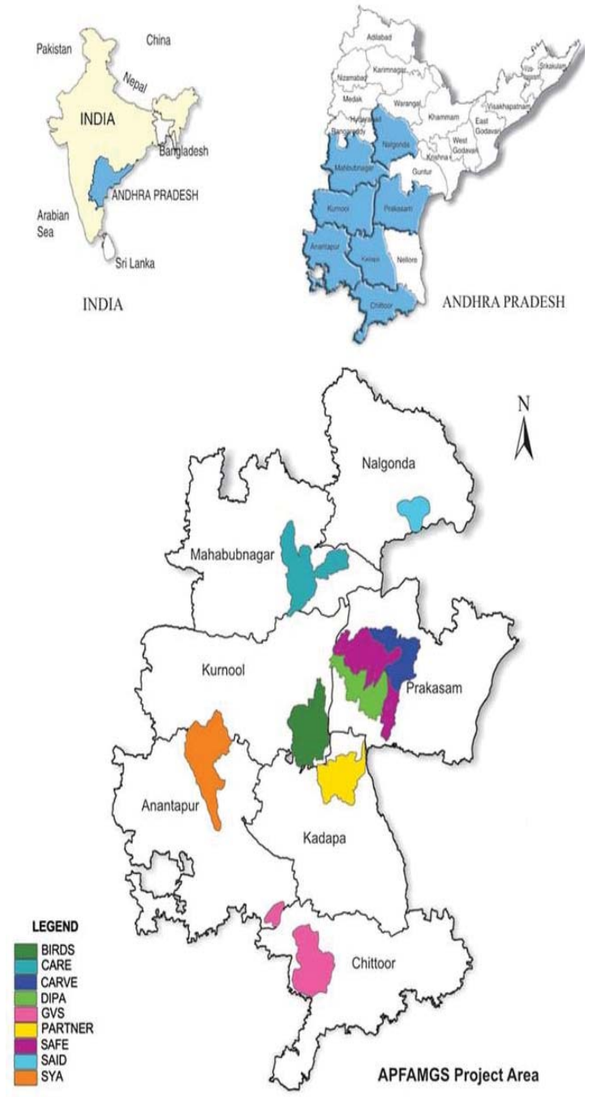
- Continued on-ground presence is important for such collective action to succeed
- The funding partner needs to be intensely involved in the operations by creating dedicated teams rather than providing financial support alone
- Government involvement is essential for accelerating operations
- Developing a strong communication and conflict resolution strategy is necessary for building trust
- Farmers should not be considered as beneficiaries alone, and should be encouraged to invest and develop a sense of ownership too.
- A project should be designed by adopting a scientific methodology, and only after the careful consideration of the local situation, making it essential to involve local experts with proven track records.
- Demonstration of success even at a small scale is essential to trigger the mobilisation process

Figure 6: Gundar Basin case study: Process highlights

Perception of common threat/opportunity	
↓	
A agriculture dominant area dependant on tank irrigation was struggling due to poor status of tanks	HUF, DHAN Foundation, NABARD and farming community realised renovation of tanks was an opportunity for improving livelihood of marginal farmers.
Leads	
↓	
Conducting a background study of the area, conceptualising a cascade level tank rehabilitation programme, procuring funding – and most importantly, convincing farmers, Panchayat Union and the government department, DHAN easily lead the project	
Strong ties and networks	
↓	
With farmers and government agencies doubting a private sector initiative, the process of building trust was not easy.	Intial tank level successes demonstrated the project's efficacy and gradually led all stakeholders to develop strong ties and networks.
Strong communication and coordination mechanisms	
↓	
Conducting regular farmer's meetings, establishing field offices to share farmers' concerns and organising capacity building programmes for field staff to strengthen the coordination process.	A strong communication and coordination strategy was key to the success of this intervention
Effective accountability and monitoring project	
↓	
Monitoring of work and setting of objectives occurred at three levels – tank, cascade and block level.	Both internal and external project monitoring made the system transparent, and the intervention sustainable.

Case study 2: Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project

Figure 7: Location of APFAMGS project area & its characteristics



Districts Covered: Nalgonda, Mahbubnagar, Kurnool, Prakasam, Anantpur, Kadapa, Chittor

Number of Hydrological Units: 63

Population: 661 habitations, population nearly 900,000

Major community: Farmers

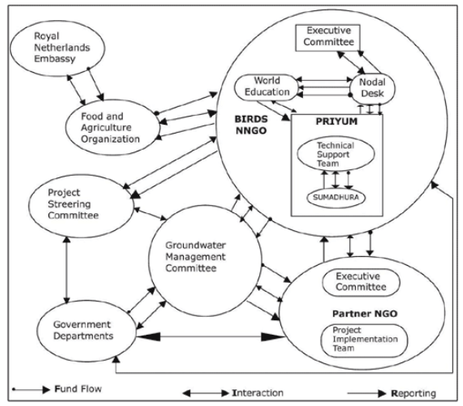
Major water use: Irrigation

Source: Ground water

Problems: Over exploitation of groundwater, threat to food security and social instability

Project objective: Sustainable supply of groundwater through participatory demand side management and knowledge creation.

Stakeholders: 9 NGOs (with BIRDS as nodal NGO), habitants of 7 districts, FAO, Royal Netherlands Embassy, government departments



Source: Ravi K Ganti (2009) Presentation made on APFAMGS, available at http://www.slideshare.net/indiawaterportal/a-p-f-a-m-g-s-project , accessed on 7July 2014; and APFAMGS, FAO website; available at http://www.fao.org/nr/water/apfarms/about.htm, accessed on 7July 2014.

Background

The erstwhile state of Andhra Pradesh was the fourth largest state in India, located along the south-eastern coast. Despite four major rivers—Godavari, Panna, Tungabhadra and Krishna—flowing through it, almost 50% of the erstwhile state's net cultivated area was irrigated by groundwater.[64] Agriculture is the main source of income and engages 60% of the population in the region. Rice is the main staple diet, and a major crop requiring high water intensity. Other important commercial crops are groundnut, chillies, cotton and sugarcane.[65]

The average rainfall received in the state continues to beabout 925 mm, mostof which is gained from the retreating south-west monsoons. Almost 41% of this is lost through evapotranspiration, given the climate of the region, and another 40% is lost as surface run-off,leavingonly 10% to beretained in the soil.[66] Large parts of the erstwhile state are covered by hardrocks, where aquifers are not extensive and are controlled by secondary openings that offer limited discharge.

Droughts are a frequent occurrence in the region, with about seven districts of the erstwhile state—Nalgonda, Prakasam, Karnool, Kadapa, Chittoor, Annantpur and Mehboobnagar—declared as among the most drought prone districts. Drought severely affected crop production in the early 1980s, and resulted in farmer suicides, unemployment, poverty, acute drinking water and fodder scarcity. A semi-arid geology, a crop pattern tilted towards commercialisation, inadequate support from institutional, political and financial structures, together with unsustainable agricultural practices led to physical, social and economic stress in the region.

Intervention

In 1995, Bharati Integrated Rural Development Society (BIRDS), a local NGO, initiated the Andhra Pradesh Groundwater Bore well Irrigation Schemes Project (APWELL) with funding from the Royal Netherlands Embassy (RNE) and support from the Andhra Pradesh State Irrigation Development Corporation (APSIDC) as well as the Institute of Resource Development and Social Management (IRDAS). By 2003, APWELL had assisted small and marginal farmers to increase their agricultural production by providing 3,462 groundwater irrigation facilities. As a result of bore well installations, however, groundwater tables were observed to be depleting at a much faster rate than anticipated due to changing agricultural patterns. The project, therefore, underwent mid-term corrections and re-emerged with pilot testing initiatives such as Participatory Hydrological Monitoring (PHM), artificial groundwater recharge and promotion of organic agriculture.

It was only after a thorough audit and analysis of this intervention that the APFAMGS project was conceptualised in 2004. It lasted for five years, from 2004–09, and was implemented through a federation of 63 registered farmer institutions guided by nine NGOs. BIRDS, acting as a nodal agency, along with RNE, the Food and Agricultural Organisation (FAO) and other technical advisory bodies (PRIYUM) called for a reversal of the then ongoing trend and encouraged traditional, yet scientific methods of water management. The project area was spread over 40 mandals, forming a part of 303 panchayats (63 hydrological units) in seven the state's drought prone districts. The major project component was to focus on demand side management, along with technical and scientific capacity building of the farming community.

The project aims and objectives were in tune with global trends for environment projects and their management, integrated watershed management principles and the National Water Policy of 1987. The project design and implementation included unique and innovative models of inclusive participation, knowledge creation, equity, environmental sustainability, sustainable practices and community development (including poverty reduction).

Project objectives[67]

- Technical and scientific capacity building of farmers to collect and analyse data on groundwater through PHM
- Adopting Farmers Field School (FFS) approach for promoting eco-friendly farming system
- Facilitating formation of Groundwater Management Committees (GMCs) for regular monitoring of groundwater levels, rainfall and discharge.
- Promoting Crop Water Budgeting (CWB) as a tool to empower farmers for deciding appropriate crop system to match available groundwater
- Empowering the community to use appropriate initiatives in groundwater recharge measures

Some new approaches developed and field-tested by APFAMGS included the FFS,[68] CWB,[69] Habitation Resource Information System (HRIS) and the crop-water information kiosk (CWIK). As an outcome of the project, 63 Hydrological Units (HUs) were delineated within the project area and water data was monitored and compiled across these HUs regularly with the help of 190 rain gauges, 2,109 monitoring wells, and 63 surface flow gauging stations; while artificial recharge was supported by 969 recharge wells.[70] APFAMGS established 658 GMCs—one for each village—and 63 Hydrological Unit Networks (HUNs) at the watershed level.

Farmers belonging to HUNs were trained to understand groundwater systems in a scientific manner, and collect and analyse the data. An intensive hydrological database was created using participatory data collection techniques and a GIS platform for the usage of GMCs. As an outcome of the project, farmers in the area now practice CWB for collectively deciding cropping pattern and regulating their groundwater usage. The FFS continues to train and educate more farmers from all over the state.

Figure 8: Observatory well, R.K Puram village, A.P

Figure 9: Rainfall measurement Gauge – demonstration by Mr. Verachari, farmer and secretary, GMC, R.K Puram village

Figure 10: Groundwater data displayed on the wall of the main village road, R.K Puram village

Figure 11: Crop Water Budgeting – visual representation displayed on the wall of the main village road

Source: CEEW Field Visit to R.K Puram Village and Peddavagu Village in Kurnoor district, Andhra Pradesh in August 2014

Case analysis

APFAMGS presented a unique case for this collective action study for two main reasons. To begin with, APFAMGS was implemented in districts belonging to different watersheds that were delineated through primary hydrological studies conducted by BIRDS, with technical assistance from PRIYUM, and were termed as Hydrological Units (HU). Secondly, the exit strategy of donors and NGOs were built as an integral part of the project by providing complete command and control to the beneficiaries of the project.

It is important to mention that this case analysis does not review the success of the project, but delves deeply into the factors that aided the success of this collective action with the help of the analytical framework chosen for this study. A field visit to two of the HUs, R.K. Puram and Pedavaggu, in Kurnool district informed the following analysis. During the field visit, the functioning of the GMC and the CWB exercise were observed in detail, along with in-depth interviews with ground staff, trainers, members of HUs, and farmers.

Over the years, semi-arid conditions, frequent droughts and inadequate institutional support had already threatened the small and marginal communities of the region. Additionally, overexploitation of the main source of water for drinking and irrigation created a **threat** among the farming community, leading to a surge of farmer suicides and deteriorating socio-economic conditions in the region. The lack of alternative forms of livelihoods led to stalemate situation in the seven drought prone regions; and the threat-ridden farming community welcomed and fully participated in the initiatives led by BIRDS to implement APWELL. Later APFAMGS gained the full support of the farming community, which was severely threat-ridden.

The involvement of the farming community in the implementation and operation of project was completely voluntary, driven by their need for improving prevailing conditions. **No incentives** (monetary) were offered for involvement, and neither were any penalties imposed for non-participation. Farmers even donated parts of their land for building small water harvesting structures (ponds and small tanks), along with leveraging their 'work' time towards the operation of the project. The normative and social incentives to be a part of the project, however, could be assumed to have played a major role in getting all 661 villages to act collectively.

An advantage for this project was its single-user characteristic. The project area was dominated by agriculture being the main user of water. No sectoral competition for water use existed, and therefore, no conflicts existed either. The NGOs, funders and the farming communities were also in unity with regard to the scope of the project, and the outcomes envisioned. The **homogeneity of interests**, therefore, aided collective action in this case.

Another usual cause of conflict is **under-defined rights and entitlements** for water access and use. Given the nature of the water resource in this area, all farmers with bore wells had access to the groundwater resource; and land ownership governed groundwater usage rights. Depleting water tables and the subsequent threat, however, pushed farmers to manage their groundwater source collectively, despite having the right to access and use the water that lay below their fields. As mentioned earlier, farmers voluntarily gave up their rights (over both land and water) for the collective gain of their watershed. During the project implementation, specific water sharing agreements were formulated by GMCs for resolving future conflicts. Such actions were preceded by extensive knowledge and understanding of the hydrology of the watershed, and the nature of the groundwater resource, developed during APFAMGS.

In this context, BIRDS played a major role in developing relevant technical understanding among the stakeholders by demystifying the scientific concept for even illiterate farmers. Besides acting as the nodal agency throughout the intervention, BIRDS headed a consortium of eight other Andhra Pradesh-based NGOs, supported by a range of consultants. Under the leadership of the founding director, Mr. V.R. Rao, BIRDS was instrumental in procuring funding from FAO, designing the intervention through inclusive farmer participation, conducting training workshops, providing technical support to the affected communities, and improving the project by accommodating regular feedbacks. BIRDS corresponded with FAO to regularly communicate the outcomes of the project; while FAO played the role of donor (for re-routing funds from the Dutch Embassy) and appointed a representative in India as the Budget Holder (BH) for the project. It is safe to assume that leadership from BIRDS was critical in the conception and execution of the APFAMGS project. The interviews conducted during the field visit unanimously voted BIRDS as the **leader** of the intervention programme.

The fact that BIRDS could play the leadership role in the project may be attributed to the strong **social ties and networks** that existed between BIRDS, the farming communities and funders. BIRDS' previous active engagement in drought prone regions for rural development, and improvement in the access to quality education assisted it for this water management project. It was during its earlier project in the area that farmers had expressed their concerns over the reducing availability of water. Consequently, BIRDS had approached technical bodies (APSIDC) to review the data and information for conceptualising an intervention programme. With this bottoms-up approach, BIRDS contacted its network sources for funding APWELL, and subsequently APFAMGS. Social ties and networks among different villages in the seven districts were further strengthened during the execution of APFAGMS. The formation of HUNs with representation from all villages falling into each HU, the GMCs, Self-Help Groups (SHGs) and panchayats, all created the required network for co-ordinating information and decisions across the project region. Strengthening the social fabric embedded in the HUNs was achieved through numerous social and cultural activities conducted regularly by BIRDS, such as *Kalajatha*.

The initial mix of the group that triggered such large-scale expansion of the project, inviting commitment and involvement from more stakeholders, made it much more difficult to analyse the APFAMGS project. Given that APFAGMS was preceded by APWELL and other smaller projects conducted by BIRDS in the region, it was difficult to trace the project's critical mass. However, field visit and interviews revealed that the APWELL project partners could be labelled as the critical mass for the APFAMGS project, since without the presence of APWELL; APFAMGS could never have gathered the long-term commitment and involvement from farmers that it had attracted. The trust built through APWELL led to the successful execution of APFAMGS.

Social identities did not seem to play an inhibiting role in the APGAMGS intervention, although Scheduled Tribes (ST), Scheduled Castes (SC) and income level differences existed within and among the project villages. A key reason identified by the interviewees of the project was the looming threat, which required farmers from different social backgrounds to work collectively together. The other reason was the special focus laid on SC/ST empowerment programmes by BIRDS, along with education and awareness for removing caste and gender biases.

The presence of a **strong communication and coordination mechanism** within and between villages, watersheds, NGOs and funders was also a strong factor for the success of this project. At the ground level, GMCs are the smallest unit for co-ordinating and communicating information and decisions. A GMC existed for every village; and comprised representatives from other developmental groups such as women's Self -Help Groups, panchayats, healthcare groups (if any) and others. These GMCs met monthly for monitoring groundwater levels and reporting their findings to the next level of associations—the Hydrological Unit. Each HU usually comprised four to16 village, as per the physical delineation of each watershed. The HUN met bi-annually to decide on the cropping pattern based on the data received from all GMCs; and it was at these meetings that CWB was initiated too. Since the project ended in 2009, BIRDS has since withdrawn from these regular meetings, but is still available for any technical assistance that may be required by the HUNs. During the project, BIRDS maintained regular communication with FAO and other NGOs on the progress and execution of the project, while training the ground staff and farmers to operationalise GMCs and HUNs. As a result, a flow of information from both directions—bottom-up and top-down—were maintained. The main principles followed for the communication strategy was transparency, resilience (political and social) and accountability. As a result of the robust communication and coordination system, capacities were built and decision making became more informed.

Monitoring capacity building programmes is always a daunting task. APFAMGS developed its own mechanism to assess these activities by incorporating both inclusive and **exclusive monitoring** mechanisms. During the project, farmers provided feedback on capacity development to the project staffs, who in turn reported the same to the co-ordinator at the HU level. The project staff also monitored their own activities internally. A coordination committee was set up to facilitate cross-learning, and to monitor the activities of partner NGOs. There was also a Technical Support Team that monitored the inputs provided on specific technical areas, including the quarterly progress made by each partner. FAO India provided regular monitoring support and facilitated reporting bi-annually. The Project Steering Committee annually reviewed the implementation, approved the annual work plan, and provided interface with policy makers to disseminate lessons learnt from the project as policy prescriptions. On financial aspects the accountants' team for the project monitored all partner organisations on a quarterly basis and conducted audits annually (besides internal audits conducted by each NGO).FAO India also carried its own audit and discussed the findings with partners.[71] In all, monitoring was conducted for all activities undertaken by GMCs, HUNs, NGO networks, BIRDS, FAO and all other involved participant organisations. After the completion of the project, the monitoring and evaluation role was given to the HUNs, at times assisted by BIRDS. Accountability for the responsibilities given to farmers, villages and GMCs was also built during the project implementation through informal practices.

Key takeaway points

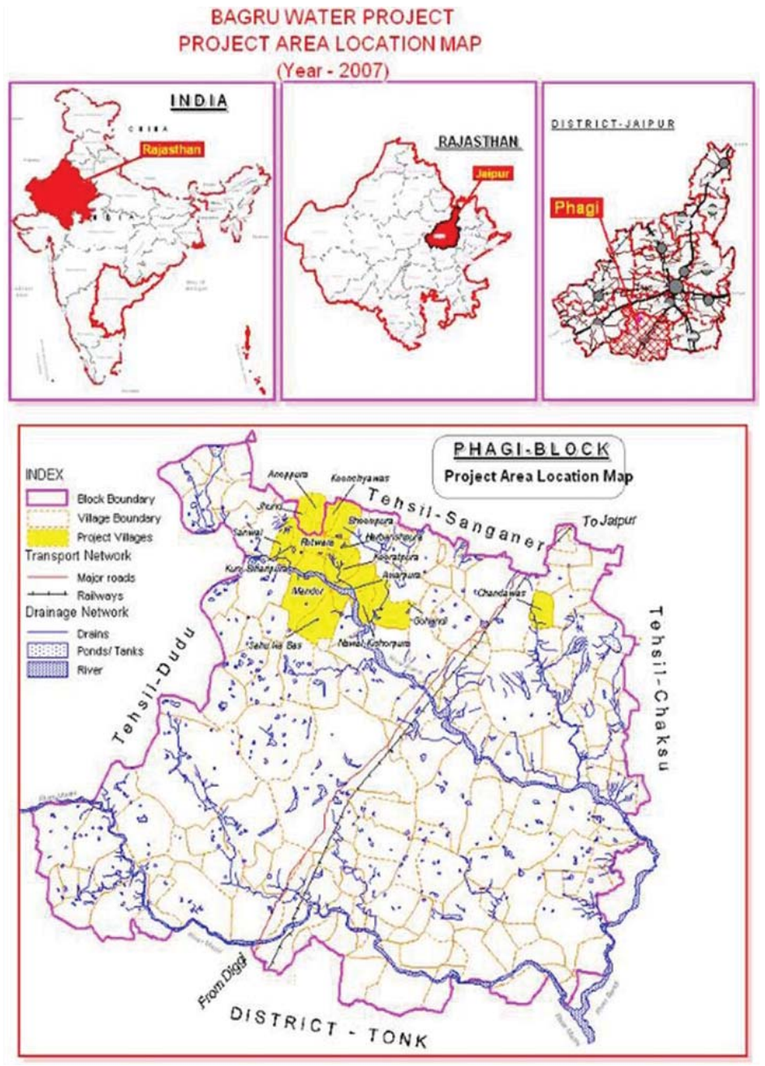
- Demand side management should be promoted through education, information dissemination and demonstrating good practices of water use.
- Users should not be considered as beneficiaries alone, but should be encouraged to invest and develop a sense of ownership towards the project. A bottoms-up approach is highly advisable.
- Hydrological boundaries should be defined for the project to facilitate assessment of the technical and scientific impacts of the intervention on the water cycle. A project should be designed by adopting a scientific methodology, and only after the careful consideration of the local situation, involving local users.
- Reliable and authentic data is a key to managing resources efficiently. Scientific data should be simplified for the comprehension of target users, whose technical capacities should also be built for collecting data.
- Collective decision making informed by participatory data collection and assessments should be encouraged for collective planning of water usage at watershed level.
- Collective action around water should integrate livelihood and other critical issues for all-inclusive development of the area of intervention.

Figure 12: APFAMGS case study: Process highlights

Analysis of threat and feedback from the preceding project on bore wells (APWELL)	
↓	
Droughts and high dependence on depleting groundwater sources created threat among farmers of 7 districts in erstwhile state of Andhra Pradesh.	BIRDS (NGO), FAO and RNE developed the APFAMGS design based on farmers' feedback and requests from the preceeding APWELL project.
↓	
Groundwater data analysis and pilot projects from APWELL	
Installation of more observatory stations and rain gauges for collecting data through inclusive participation.	Data analysis and CWG pilot were conceptualised and conducted, respectively, in consultation with farmers.
↓	
Formation of committees and neworks to strengthen communication and coordination	
At the village level, GMCs were formed.	At the watershed level, HUNs were formed.
↓	
Training, education and capacity building of the farming communities	
FFS was established to train farmers on scientific and technical knowledge on demand side management	Networks and ties were strengthened through social and cultural programs like Kalajatha among and within different Hydrological Units
↓	
Strong coordination mechanism	
GMCs meet monthly and HUNs meet bi-annually to discuss issues of physical target fixing, financial constraints, water level situations, etc. An effective monitoring and evaluation mechanism.	
↓	
Monitoring and evaluation	
A monitoring committee was set up to facilitate cross-learning and monitor the activities of partner NGOs. FAO India provided regular monitoring support and conduced the final audit and evaluation.	After the project completion, HUNs were responsible for monitoring all GMC activities.

Case study 3: Maintaining sustainable supplies of water in Phagi, Jaipur district, Rajasthan

Figure 13: Location of the Phagi project area & its characteristics



Project Area: 1,114 sq.km

Villages Covered: Bheempura, Chandawas, Gohandi, Harbanspura, Sanwal, Rotwara, Sawaka Baas and 8 others

Population: Nearly 100,000

Major community: Farmers and other agricultural workers

Major water use: Irrigation

Source: Groundwater (borewells and ponds)

Problems: Low availability and poor water quality

Project objective: Maintaining sustainable supply of water

Stakeholders: IKEA, AL Paper House Pvt. Ltd., Advit Foundation, village communities

Pilot project outcome: 169,000 cubic metres of water storage capacity developed

Current Status: Ongoing

Source: Advit Foundation 2008, Sustainable Water Management in Rajasthan – Project Implementation Report. Gurgaon.

Background

Phagi Tehsil in Jaipur district (40 km from Jaipur city) is probably the driest part of Rajasthan. The tehsil covers an area of 1,114.308 sq.km, including 15 major villages. The total population of Phagi Tehsil is around 161,610 and its population density is 145/sq.km,[72] dominantly engaged in agricultural activities. The area is characterised by multiple micro-watersheds with tributaries of Bandi River (such as Vani River) draining to the south-east of the area. The area's primary source for water, however, is erratic rainfall, 90% of which occurs during four months in a year with a moderate recharge capacity of only 14%.

The main occupation in Phagi Tehsil is agriculture. Cereals and millet crops such as wheat, paddy, jowar, bajra, ragi, and cashcrops such assugarcane and tobacco, besides groundnuts, pulses, jute and kindred fibre crop, cotton, cinchona and other medicinal plants, fruitsand vegetablesare grown in the area. About 60.98% of its main worker population is engaged in cultivation.

The significance of the Phagi block maybe analysed from its proximity to Jaipur City and certain industries. Major villages (about 15) are located at a distance of approximately 10–20 km from different factories near Jaipur. The population employed in sectors other than agriculture and its related activities range between 10% and more than 45%, comprising industrial factory workers, plantation workers, and those engaged in trade, commerce and the services sector. The AL Paper House at Taluk Sanganer and DT Ceramics at Taluk Bagru (Block Headquarter), for example, are located close to Phagi and employ a fair section of its population as workers.

Nevertheless, agriculture being the main occupation of the population, major water uses are for drinking and irrigation needs, which are met by groundwater supplies (wells, borewells, village ponds, etc.). During the past few decades, an increase in agricultural production resulted in a declining water table in the region. Consequent decrease of water quantity (low yield) and deterioration of water quality (especially fluoride contents) was also evident. A simultaneous increase in human and cattle population had meanwhile increased drinking water draft manifold.

Villages in the area are serviced by the water supply system provided by the Public Health Engineering Department (PHED), Rajasthan, under varying classes, such as Regional Water Supply System and Public Stand Post. Unfortunately, they have been deemed redundant and inefficient, given the poor quality of water at the source and inadequate maintenance of supply systems.

The lack of storage capacity, rainwater harvesting structures and exploitation of groundwater led to severe conditions of water scarcity and soil degradation in Phagi Tehsil. The area even experienced severe droughts over the past few decades, the worst lasting for five years (1993–03). Demand for agriculture, drinking and sanitation had been steadily increasing, meanwhile, and there was no doubt that the area needed immediate attention towards introducing water conservation and management.

Intervention

The Advit Foundation, in collaboration with IKEA's social initiative, AL Paper House Pvt. Ltd., and village communities, undertook an intervention programme to provide sustainable supply of water in Phagi Tehsil.[73] The overall purpose was to plan, develop and maintain water resources to support drinking, agriculture and industrial requirements for the growth and wellbeing of the affected communities. The main objectives of the project were: [74]

- Development of a model to maintain the sustainable supplies of ground/surface water to the export factories and the communities living around these factory units.
- Identification of technologies and management approaches to help achieve sustainable groundwater recharge systems.
- Aggressive promotion of solutions for sustainable groundwater recharge among target groups.

The Advit Foundation carried out a progressive methodological approach, collected data, prepared maps with the help of village communities and factories, conducted resource analysis, and developed an implementation strategy to achieve the project objectives. Detailed survey designs were developed to collect village level, factory level and other related information from government departments, metrological stations, and research institutions. Participatory Resource Appraisal (PRA) exercises of NGOs were conducted in each project village to ensure the participation of village communities. As a result, detailed PRA maps were developed for each village,[74] before accomplishing the project design.

The design and construction of five water harvesting structures were undertaken across five pilot villages (Bheempura, Sanwal, Kiratpura, Navalkishorepura and Chandawas) to test the viability of the intervention programme. Water user groups and local NGOs were trained to execute and monitor these pilot structures. Additionally, three village ponds were built at Sawan ka Baas, Jodindia Bhojpura and Awandia. As a result of the check dams and village ponds, a total of 169,000 cubic metres of water was stored successfully, meeting the irrigation and drinking needs of the said villages. Each structure was designed to recharge at least a kilometre in radius, i.e., 100 wells in the area, ensuring equitable access of water for the village communities. After the completion of the project, water is now available for 10 months in a year, soil moisture has improved, and the area's cropping pattern allows for two crops per year.

Learnings from this pilot project were eventually used to strategise watershed development plan for the remaining villages of Phagi Tehsil. Water user groups and other local NGOs were mobilised to manage their water resources and implement the watershed development plan.

Project outcomes

- Total of more than 100,000 cubic metre of water storage capacity was created through these structures. Each structure supports at least four nearby villages for meeting their water requirements.
- Soil moisture has increased, resulting in two or more cropping cycles in a year, from the earlier practice of just one per year.
- At least 7,000 livestock is benefitted from the water availability.
- Other environmental initiatives such as afforestation, electrification and skill upgradation and technology dissemination on solar cooking were also undertaken to improve the living conditions of the citizens of Phagi Tehsil.

Case analysis

Phagi Tehsil is a unique case where multiple watersheds were managed together by bringing in different stakeholders, including industries in the area (supplying products to global partners), village communities, local NGOs, Water User Groups (WUGs) and off-ground NGOs. Despite multiple villages in the block being drained by small tributaries of the Bandi River, the area was made water secure by tapping into other resources of water, such as groundwater and rainfall. The cumulative impact of the development of multiple watersheds maybe now seen spreading across an area spanning 1,114.308 sq.km, with an affected population of more than 17,000 households. In order to comprehend the factors for the success of this project, it is imperative to explore the process of collective action that led to the development of sustainable water supply in Phagi Tehsil.

The hydrology of Phagi Tehsil is such that evapo-transpiration losses are as high as 57% and the volume of seepage is also very low (6.67%) due to the structure of the soil. The dry climate, excessive groundwater exploitation and erratic rainfall patterns have led to severe conditions of drought affecting lives and livelihoods. As a result, severe **water threat existed among users** in the area. Agricultural production was affected with barely one crop per year feasible for farmers. The loss of moisture in the soil led to infertility of the land, further affecting crop production. Drinking water supplies were irregular and poor in quality, leading to health deterioration. Even industries located on the outskirts of Jaipur, especially water intensive paper and metal finishing factories, were affected by the water stress. The production cost of these industries increased as water needed to be purchased from external sources.

It was against this background that local factories took up the initiative of making their premises water positive, but soon realised that the impact was insufficient. To arrive at win-win situation, therefore, the factories approached Advit Foundation to conduct a detailed analysis of the entire region and develop an integrated area plan to manage water sustainably.

While conducting the evaluation and detailed assessment of the Phagi Tehsil, Advit Foundation contacted different user groups, including factories and their workers, village communities and local NGOs to develop realistic and implementable plans. These different user groups assisted Advit Foundation, due to the perceived benefits from the project intervention. As such, there were **no penalties or incentives** provided either by the government or factories for collective action to occur.

A **mild heterogeneity of interests existed** among different stakeholders, however, which was more due to mistrust. Village communities were sceptical of allowing third party groups to intervene in their water management processes, and questions were raised on access and entitlements to water. Notwithstanding such diverging issues, conflicts were soon resolved mainly because the factory workers, who belonged to the affected villages, helped in convincing others of the win-win approach of the intervention. As a result, multiple users converged their interests in maintaining and improving the primary water supply in the area.

Furthermore, Advit Foundation readily involved local representatives from the WUG and village panchayat committees in the process of their investigation—especially the creation of watershed maps. Due to the involvement of panchayat committees, issues related to land or management rights did not create any conflict. The fact that **rights and entitlements were principally defined** also helped in project execution. All necessary structures were constructed on panchayat land, and at no point were individual properties infringed upon. The project was designed keeping in mind land ownership and management rights, with proper consultation from all stakeholders.

Such consultations and negotiations were a daunting task, admitted the interviewee involved in this project. It required communication skills, resources, technical capacities and trust-building skills to even initiate the process of collective

action. In all fairness, Advit Foundation maybe titled as a 'leader' of the project. Not only did it carry scientific assessments, planned technical interventions and collated data from different sources, but it also effectively gathered support from all different stakeholders and mobilised village communities to act collectively. If one had to pinpoint the prime mover of the initiative, however, it would have to be the factories in the area and their global import partners.

Nevertheless, for such an action to transpire collectively, **strong network and ties** are critical among different stakeholders. In this case, the factories' strong ties with Advit Foundation were a facilitator for this project. Similarly, strong ties existed between factories in the area and their employers who came from the affected villages. Both were typical employee–employer relationships, but improved drastically with the project process and execution. For instance, these ties have now strengthened counting in surrounding villages, and have led to other developmental objectives such as upgradation of schools, home electrification using solar energy, and home workers programme to generate additional income.

The ties were further reinforced when the impact of five pilot structures were sensed. The pilot structures implemented in five villages—Bheempura, Sanwal, Kiratpura, Navalkishorepura and Chandawas—with the help of village communities, Advit Foundation and AL Paper House Pvt. Ltd. provided a demonstration effect to build trust among other villages and helped in mobilising other factories and villages in Phagi Tehsil to undertake collective action for improving their water supplies. The Coca-Cola Foundation, for instance, funded three village ponds at Awandia, Sawan ka Baas and Jodinda Bhojpura, accumulating 89,000 cubic metres of water. Other similar projects are currently either at a proposal stage or design stage for covering the entire district of Jaipur. It would be difficult to imagine the occurrence of these additional projects without the demonstration project. Hence, it would be safe to assume that the **critical mass** for this project was met by the water harvesting structures created in the five villages by AL Paper House Pvt. Ltd., Advit Foundation and participants from the five villages.

The replication of these pilot structures were expedited with relative ease due to the absence of inhibition from caste and religious divisions as well as gender biases. Phagi Tehsil largely constitutes tribal communities (such as the Bagaria),with a fairly significant population of scheduled tribes and castes, over whom poverty looms large. Wells in this area are evenly distributed, ensuring access for all. Therefore, these **social identity** differences were hardly a constraining factor in project implementation.[75] The Advit Foundation highlighted the significance of communication and coordination early on and throughout the project. Thanks to the transparent communication mechanisms conflicts (based on either rights or entitlements or social identities) were resolved.

Communication has been a strong feature of this case. Had the affected factories not communicated their concerns to Advit Foundation, which in turn would not have conducted studies on the ground and consulted the villages—this project would have been difficult to accomplish. A common understanding of threat was developed with regular group discussions between different stakeholders. Thereafter, the mapping and assessment exercise was conducted with the help of communities and factories, creating not only a sense of ownership but also aiding in realistic planning for the project. For instance, PRA were religiously conducted by Advit Foundation to identify water harvesting activities such as *anicut* construction, *nadi* renovation, and farm pond building on watershed basis for each village. An agreement was reached among different members of the PRA, and a commitment for full support in execution was formalised. **Coordination** among village communities, factories like ALPaper House Pvt. Ltd. and IKEA was handled efficiently by Advit Foundation through regular monitoring and assessment reports disseminated among key stakeholders.[75]

Monitoring and evaluation mechanisms developed specifically for the project were eventually formalised. Internal monitoring mechanisms were followed for procedure and quality control by the funding agency. Furthermore, customised to fit the case, Advit Foundation created a system of coordination to monitor the project. A village representative was selected (since the watershed plans were individual village based) to report to the Advit team present on ground. He had a sense of accountability along with others to authentically report the status of the project. Monthly visits were conducted by Advit's technical team to ensure proper working of the project. Regular feedback sessions with factories and village communities were conducted to resolve issues and list challenges in maintaining the structures. Consequently, actions were taken in consensus with the entire group. This process of monitoring and accountability became increasingly robust and accomplished in sustaining collective action.

As of now, there is no exit strategy decided by Advit Foundation. They have established an on-ground office to monitor and sustain the project outcomes. Since the factories are a key stakeholder in this intervention, there is a fair enough chance of a sustained funding process. However, intensive training and capacity building of the village communities and awareness among factories are an integral part of the project plan, which will eventually aid in the continuity of the project, after the anchor—Advit Foundation—exits the site permanently.

Key takeaway points

- The right mix of stakeholders facilitates collective action. With a fairly equitable stake in the project, factory workers, factories and village communities, along with Advit Foundation easily developed the common understanding of threat and acted upon it. Less time was wasted in convincing and building trust.
- Demonstration of the impact of the project builds trust and invites commitment from the stakeholders on a continued basis. It also gives a realistic bench-mark for future planning of the project in terms of resource input and output.
- On-ground presence of a technical team, until training and capacities of those involved have been built is critical for projects to succeed. At no point should the factories or villages lack information or abilities to act on sudden challenges and issues related to the water structures or processes.
- Sense of ownership is critical in implementing projects and sustaining collective action. This sense of ownership comes from involving the key stakeholders in the initial stages of project planning. As reported, there have been instances in this case where an overnight storm threatened to destroy the water structures and communities worked tirelessly to protect the structures with continuous monitoring.
- Partnering with local industries ensures continuous funding for the project, increased productivity, strengthened relationships and livelihood opportunities.

Figure 14: Phagi case study: Process highlights

Threat assessment and stakeholder identification

Severe threat to groundwater resource felt by users (farmers and factories).	Advit Foundation with its networks and ties in the area liaised with other stakeholders.	Factories and Advit Foundation (NGO) took the initiative to provide sustainable supply of water in the affected area.

↓

Strong communication strategy

Strong bottoms-up communication strategy was implemented throughout the project with the help of local representatives from villages and factories, coupled with group meetings and focus group discussions.

↓

Inclusive data collection and assessment

Project team conducted exhaustive assessment exercise with intensive particpation from local stakeholders.	Village maps were drawn for the first time and refined by satelitte imaging and GIS tools.

↓

Building trust

Trust was built through pilot (demonstration) projects to build check dams in 5 villages, which mobilised other stakeholders.

↓

Locally owned coordination mechanism

Initial coordination was handled by Advit and later transferred to village communities with overall guidance from Advit at all the three levels of communication established for connecting all stakeholders.

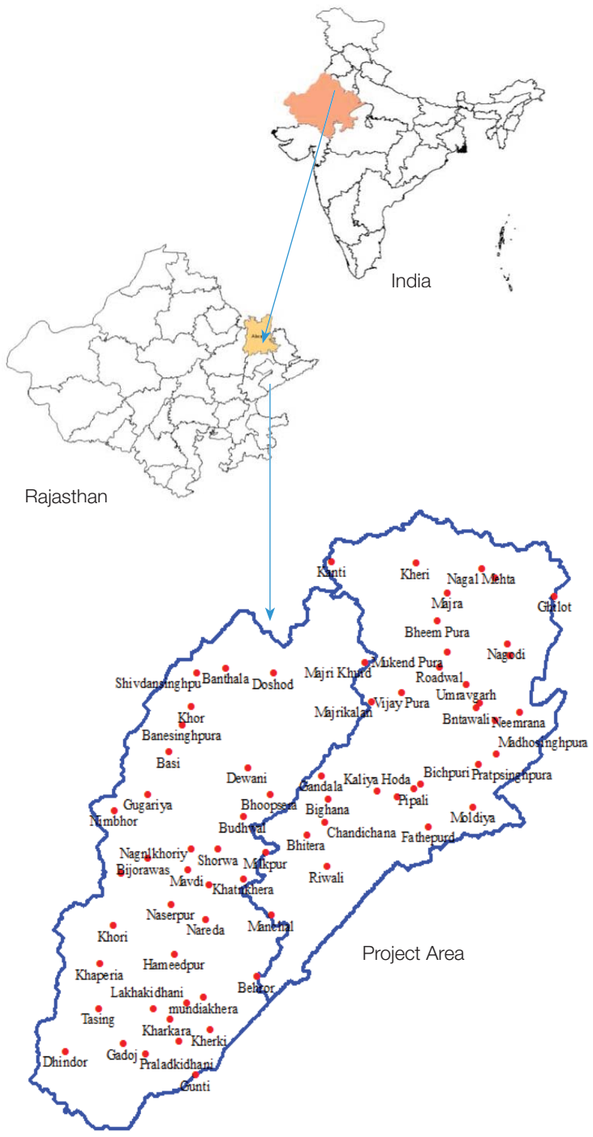
↓

Third party monitoring and evaluation

Internal and external audits and evaluation were regularly conducted and a feedback mechanism was developed to monitor progress and resolve challenges.

Case study 4: Neemrana project, Alwar district, Rajasthan

Figure 15: Location of Neemrana project area & its characteristics



District: Alwar

Tehsils covered: Neemrana and Behror
No. of villages: 68

Geographical area: 274.46sq.km

Population: 156,427

Rainfall: 600–700 mm/annual

Major community: Farmers

Water users: Industries, farmers and residents

Source: Groundwater

Problems: Declining trend in rainfall and groundwater level, crop failures due to various reasons.

Project objective: Groundwater recharge, water budgeting, nutrient management for proper yields, creating farm-market linkage

Approach: Building water recharge structures, monitoring water level data, encouraging farmers to conduct soil testing, promoting use of micro-nutrients deficient in soil, linking famers directly to distributor of seeds, micro-nutrients, fertilizers, etc., to reduce input cost and organize farmer trainings for improving agriculture practices

Stakeholders: SABMiller, CII, ACWADAM, HPPI, Gridline Consultancy, RIICO and farming community

Source: CII (2013), *SABMiller India Initiative for Sustainable Management of Water Resource in Neemrana, Rajasthan,* Annual Progress Report; Shape file of watershed provided by Mr Samar (CII), Neemrana

Background

This project is different in many aspects from the other national projects analysed in this report. To begin with, the major focus of the work is towards providing agriculture extension services to the farmers and not water. Secondly, the collective action still lacks extensive involvement of the major users, i.e., farmers; and lastly, this is a multi-user area comprising industries, agriculture and residents, and therefore, not completely dominated by agriculture.

The project area of Neemrana and Behror block is located in Alwar district, Rajasthan. Many industrial units operate in this area, which is famous for the Neemrana Fort. The average annual rainfall in the area is around 700 mm, which is showing a declining trend, as reported by the residents. The area does not have any major surface water source and relies completely on ground water. The unconfined aquifer is shallow and completely dry. A few clayey layers occur at some locations, which prevent infiltration of water, and holds it for short-term use. The groundwater level is depleting due to excessive extraction and has reached 300ft. The quality of water is not too good either, as the Total Dissolved Solids (TDS) level is high ranging between 2,000–7,200 ppm. Water problem is thus persistent in the area, which is a matter of grave concern.

There are several other existing problems in the area, such as crop failures or low yield due to lack of information about the appropriate use of micro-nutrients, insecticides or organic manures. Additionally, farmers here have to buy seeds and other agriculture inputs at higher price points due to the monopoly of local shops. They are unaware of different high yielding varieties of seeds and lack information on latest and upgraded agricultural practices, since there is hardly any training or educational support provided by government agencies.

It is also important to mention here that farmers in this region (as reported by the project team and by farmers during the field visit) do not strongly distinguish themselves on the basis of caste, and community. There is not any extensive disparity in the income and livelihood status of the population in this region due to five main reasons—i) this is an industrial area, and therefore land prices are very high; ii) farmers here are not marginal, and generally fall in the category of small and medium farmers; iii) milk production is a good business, and most farmers have high milk yielding cattle varieties; iv) they get good rates for their crops because the area is not remotely located; v) a few seed supplying agencies directly give contracts to farmers for certain crop varieties and more seed production. These five factors incentivise farmers in the area to invest more time and effort in agriculture. However, due to the increasing cost of land, farmers are being forced to sell their source of livelihood. Deteriorating conditions have made it even more necessary for farmers to come together and collectively act in the common interest of improving their condition.

SABMiller, a brewing industry located in the area, commenced a joint project in 2009 with the Confederation of Indian Industries (CII), the Advanced Centre for Water Resources Development & Management (ACWADAM), the Gridline Consultancy and Humana People to People India (HPPI) to address all these issues. The initial survey for understanding various aspects, such as recharge areas, land availability, perception of farmers, local agriculture practices, education levels, and income, took a lot of time and effort. The project area was selected on the basis of delineated hydrological boundaries. It comprised two watersheds named after the tehsils they are located in—the Neemrana watershed (12,500 ha) and the Behror watershed (15,000 ha). Various types of rainwater recharge structures have been built according to the area topography, and there are seven recharge structures in total.

Starting with water management activities, and moving towards providing agriculture extension services, the project team has developed a good relationship with the farmers. The team is now working in 68 villages, with at least two agriculture demonstration plots in each village. Their major activities include the development of a water balance model for the entire area, technology demonstration for rainwater harvesting and recharge (RWH&R), agricultural extension programme with farmers for enhancing water and land use productivity and efficiency, and web-based information centre for farmers, panchayats and other stakeholders.

Project objectives[76]

- To improve established water balance through detailed investigation.
- To increase awareness among Panhayati Raj Institutions (PRIs) and farming communities about groundwater depletion problems and methods to conserve, preserve and replenish it.
- To promote and demonstrate efficient irrigation techniques, such as drip irrigation.
- To demonstrate low-cost RWH structure technology, coupled with recharge shaft.
- To construct new rainwater harvesting structures in the project area.
- To promote crop management practices.
- To develop direct supply channels involving direct availability of fertilizer from the industry to the farmers.
- To establish direct marketing channels between the farmer and the food industry, eliminating the role of the intermediary and increasing profitability.

- To introduce and promote weather insurance in the project area.
- To promote Gliricidia plantation for improving greenery in the area, as well as for improving organic carbon content in the soil.
- To pursue state watershed department to take special water conservation drive to ensure overall participatory success of both industry, and the government.
- To pursue gram panchayats to incorporate complete watershed agenda into the National Rural Employment Guarantee Scheme (NREGS) action plan and mobilise non-government funds to complete the project for a better tomorrow.

Case analysis

The project document prepared by CII was very helpful in understanding the progress made by this intervention, and the role of various stakeholders in it. To get a detailed understanding of the process, an interview was conducted with Mr. Vinayak Damle (CII), together with a short visit to the project area. The site visit included a trip to two rainwater recharge structures, interviews with farmers from three villages (Milakpur, Khatan Khera and Chandi Chadan) and with Mr. Satish Chhichholiya (HPPI).

This project with its several promising interventions began because of two policies:

- A new policy of the Central Ground Water Authority (CGWA) that mandated every industry located in the region to recharge an equivalent amount of water consumed.
- SABMiller's organisational policy which mandated the industrial units of SABMiller to use water efficiently and work for the betterment of the local community and environment.

Although water scarcity was becoming a threat in the area, it was the CGWA **penalty mechanism** for all industrial units, which triggered the intervention. SABMiller, being a responsible industry player, immediately approached CII (of which it is a member) to create an action plan to address the issue. The first phase of the project was majorly focused towards recharging groundwater by capturing rainwater. With the help of ACWADAM and advice from the CGWB, the area was studied in detail. Two watershed units were delineated and the recharge areas were defined. However, acquiring land for recharge proved a difficult task. The irrigation department executive engineer opposed the intervention on the grounds that it would negatively impact irrigation in the downstream region. The project team then convinced the official that the recharge would actually increase water availability in the downstream region by saving water that was being lost as runoff or by evaporation. The district collector supported this initiative and the project finally took off.

The area is known for its industrial units, and is one of the major industrial nodes along the Delhi–Mumbai Industrial Corridor (DMIC). The area's multi-user situation with various industries, farmers, and residents made the project very complex, and **heterogeneity of interests** was evident. As groundwater resource is the only source of water, the competition for it is very high. CGWA tries to control the situation by pushing higher recharge norms for the industries, but is failing as the groundwater level continues to decline. Various industries have undertaken groundwater recharging in isolation; and have, therefore, been unable to create the required impact. The Rajasthan State Industrial Development and Investment Corporation (RIICO), a premier agency of the Government of Rajasthan, is one of the major stakeholders for industrial land use planning and management of resources. It has also participated in stakeholder meetings and deliberated over possible interventions. In the absence of the participation and willingness from all relevant stakeholders, however, intervention at a required scale could not be achieved. As far as the project was concerned, stakeholders like SABMiller, CII, HPIP, local government agencies, and the farming community had a common interest of improving the livelihood of farmers by adopting sustainable interventions. Although the local government is supportive in an overall manner, its involvement has not been substantial. This is regarded as one of the key reasons for the slow progress of the project. During the field visit it was observed that the project team had developed a good connection with the farmers over time, who now seek regular advice from agriculture experts in the team. Following the result of such advice, they have begun to trust the team's opinion.

The groundwater resource in the area is suffering from several quality issues, of which high TDS is the major one. Although farmers **have rights** to use water as per their requirement, the farming community does not seem to abuse the resources. To optimise water use for irrigation, nearly all of them use sprinklers, and a few even use drip irrigation. Open irrigation is used only when the requirement of water is high, such as during the later stage of wheat cultivation. Furthermore, the government has put a limit on power supply to the agricultural fields to check overexploitation of groundwater. While residents receive continuous electricity at home, power supply to agriculture fields is restricted to around five hours. The emphasis on water conservation has been further strengthened by the SABMiller–CII intervention. The project began with a focus on supply side management, but soon shifted its attention towards demand side management.

The project motivation came from SABMiller, which was then conceptualised by CII, with local support from HPPI.

Figure 16: Milakpur village consultation

Figure 17: Khatan Khera village consultation

Figure 18: Chandi Chanan village consultation

Figure 19: Check dam built by the project team in Neemrana

Source: CEEW Field visit to Neemrana in August 2014

CII has continued providing technical guidance to the project team, and their experts are working on fields to further strengthen the relationship with farmers. While interviewing farmers, their familiarity with different stakeholders involved in the project was verified to be true. They identify the field staff as a single entity, and not as either CII, SABMiller or HPPI staff. The project is being carried out efficiently and each stakeholder is working within their area of expertise and responsibility. There is **no single institution that can be termed as the leader**, but leadership from different agencies is said to exist at different phases of the project. Lack of local leadership and involvement of government agencies, in fact, has been problematic in carrying the project at a faster pace. Farmers who have benefitted from the project have, however, been acting as a source of information among other farmers. In turn, these farmers have been helping to mobilise farming communities during mass meetings by delivering technical advice to concerned persons and collecting input demands. To build their technical as well as leadership skills, training programmes are organised with a focus on suggesting ways to transfer knowledge and skills.

The stakeholders, especially CII and SABMiller, shared strong ties and network. However, to bring in the benefits of an institution that had strong networks with the farmers in the area, HPPI was involved in the project. It was a not easy to convince farmers to join the intervention due to the existence of certain negative perceptions pertaining to industries. Since the 1980s, with the upcoming industrial units, severe impacts on groundwater quality and quantity have been experienced by the farmers. The inconvenience and distress caused by such industries had, therefore, led to mistrust. It was also highlighted by HPPI during the interview that even though the on-ground presence of HPPI was strong and people trusted them, it was difficult to convince the farming community because they did not trust SABMiller. Thus initially the social identity of various stakeholders group decelerated the collective action initiative. However, with the help of regular interaction and initial demonstration of the successful pilot project, farmers began trusting the intervention.

A network seems to be developing as the project team is building associations at village level, creating a platform for the members to come together and discuss their challenges and solutions. However, association is currently restricted to farmers who have volunteered to provide demonstration plots. Other farmers are still in the phase of getting involved with the project. The project team workers are struggling due to lack of manpower, but are trying their best to pass the

benefits of the interventions to all the villages in the project area. In total there are only four field workers, and the number of villages are 68, which makes it difficult for focused work, because each worker services 17 villages on an average. Field experts are, however, available in case of any requirements.

Interactions with field experts made it evident that progress has been gradual, with initial challenges of a lack of adequate support from government agencies. Three institutions who fought the challenges together at different levels were CII, SABMiller and HPPI. The initial phase where these institutions, along with support from ACWADAM, CGWA and the local administration, began the construction of the recharge structure in the ridge region, laid the foundation of the project. Without involving the major users, i.e., the farmers it was not going to succeed, however, especially at an impactful scale. It was only after the initial recharge structure was built in the ridge area, the pre and post monsoon water level were measured in the well of farmers at a downstream location of the recharge site, and the farmers could clearly see the rise in water level, before any trust could be built up. After having been convinced themselves, the benefitted farmers began convincing farmers in neighbouring areas to join the intervention. Demonstrating the results proved to be a key success factor for this intervention. This initial mix of stakeholders that brought about the demonstration effect can be called the critical mass as it triggered the process, and built confidence in other farmers to become involved.

The farmers in this region (as reported by the project team and by farmers during the field visit) did not strongly distinguish themselves on the basis of caste and community. The problem of individual social identity, therefore, did not get transformed into an obstacle for collective action in this case. As discussed earlier, there is no noteworthy difference in the income and livelihood status of the population in this region either. The increasing cost of land, however, has been forcing farmers to sell their land. Such deteriorating conditions made it necessary for farmers to come together and collectively act in the common interest of improving their lives.

HPIP, the NGO partner, worked towards building trust within the community by following several communication strategies. They were involved in all social and cultural events in the villages, becoming a part of the community. Several mass awareness events such as rallies, farmers' field day event, exposure visits, and audio visual campaigns were organised too, which increased the participation of farmers in the project. During the field visit, farmers reported that audio-visual camps were easy to comprehend. Last year, more than 3,000 farmers participated in 130 visual camps. During such events, crop production movies, clips on irrigation practices, use of micro-nutrients, disease and pest management, improved agriculture inputs, water resource status, ways and means of its sustainability, etc., were displayed. A large focus was hence placed on communicating the objectives and benefits of the intervention.

Coordination among the stakeholders was strong, as they held regular which became more frequent during cropping seasons. The PRIs also participated in awareness programmes, but are yet to get intensively involved in the programme, which is the case with the agriculture department too. The coordination with CGWB seems smooth and the project team regularly seeks advice from the hydrogeological experts. The local industries have also started showing interest in the interventions, and Hero Motors has contributed towards several recharge structures as suggested by CII experts.

The on-ground project team regularly report to their respective organisations; and experts from CII, Pune visit the site quarterly to monitor the actual progress and challenges faced by the on-site project team. The HPPI sends monthly work plans to their head office in Delhi, which validates the physical and financial aspects. There are thus multiple internal auditing and monitoring systems to keep a check on the project. However, annual audits from an external agency are still missing. The per capita efficiency of the on-site team is high and they have developed regular communication channels with the farmers.

In short, this project has planned many benefitting interventions and has begun achieving good results, but to scale it up further, it needs more human resources, especially participation from more farmers and greater involvement from government agencies and local industries.

Key takeaway points

- Demonstrating by pilot projects should be undertaken to convince farmers and build trust.
- Support and guidance from government agencies is important.
- Areas struggling with water quality and quantity issues need similar penalty mechanisms as posed by CGWA in this case as well as a system of incentives to promote collective action.
- Regular communication with farmers is essential to push them for changing their traditional practices, and most importantly building trust.
- The industrial planning body of the concerned areas should develop robust water resources database before allocating land for industrial setups. Such as in this case, RIICO should take integrated water-land concerns into account before sanctioning licenses.
- Creating economic linkages between competing users for water is advisable. Put differently, establishing backward or forward market linkages between a particular industrial output to agricultural input or vice-versa would create synergy in the region and sustain collective action in the region. For instance, treated industrial wastes can be used as fertilizers for agricultural production in the area or food-processing industrial units in the region can support agriculture in the region.
- Human resource development, especially building capacities of government agencies working on ground such as agriculture department officials or scientists of the Krishi Vigyan Kendra (KVK) should definitely be focussed upon.

Figure 20: Neemrana case study: Process highlights

Penalty triggered the process of collective action

Although water scarcity was becoming a threat in the area, it was the CGWA penalty mechanism for all industrial units which triggered the intervention. SABMiller, CII, ACWADAM, HPPI, Gridline Consultancy, RIICO, and the farming community worked collectively towards achieving water security.

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Strong ties and networks

The stakeholders, especially CII and the SABMiller, shared strong ties and networks as SABMiller was already a member of CII.

HPPI was involved in the project to develop strong networks with farmers in the area.

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Strong communication and coordination mechanism

Regular field visits by dedicated staff ensured that communication with the farming community was regular. Several mass awareness events such as rallies, farmers' field day events, exposure visits, and audio visual campaigns were organised.

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Effective monitoring and evaluation mechanism

The on-ground project team regularly reported to their respective organisations. Experts from CII, Pune, visited the site quarterly. HPPI sent monthly work plans to its head office in Delhi, which validated physical and financial targets.

Box 1: Cross-cutting Agra programme, Uttar Pradesh – a case study of a city-level slum upgradation project triggered by threat to the nearby world heritage site of the Taj Mahal.

Agra is one of the most prominent cities of Uttar Pradesh, spread over an area of 188.40 sq.km. It resides on the banks of River Yamuna, supporting a population of approximately 1.2 million people. The seventh wonder of the world, the Taj Mahal, and other Mughal period buildings has provided this city with an enormous opportunity for a tourist-based economy. Various physical and political factors, however, have been halting Agra's development, along with degrading the environment (polluting the river) and severely impacting health and living conditions in the city.

Poor living conditions characterise the 252 notified and 178 non-notified slums in Agra that comprise over half the city's population. [72] Most slums in the city are characterised by poor sanitation, drainage, and water facilities. Slum dwellers live in the shadow of the city's lesser-known monuments. They do not derive any income from the tourism, and are obviously unconfined to conserve their heritage, resulting in poor sanitation conditions of these sites. Such indifference and repression was resulting in open/overflowing drains suffocated with unconfined excreta and solid waste, stagnant waste water, rampant open defecation and indiscriminate waste disposal.

A joint collaborative effort of Agra Nagar Nigam and the NGO, CURE India, was undertaken with financial assistance from the Cities Alliance and United States Agency for International Development (USAID). The broad objective of the programme was to prepare a reform-linked citywide slum upgradation plan for Agra. [73]

Outcomes of the project

- 118 private toilets have been built in the slums. An additional 2,745 have been constructed/ approved by the District Urban Development Agency (DUDA).
- The city is on its way to having the first 'open-defecation free' settlement.
- It has the first functional Dencentralised Water Water Treatment System (DEWAT) in the city/state.
- Family health is better and healthcare expenses have dropped by INR 600 per month due to home toilets.
- Income levels of slum families in the project have improved from nil to about INR 150 per day, and are fully sustainable.

Slum development in Agra was paid attention to only when the Taj Mahal came under threat due to increasing air and water pollution. Such pollution levels increased in the city, with unplanned developments, encroachments, lack of basic infrastructures and poor municipal/civic services, leading to open/overflowing drains suffocated with unconfined excreta and solid waste, stagnant waste water, rampant open defecation and indiscriminate waste disposal. Evidently, threat existed in terms of health and living conditions for the slum dwellers, and on the lesser known heritage buildings.

Industries in the area were already being penalised under pollution control laws but unfortunately that did not induce them to undertake collaborative actions with the slum communities. Upgradation of slums involved single-users, and other stakeholders were funders, designers, trainers or service providers. Therefore, there was homogeneity of interests among stakeholders. For instance, government departments involved such as Sustainable Urban Development Association, Agra Development Authority, Agra Jal Nigam, Agra Jal Samiti, Archaelogical Survey of India, Forest Department, State Pollution Control Board and district magistrates were interested in their mandate of a slum-free city, the protection of heritage monuments, and improvement of tourism. The slum dwellers were committed to improve their living conditions and Franc Water, Apollo Tyres and small enterprises were to benefit from the wastewater technology market demands. All these interests converged to meet the project objectives.

Rights and entitlements were said to be non-deterministic of the collective action, since most of the treatment structures were constructed on government-owned land. However, frivolous land rights and ownerships did create hurdles while constructing toilets for households and rainwater harvesting structures.

Planning, designing, consulting and execution require not only resource and capacity but also willingness and determination. Co-ordinating between different agencies and stakeholders, CURE India can be safely assumed to be the leader of this project. CURE India was approached by USAID (given their previous working relationship) to work in this area, and none of the project plans would have been approved without Agra Nagar Nigam's proactive participation and support. Yet, CURE India forms the backbone of the project with its immaculate technical capacity and on-ground presence, along with its skill to develop strong network and ties between government departments, small-medium enterprises in the area, slum dwellers and multilateral development organisations.

A pilot project with a small number of houses in the Kucchpura began constructing toilets; later 1,000 toilets were sanctioned by the DUDA. A critical mass was achieved, which signalled the commencement of the project, and confidence was seen to be building towards the intervention, consequently leading to further commitment from different stakeholders for upscaling the project. As a result, a DEWAT was built, bringing biochemical oxygen demand levels to acceptable standards. More groups began to organise themselves to establish private sector links to prepare products linked to tourism and state development initiatives such as building roads and water supply started improving.

Strong coordination and communication was an imperative for the project to be implemented successfully. [74] Continuous communication and consultation was conducted with the communities and government departments involved in the project. Information on the project was regularly disseminated and feedback sessions were held periodically to monitor the status and progress. Through such sessions, capacities and training was imparted to locals to enable them to sustain the installed systems and carry on the cleaning, repair and maintenance of wastewater treatment plants, after CURE India exited the site. For additional support, however, CURE India has established a local NGO to assist in sustaining the project outcomes.

Key learnings

- Network and ties among stakeholders especially the anchors (funders) and executing bodies (NGOs) is imperative for the collective action to start.
- Support from government departments is instrumental in facilitating action on ground.
- Sense of ownership needs to be developed within the communities towards the project for sustained interest and commitment through strong communications.
- The broader the objectives, the more scope there is for improvement and holistic development. It was within the broader scope of slum development objectives, For instance, within which water security could be achieved involving both upstream and downstream communities.

Box 2: Hiware Bazar village, Ahmednagar, Maharashtra – a case study of village transformation through collective action driven by excellent leadership of the Sarpanch, Mr Popatrao Pawar.

Hiware Bazar is located in the Ahmednagar district of Maharashtra. It is now a well-known village because of the change it has undergone in last 25 years. The village lies in a drought prone area, because it receives only 300-400 mm of rainfall annually. It has an area of nearly 977 ha, and people here traditionally rely on agriculture for their livelihood. The village has 235 families and a population of around 1,250. Till 1990, agriculture in this area was dependent on rain as the groundwater was inadequate to meet their requirements owing to the less recharge potential of the area. The groundwater situation further deteriorated as a result of increasing deforestation, taken up to increase financial gains, which reduced the recharge capacity of the area. It also led to heavy soil erosion which ultimately made agriculture a difficult occupation to continue. As reported, during 1972,due to scanty rainfall, all the wells dried up and drinking water became scarce. Severe drought-like conditions were experienced, there wasn't enough fodder for the cattle, and farms turned barren. The loss of livelihood forced people to sell their lands and other assets, even forcing some into criminal conduct. This situation continued till 1990,by which time the village had become notorious for criminal activities. [75]

In 1990, Mr Popatlal Pawar, who had left the village to pursue higher education, returned to his village to improve prevailing conditions. He contested in the panchayat election, and won it unanimously in 1990. He then called for a *gram sabha* (village meeting) and discussed the issues which required immediate attention. In this meeting, the villagers collectively decided the priority area to be addressed during the first five-year period (1990–95). His highly respected position in the village helped him attain long-term commitment and sincerity from the villagers. The journey of collective action began from this point, with a major focus on watershed management, education, drinking water availability, employment and health.

Due to past experiences of corruption and abuse of authority, there was mistrust among the villagers. To address this, Mr. Rao declared his assets openly and also called the Zila Parishad (District Council) officer to conduct an audit and open disclosure of the revenue and expenditure account of the panchayat on an annual basis. This was a great move for creating a transparent system. Henceforth, every villager had access to the panchayat accounts and could raise their concerns at each annual meeting. Gradually trust was built, and people began to believe in their new leader.

As a result, renovating the village school, voluntary land donation for afforestation, construction of check dams, etc., were all undertaken through collective decisions of the community, under Mr. Rao's leadership. An innovating component of this intervention was the introduction ofthe 'water budgeting' system. Water allocation, according to the system, is based on the water level recorded during pre and post monsoon periods. Drinking water for both human and cattle is a priority, followed by agricultural requirements. Based on the water budget, cropping pattern is collectively decided in the *Gram Sabha*, and some water is reserved for emergency requirements. Furthermore, villagers have formed committees to keep a record of the forest area, and ensure that wildlife is protected. All these are collectively done. For instance, rain gauge and groundwater level monitoring is done by school children, and other tasks such as water tax collection from individual households is conducted by the women. The panchayat also ensures that landless labours are involved in some or the other activities. [76]

Thus the intervention is all inclusive and has successfully created a sense of ownership among the village community. The intervention won many awards and Mr Pawar is now a member of several water-related state level committees. Some of the outcomes achieved by this intervention are listed below: [77]

- Increase in groundwater availability: water table rose up from 70–90 ft. to 20–25ft.
- Change in cropping pattern (jawarand bajra to onion, potato, floriculture, etc.).
- Change in irrigation practice: many farms brought under drip/sprinkler irrigation.
- Change of primary school to high school: literacy level grew from 30% to 95%.
- Increased number of cattle: increase in fodder availability from 1,500 metric tonnes to 6,000 metric tonnes; increase in milk production from 300 litre/day to 3,500 litre/day.
- Per capita income increased from INR 830 to INR 30,000, with only three families below poverty line.

The village thus experienced an overall improvement, which would have been impossible without the collective action and leadership of Mr. Pawar. However, there were a few other factors which also helped the initiative become successful:

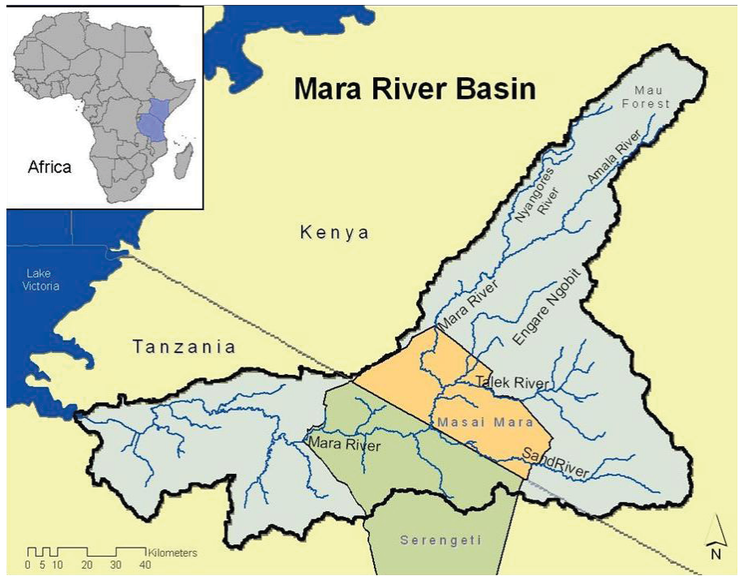
- More than 80% of the population were Marathis, dispensing with the problem of diverse **social identity**.
- There was a **penalty structure** adopted which was collectively decided by the community for any acts of disobedience. A recent research study by Mumbai University found that the norm of co-operation and collective action is more fragile in Hiware Bazar Village and their stability depends crucially on monitoring and punishment mechanisms.
- The village was fortunately selected by the Adarsh Gaon Yojana of the Maharasthra Government, which provided financial stability to the intervention.
- The community continued to work on low wages or voluntarily reduced their labour cost, and utilised funds for buying equipment and materials alone.
- Although the focus was on water management, education was the priority area, which helped in developing better understanding about the benefits of the intervention.
- Another success factor was simultaneous focus on supply and demand side management issues.
- Proximity to a few good water management practices in the nearby villages of Ralegaon-Siddhi and Aadgaon aided in reforms.
- The **accountability and monitoring** of funds was **transparent and well managed** because a dedicated NGO, Yashwant Krishi Gramva Panlot Vikas Sanstha, was created for this purpose.

Section VII

Global case studies

Case study 1: Transboundary Water for Biodiversity and Human Health in the Mara River Basin (TWB-MRB) project, Kenya & Tanzania

Figure 21: Location of Mara River basin & its characteristics



Geographical area: 13,750 sq.km

Location: Kenya and Tanzania, Africa

Population: More than 1 million

Water users: Masai Mara National Reserve, Serengeti National Park, farmers, fishermen, mining and tourism industries

Problems: Declining water availability due to heavy runoff, pollution and ecological degradation.

Project objective: To improve water resource management in order to reduce threats to biodiversity and enhance human health and livelihoods.

Stakeholders: Mara Water Users Association, local government bodies, Florida International University, WWF-EARPO, CARE-Tanzania, World Vision-Kenya.

Source: Global Water for Sustainability Programme 2012

Background

Mara River is a transboundary water resource shared between Kenya and Tanzania. The basin has gained global significance due to the presence of the rich Mara ecosystem, including the World Heritage site of the Masai Mara Game Reserve in Kenya and the Serengeti National Park in Tanzania. Its intimate connection with Lake Victoria and the Nile Basin has gathered further attention to the health of the River. The Mara River Basin faces serious environmental and water resource problems, primarily from the intensive settlement and cultivation in the Mara River Basin leading to loss of vegetation cover, widespread soil erosion, decreased water infiltration capacity, decreased soil fertility, and increased sedimentation and water pollution in the rivers.

The Mara River runs through a length of 395 km covering 1,375,000 ha between Kenya and Tanzania. The river originates in the Mau Hills, 3,000m above mean sea level in Kenya, and flows through Masai Mara National Reserve to get to the plains. Mara River is composed of five tributaries, of which Rivers Nyangores and Amala are its main tributaries. Sand River, the last of the major tributaries, joins the Mara at the Kenya–Tanzania border.[77]

The area receives rainfall of ~1,400–1,800 mm, covering an area of approximately 84,410 ha. Besides the Mau, there are a few forest plantations that provide timber for tea factories in the area. Due to heavy bamboo population, forests here have high rainwater absorptive capacity, making the area moisture surplus. However, due to excessive deforestation, excision and mismanagement, almost 40% of the forest cover has been destroyed, leading to severe threat to the Basin's ecosystem.[78]

The middle ranges of the Mara Basin, situated just below Mau forest, supports agricultural activities; but only 28% of the available arable land is under cultivation. Large scale commercial farming in areas of more than 100 ha growing maize, wheat, barley and sunflower is a dominant economic activity. The farmers in these areas practice mixed cropping of maize, beans, and potatoes. Subsistence small land farming in an area of 2–5 ha is also prevalent, along with tea plantation and dairy farming. Despite an irrigation potential of 32,000 ha, only 300 ha of land is irrigated along the river floodplains. Several small holder irrigation schemes, covering 165 ha of land, are under implementation. 80 Meanwhile, runoff from fields, excessive use of agro-chemicals and unsustainable agricultural practices has caused deterioration in the water quality.

The lower part of the Mara River Basin is characterised by the Masai Mara Serengeti Wildlife ecosystem spread across approximately 1,510 sq.km. Due to low and unreliable rainfall, the main economic activity is limited to livestock production, wildlife conservation and tourism. Wildlife generates incomes of more than KES 40 million every year to the Narok County Council (an extension of Tanzania's Serengeti National Park). Tourism is one of the major economic sectors for both Kenya and Tanzania, contributing approximately 12% and 16% to their GDP, respectively. The Masai Mara area has attracted tourists more rapidly than any other park or reserve in the country, with visitor entries rising by 9%, and bed nights by 12% annually. [79]

In the downstream end of the basin, lying wholly in Tanzania, are river flood plains characterised by high population density. Fishing dominates the major socio-economic activity here, as well as the source of food and livelihood for several communities in the basin, contributing as much as 25% to Tanzania's GDP.[80] However, the recent performance audit report released by Tanzania's Ministry of Fisheries and Livestock development draws attention to serious concerns over declining fish stock and the devastating environmental implications attributed to over-exploitation and under regulation of fishing.

The Mara River Basin supports over one million people with various socio-economic and cultural backgrounds. Poverty looms in large areas and gender inequality is high, because women have less access to natural resources and the formal economy. Access to infrastructure facilities and social services is limited to the majority of the population in the Basin.

Issues and challenges

Rapid population growth, increasingly unsustainable economic activities, lack of infrastructure, ineffective implementation of laws and regulation for environmental protection and conservation have led to severe threat to the water and ecology of the Basin. In the upper section of the river, diminishing forest cover and over-exploitation of timber is leading to heavy soil erosion and sedimentation of the river, consequently affecting agriculture and water availability in the middle and lower reaches of the Mara. While there are instances of rapid division of large farms into small land holdings in the upper range, the lower stretch is facing difficulties due to increase in land acreage under commercial large scale farming. Increasing demand for irrigation water—and now with mining activities picking up—demand for industrial water is causing further stress on the water resources. Four major co-operatives operational in the Mara Basin—the Mara Miners Cooperative Society Ltd., Mlima Mgosi Cooperative Society Ltd., Msege Miners Cooperative Society Ltd., and Nyamagunchara Miners Cooperative Society—all practice open pit mining for minerals, especially gold, kaolin, limestone and gemstones.[81] Consequently, degradation of water quality and quantity, and loss of biodiversity has invited global attention to the Basin, primarily due to the threat to World Heritage sites.

Interventions

Various initiatives were started for the improvement of water resource development in the Mara River Basin within the broader goal of Nile Basin Initiative and Lake Victoria Basin Initiatives. Mara River Basin Initiative (MRBI, 2003–2012) and Transboundary Water for Biodiversity and Human Health in the Mara River Basin (TWB-MRB, 2005–2012) are two of the most significant of such interventions. For the purpose of this study, and as per the boundary conditions of 'multi-stakeholder involvement', we will be focussing on the TWB-MRB project.[82]

The overall aim of TWB-MRB was to support sustainable water supply, sanitation, and hygiene services to improve health and increase economic resiliency of the rural poor, while also conserving biodiversity within the trans-boundary integrated water resource management framework.[83] Specific objectives were to:

- Increase sustainable access to water supply by poor rural and small town dwellers.
- Increase sustainable access to sanitation and hygiene services by poor rural and small town dwellers.
- Improve the management of water resources within the trans-boundary context to conserve biodiversity and improve human health.

TWB-MRB is a collaborative effort, under the Global Water for Sustainability (GLOWS) programme, with participation from Mara River Water Users Association, research and scientific bodies (Florida International University, local universities), international (WWF) and regional NGOs (WWF-EASARPO, CARE Tanzania, and World Vision, Kenya) and local government partners.

Project outcomes

The outcomes of the nine-year project were as follows:

- Improved access to water and sanitation through successful construction and operation of natural springs, rooftop and rock catchment rainwater harvesting structures, boreholes and piping systems.
- Payment for Ecosystem Services mechanisms were established through innovative finance mechanisms and environmental flow recommendations were implemented.
- Capacities of civil society organisation at various national and regional levels were built through basin-scale network of Water Users Association, Technical Advisory Committees, National Stakeholder Forums and Water Users Committees.
- A highly participatory Integrated River Basin Management Plan was produced with the establishment of Transboundary Water Users Forum.
- A clear focus on research and training was established through Mara River GLOWS Scholar Programme to further investigate and understand hydrological and ecological processes.

Case analysis

Within the scope of our project, the Mara River Basin presents an interesting case of an ecologically sensitive basin involving two countries facing similar water security challenges. TWB-MRB not only depicts the significance of Integrated River Basin planning, but also highlights the imperative of stakeholder involvement and formalisation of platforms for continual interaction and learning.

The Mara River Basin was gazetted in the late 1940s.[84] As mentioned earlier, the area is home to Kenya's famous Masai Mara Game Reserve and Tanzania's Serengeti National Park. Despite being an attractive global tourist destination and significant contributor to Kenya and Tanzania's economy, by 1999, conditions of the Reserve and its surrounding areas began to deteriorate due to mismanagement, rampant poaching, inadequate infrastructure, lack of maintenance and under regulated activities in the Mau forest. A population increase in the middle and lower stretches of the river, the surge of commercial large-scale farming, and growing mining activities put further stress of the river system. Threat was felt by the communities due to reducing water availability; by national governments for maintaining their tourism attractiveness and economic growth objectives; and by regional river bodies such as the Lake Victoria Basin Commission (LVBC) and Nile Basin Commission (NBC) to protect broader ecosystem conservation goals.

The seriousness towards the perception of threat can be understood from the diction in the Kenyan Water Resources Management Act 2002, and Tanzania's National Water Policy 2002 and Water Resources Management Act 2009. The principle of environmental flows, protection of aquatic ecosystems, ecological and human vulnerabilities have been given fair attention in the policy documents, along with statutory provisions of penalties and punishments. Such provisions, however, have been ineffective in regulating excessive logging, deforestation, waste water discharge into the rivers and poaching activities; 87 and hence, the institutions executing these laws and regulations are deemed redundant. There is also no known incentive structure in either of the countries to foster collaborative action towards the Mara River management.

Moreover, the water policies in both Kenya and Tanzania have given management and allocation powers to water management authorities, who are obligated to guarantee sufficient flows at all times to meet basic human needs and protect ecosystems underpinning sustainable development imperatives. Land ownership and land use rights are, however, neither effectively enforced nor clearly separated from water rights. With communal lands increasingly being converted to private ownership, it is leading to civil conflicts between indigenous communities.[85]

Having vaguely implemented land and water rights, World Vision – Kenya faced severe difficulties in procuring land for building water infrastructures (also given the high population density in the area). Water supply solutions were innovated through the use of pipeline distribution projects from spring and rainwater harvesting tanks, and water purification efforts were undertaken using local traditional bone char methodologies for the locals to be convinced about the project.

Despite the lack of incentives and stringent penalty arrangements, and inexplicit rights and entitlements structures, certain collective action did occur to improve the Basin's water quality and conserve its biodiversity. The Florida International University (FIU), along with the World Wide Fund for Nature Eastern Africa Regional Programme Office (WWF-EARPO) brought together Kenyan and Tanzanian governmental bodies, local partners and other civil society organisations to work towards achieving Transboundary Water Management for Biodiversity Conservation and improvement of Human Health in the Mara River Basin (TWM-MRB).

It would be difficult to assign the 'leader' title to any one partner organisation, given the fact that at different phases of the project each partner took leadership in meeting the objectives as per their expertise and organisational strengths. After reviewing the documents of the project, however,it is evident that FIU led the project concept, design, planning of activities and overall coordination; while WWF-EARPO led activities on ground and provided grassroots feedback for a realistic designing of the project. It was FIU's intensive on-ground research and detailed assessments of hydrology, geomorphology, ecology and socio-economic conditions of the Mara River Basin, however, that provided technical and scientific guidance for effective implementation. FIU also provided overall primary coordination between different partners and their actions to harmonise activities to meet multi-objective project outcomes.

The Lake Victoria Basin Commission was instrumental in bringing collaborative action at the basin level. It was their legal mandate for co-ordinating the joint management of the environmental resources of Lake Victoria Basin and its associated river ecosystems that hugely facilitated Transboundary Water Management Forum in Mara River Basin. Put simply, strong networks and ties existed as a result of this already established co-ordinating body in the region, resulting in more context-appropriate project designing and implementation, and potential for long-term sustainability.

Over the course of the programme, FIU established a close relationship with the Lake Victoria Basin Commission, along with Kenyan and Tanzanian Water Authorities for the joint management of the Mara River Basin. WWF-EARPO aided FIU extensively with their long drawn work experience and strong ties in the basin. WWF-EARPO's network with the global WWF and other global NGOs mobilised regional and international communities to join the project. These included CARE-Tanzania and World Vision.

Implementation of water supply and sanitation programmes faced challenges in attracting the appropriate community contribution for the planned infrastructure. Certain socio-economic conditions also impeded the intervention of sanitation and hygiene facilities. CARE Tanzania utilised a variable approach to induce behavioural change, using trained facilitators.

Once the FIU led research and scientific assessments were completed, basin-wide consultations, training and dissemination of analysis was undertaken to create the Biodiversity Strategic Action Plan (BSAP) and implementation plan for Payment for Ecosystem Services (PES). On the one hand, WWF-EARPO played the backbone for all basin-wide consultations and networking, while CARE-Tanzania and World Vision undertook the role of implementing activities related to water supply, sanitation and hygiene promotion in the basin.

By the end of fourth year of the project (2008–09), multiple capacity building of Mara River Water Users Association and Mara River Catchment Committee were undertaken focussing on governance, action plan development and sustainability. Through further intensive networking, regular knowledge dissemination and consultative workshops at different levels, strong communication and coordination channels were established by FIU and WWF-EARPO. Thereafter, the final draft for Transboundary Water Users Forum (TWUF) was approved and submitted to the LVBC—marking the formalisation of an inclusive interactive action-oriented multi-stakeholder platform, involving all responsible actors—government departments, international conservation organisations, protected area authorities, environmental conservation agencies, private individuals, and research and financial institutions.

Basin level interventions have multiple challenges ranging from varying institutions, forms, protocols and financial structures to geographical inaccessibility and social challenges. To co-ordinate decisions and actions between multiple stakeholders in different regions becomes a daunting task. FIU addressed such challenges by appointing a full-time co-ordinator in the region with a mandate to convene quarterly meetings between partners for uniform information dissemination of the project.

At the end of the project year (2011–12), through exhaustive stakeholder discussions, the preparation of the Biodiversity Strategic Plan (BSAP) was finalised. The monitoring mechanisms were clearly listed down in the plan and LVBC was unanimously given the responsibility to undertake it.

In a nutshell, the TWB-MRB project had effectively brought local, national and regional stakeholders in the basin to interact and co-ordinate with international scientific and technical bodies to improve access to water and sanitation services, along with creating resilient and long-term institutions for carrying integrated conservation of the Mara's ecology in a sustainable manner. Database and lessons learnt from this project have been of great aid to other initiatives for the basin—the Mau Mara Serengeti Sustainable Water Initiative (MaMaSe project, WWF-Norway, UNESCO-IHE, GIZ and regional water authorities, along with other partners, 2012–17)for instance.

Key takeaway points

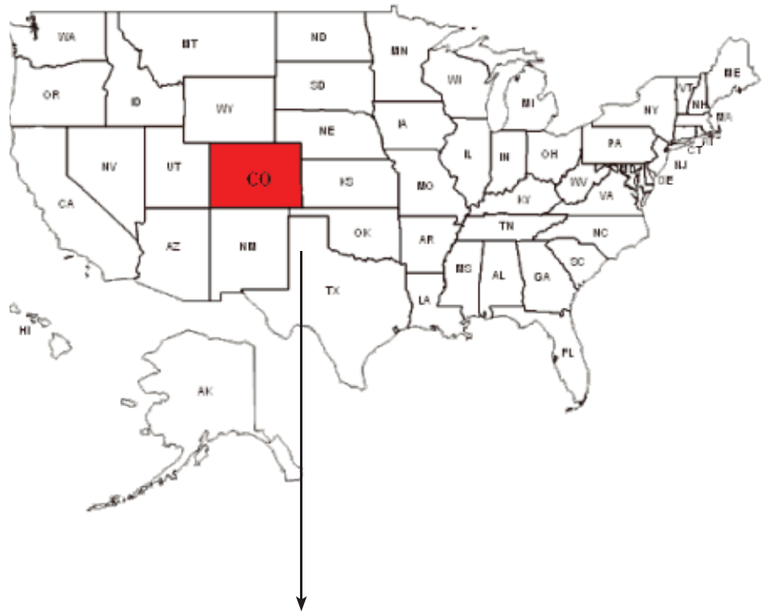
- Exhaustive and comprehensive data analysis and assessments should be conducted before any intervention and planning may involve extensive participation from local stakeholders.
- Local scientific and technical capacities should be built. For example, liaising with the government, private and other educational institutions, authorities and departments should be included in project planning and data analysis.
- Traditional knowledge should be used, along with scientific know-how, to innovate practices and processes for a particular region.
- A joint platform or forum for planning, coordinating and managing collective activities should be undertaken for sustaining project outcomes.

Figure 22: Mara River case study: Process highlights

Threat assessment and stakeholder consultation		
↓		
Severe threat to ecological reserves and water quantity and quality	Florida International University and WWF EARPO with its networks and ties in the area liaised with other stakeholders	Formation of scientific team for environmental flow studies and other detailed research on Mara River Basin
↓		
Strong communication strategy		
Strong communication strategy was implemented throughout the project with the help of WWF-EARPO - regional water dialogues, capacity building workshops and partnership meetings		
↓		
Inclusive data collection and assessment		
Project team conducted exhaustive assessment exercise (quality, hydrologic, spatial) in Coordination with local universities.	Support for graduate level research from FIU and scientific capacity building workshops	
↓		
Drafting management strategies		
Biodiversity Action Plan (BAP) developed through regional consultation	Initial development of SEA and PES implementation plan	
↓		
Formation of formal communication platform		
Establishment of a Transboundary Water Users Forum	Expansion of TWB to include CARE-Tanzania and World Vision	
↓		
Capacity building and awareness		
Local-level focussed action plans initiated (WASH services)	Further involvement of local governments and Mara Water Users Associations	
↓		
Monitoring		
Mechanisms developed during the drafting of BAP	Lake Victorial Basin Council responsible for monitoring and evaluation	

Case study 2: Clear Creek Watershed project

Figure 23: Location of Clear Creek Watershed, its extent & characteristics



Location: Colorado, USA

Towns and cities covered: Silver Plume, Georgetown, Empire, Idaho Springs, Black Hawk, Central City, Golden, Arvada Northglenn, Thornton, and Westminster

Area: 1,476sq.km

Population: 400,000

Users: Residents, industries and farmers

Major source of water: Surface

Quality of water: Poor

Reason: Extensive mining in the upstream location and poor quality wastewater discharge

Problem: Water pollution

Project objective: Cleaning up of Clear Creek to make it potable

Major stakeholders: CCWF, EPA, Molson Coors, mining department and the local community

Source: CCWF (2007), Exploring Watershed Sustainability - 2007 Clear Creek Watershed Report

Background [86, 87, 88]

Clear Creek Watershed is located in the State of Colorado, USA. It covers an area of 1,476 sq.km and supports a wide range of users. The stream originates on the continental divide at a height of around 4,267 m (14,000 ft.). The upstream region has a vast forest area, and 60% of it is under the control of the United States Forest Service. It travels down and meets River South Platte near Denver at an elevation of 1,585 m (5,200 ft). The relatively steep slope of the watershed makes it very suitable for rafting purposes. Fishing is an important recreational pursuit in the upper region of the watershed. The watershed is inhabited by several industries, farming community and residents from mountain towns such as Silver Plume, Georgetown, Empire, Idaho Springs, Black Hawk, Central City, and the major cities of Golden, Arvada, Westminster, Thornton and Northglenn in the downstream region.

The Clear Creek Watershed in Colorado is famous for the gold mining rush, which started in the late 1850s. It was due the discovery of gold by George Jackson that this mountain wilderness was transformed into a distinctive mining area. The initial gold rush was followed by silver mining, and later by molybdenum mining. The mining industries took a heavy toll on the local environment, and associated logging activities led to large-scale deforestation. Many small mining boom towns rose up, and the drainage from mines degraded the water quality. As a result, Clear Creek became highly contaminated with metals and acidity. The mining activity continued till the Second World War, after which most of the small towns disappeared, leaving behind nearly two thousand orphan mines. These orphan mines continued polluting the upper portion of the watershed through most of the 20th century.

Realising the adverse impacts on Clear Creek, the United States Environmental Protection Agency (EPA) established the Clear Creek/Central City Superfund Study Area in 1983 and placed it on the National Priority clean-up list. This was done to expedite the mine cleaning activities in the Clear Creek Watershed containing more than 1600 orphan mines at that time. Many studies were done to find out ways to clean up the wastes coming from mines and a Mine Tunnel Drainage study was done in 1987 by EPA. To strengthen the monitoring of water quality several water quality monitoring stations were also established. Gradually, other government agencies, including Colorado Division of Reclamation, Mining and Safety/Abandoned Mine Section and USDA Forest Service Abandoned Mines Lands Programme joined the intervention for cleaning the Clear Creek Watershed.

As reported, deterioration caused by years of virtually unregulated mining activities did not put much faith on government agencies; and as a result local communities suspected the intention of the conservation plans of the Clear Creek. Furthermore, the upstream communities with a sense of ownership towards the water resource did not want an external non-user agency to intervene in the management processes. The community had a fair understanding of the local setting, but lacked technical expertise and financial assets to undertake the required conservation efforts. For addressing this issue, a neutral forum called the Clear Creek Watershed Forum was created in the early 1990s through the joint efforts of EPA, Colorado Water Quality Control Division (WQCD; David Holm, the current Executive Director of CCWF, was the representing official from this division), Molson Coors (a brewery company), and a representative from the Henderson Molybdenum Mining Company. It was free from the control of any government agency or industrial body, and its purpose was to bring the stakeholders together to act collectively for achieving the common goal. It started informally with a limited number of stakeholders, but that effort laid the foundation for collaboration over Clear Creek Watershed management.

The major objectives of the forum were to share knowledge, attitudes and values; and most importantly, to define the common priorities and goals. Initially, the meetings were conducted to present efficient technologies of water treatment, better land use practices, best practices existing in the nearby areas, etc. Gradually, however, the forum was motivated by the presentations and education materials. In 1994, nearly a 100 stakeholders joined the intervention with additional representation from community leaders, successfully mobilising other interested parties and stakeholders.

The Clear Creek Watershed Initiative (WIN) as an extension of the forum's activities. It started in 1991 as a joint project of Coors and the Centre for Resource Management to provide leadership and coordination for ecological and recreational improvement activities in the Clear Creek Basin. Several parallel projects, such as the construction of new water treatment plants, and EPA mine cleaning activities under Superfund, were also conducted simultaneously. But most of these projects were executed by one or two institutions, with nearly no community involvement. Further motivated by the increasing representation of local stakeholders in the forum and their willingness to act collectively, an operational arm was created to consolidate different conservation activities in the watershed.

For this purpose, the Clear Creek Watershed Foundation (CCWF), a not-for-profit organisation was formed in 1997. It aimed to act collectively on the suggestions and recommendations made by the forum. Since its conception, CCWF has worked with different public and private partners to achieve the goal of a clean and healthy watershed. The partners include Colorado Division of Reclamation, Mining and Safety (DRMS), Environmental Protection Agency (EPA), Phelps-Dodge/Henderson Operations, Coors, Clear Creek County, United States Department of Agriculture Forest Service (USDAFS), Silver Plume, Idaho Springs, and numerous individuals. In 2006, the CCWF was awarded an EPA Region 8 Regional Priorities Grant to develop and implement the Sustainable Watershed Management Plan for Clear Creek Watershed. Based on stakeholders' input, CCWF has developed eight groups to categorise the current list of watershed-based sustainability projects. CCWF organises tours, presentations, status documents, and the Watershed Exhibit to continue the process of knowledge sharing and collective action.

Case analysis

The CCWF maintains a reasonable amount of information material on their website which has been used to analyse the Clear Creek Watershed case for this study. However, to get a better understanding of the processes a detailed interview of Mr David Holm (Executive Director, CCWF), who has been a part of the process from its initial phase, was conducted.

As reported, the presence of multiple threats triggered the process of collective action in this watershed. Firstly, the mines in the upper regions, both active and inactive, were a continuous source of pollution and were responsible for degradation of the water quality. Secondly, the Stanley Lake located downstream had become eutrophic, in part because of the wastewater contamination coming from upstream users. This was a direct threat to the drinking water supply of people in the downstream region. Thirdly, EPA's intervention of cleaning the mines was a threat to upstream users, because they did not want to be under the control of any external agency over their resources. Similarly, declining availability of usable water was a major business threat to the water-intensive industries located in the midstream and downstream region. All the stakeholders in one way or the other were, thus, impacted by water pollution; and had a huge impetus for acting collectively to clean up Clear Creek.

Several incentives and penalties greatly aided in collective action to transpire. The addition of Clear Creek on the 303(d) national priority list for needed restoration put much needed emphasis on the watershed. There was increased consciousness, awareness, responsibility and accountability towards Clear Creek.

Furthermore, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, is the federal law designed to respond to releases of hazardous substances that may endanger public health or the environment. Superfund has been of particular importance to this watershed to spearhead clean-up activities and especially to discourage polluting activities such as unregulated mining in the region. Concurrently, the upstream users had to invest large amount of funds in the wastewater treatment plants under threat of lawsuits by the Standley Lake water users and municipalities. It was in their favour to join the intervention to accrue benefits from government's technical expertise on economically efficient ways of treating wastewater.

Later on the Colorado Environmental Leadership Programme (ELP) was introduced, which rewarded users who voluntarily went beyond compliance standards set by state for wastewater treatment. The award added credibility to the image of the users, especially to the industries. Coors has been rewarded under this programme.

CCWF was also incentivised with the EPA Region 8 Regional Priorities Grant to research the concept of watershed sustainability and the application of this concept in the Clear Creek Watershed as a model for the arid mountain west. The regional fund was indeed a strong incentive for fostering collective action among different stakeholder groups, experts and research bodies.

Bringing diverse groups together was a challenging task. The complex watershed with representation from different stakeholders suffered from the problem of wide heterogeneity of interest. Even within a single stakeholders group there was heterogeneity, for example within the residents, the upstream people and the downstream people were not willing to come together. Even the government agencies such as EPA, WQCD, USDA/USFS had different interests and it was difficult to decide on collective goals. Environmentalists had focussed interest towards enriching biodiversity and preserving fishes etc. Others were interested in improving recreational value of the watershed. These divergent interests existed more so because of the social identities different groups associated themselves with. It took several negotiations in order to build consensus towards common objectives. CCWF has started working on nearly all of the above-mentioned issues and is adopting an integrated approach.

Given the competitive uses for water in Clear Creek Watershed, well-defined rights and proper allocation strategy played an important role in reducing conflicts. Water rights in Clear Creek Watershed were defined on the basis of historical patterns of consumption. However, the water rights or volumes are not fixed and may vary according to availability. The water rights can also be bought and sold. As per the consumption pattern, major users in the watershed are the urban residents, followed by industries. Irrigated agriculture is no longer a major occupation in the area. As reported, 100% of the available water resources have been allocated through water rights. Ecological flows are maintained in the mountainous portion of the watershed by

virtue of the fact that water must remain in the stream until it reaches the head gates of the senior water rights owners that are located in the lower portion of the watershed.[92] Nearly, 80–85% of the volume of water provided to the water utilities or residents is non-consumptive. As the water quality division ensures the wastewater discharged into the stream is of good quality there is not much impact on the flow of water. However, the storm water runoff causes pollution, which is currently the major point of concern. Coors, a famous brewery company, one of the major industries in the area, uses high quality groundwater for production and surface water for operations.[93]

Coors has been a determined partner in this initiative. It also has representation in the CCWF and continues to provide financial support for various operations. The WIN programme started by the Coors was one of the first projects in the watershed, which showed successful collaboration between an industry partner and a government agency. Other agencies which laid the foundation and have continued supporting the intervention include EPA, USDA/USFS, Division of Reclamation Mining and Safety and WQCD. The continued collective effort of all these institutions provided the platform for others to join the initiative. New stakeholders have brought more knowledge and diversity to the group, making it a success. Therefore, there is no single institution, which could be assigned as the leader of the intervention. However, from the time CCWF has been formed it is helping to coordinate the process with well-defined objectives.

CCWF organises several meetings in the watershed and also provides education materials to the schools for communicating the history of Clear Creek Watershed and benefits of water management activities to the children. The watershed that now actively engages stakeholders hardly interacted till early 1990s. No meetings or discussions were organised to share common concerns and the stakeholder's network was weak. It took many years before the network became strong. As the quantity of water availability was not the driving issue that was not the primary source of tension amongst the users. However, the tension between the government agency and the public, as explained earlier, was a major obstacle to overcome. This was achieved through strong communication and coordination strategy. The initial group members were persistent in their approach and continued discussions, meetings and presentations even when the participation from community was low. It was not an easy task to bring together representations from different stakeholder groups– comprising residents from both rural and urban settings, farmers, various industries and regulatory agencies. The first phase of the intervention, i.e., bringing stakeholders together on the same board, took a lot of time and several deliberations.

Regular meetings and presentations made an impact, however, and people started relating to the cause, especially by seeing similar activities being done in the nearby areas. The initial group internally discussed means to improve the communication strategy and found out ways such as presenting cases of famous people involved in similar interventions. As reported, Mr. Carl Norbeck's(the communication specialist or the coordinator of the forum) role was extremely important in motivating the stakeholders and bringing representation from the community.[94] Now, the CCWF follows various ways of keeping the stakeholders active and informed about best practices. Taking feedback from stakeholders about the progress and inputs on ways to improve has been a valuable communication technique. Numerous forums, field trips, presentations, and bus tours have been held since the start of the Forum in 1993. With time this has led to formation of a strong network amongst the stakeholders.

If we analyse the initial combination of people that led to the CCW forum creation, there were representatives from EPA, WQCD, Coors, Clear Creek County and the mining industry. This combination of people that actually triggered the collective action and gave a platform to follow could be called as the critical mass of this intervention. Although it was an informal forum, it provided a platform to the people for sharing their ideas and concerns. It was necessary to create such a platform for two important reasons; one, to inform people about the intervention that individual agencies were taking up to make the process transparent and second, to undertake inclusive participatory approach.

Creation of CCWF in 1997 led to increased focus on sustainable development of the watershed. A dedicated organisation for the watershed development ensures that objectives are met within the time limits. With representation from Molson Coors Brewing Company, Audubon Society of Greater Denver, EPA, Climax Molybdenum Company, Clear Creek Economic Development Corporation, Clear Creek County Planning Commission, Clear Creek County Historic Public Lands Commissioner, President, Jack Pine Mining Company etc., it consists of a good mix of public and private sector representatives. It has an effective monitoring mechanism to measure physical parameters such as water quality, levels, flows etc. and financial components such as cost-effectiveness of an intervention. It also eliminates the probability of diluted accountability, which generally happens in a multi organisational setup working towards a common goal. The stakeholders meet regularly to plan out the future projects. The development of this watershed due to efficient work of CCWF has attracted many people. CCWF has won several awards.[93]

In short, the complex watershed of Clear Creek with multiple users has been restored due to continuous collective effort of stakeholders.

Key takeaway points

- A strong and efficient nodal coordinator is essential for bringing stakeholders together.
- It is important to identify organisations working for the same broader cause.
- In a complex watershed such as Clear Creek, robust communication strategy is required for bringing in collective action.
- Water stressed regions facing quality or quantity issues require special incentive/penalty measures to trigger the process of collective action.
- Presenting case studies which people could relate to helps in motivating them.
- Creating a dedicated organisation for undertaking the collective action improves the accountability of the process.

Figure 24: Clear Creek Watershed case study: Process highlights

Multiple threats in a complex multi-user scenario	
Pollution coming from mines and upstream location lead to high level pollution of the Clear Creek Watershed. Due to this, the Stanley Lake which is the source of drinking water for downstream people became eutrophic.	EPA, USDAFS, mining department , SWQD, Coors decided to tackle the problem collectively
Strong communication and coordination mechanisms	
Due to the complexity of the stakeholders group first phase of the intervention i.e. bringing stakeholders together on the same board, took a lot of time and several deliberations. However, the strong focus on communication and coordination brought the stakeholders together and lead to formation of the CCWF.	
Gradual strengthening of ties and networks	
People mistrusted the public agencies and even the ties within the government agenices were not strong. Due to the existing situation and the complex multi-user mix, fixing common objectives was a challenge.	However, initial successful projects such as WIN programme by Coors had the demonstration effect. CCWF has a representation of officials from different stakeholders group who share strong ties and network.
Effective accountability and monitoring	
CCWF, a dedicated NGO, regularly measures physical parameters such as water quality, levels, flows etc..It has an accountant who does monthly bookkeeping and financial reporting to the Board. Also, as reported, there could be penalties for any misappropriation of funds, or malfeasance.	

Section VIII

Results and discussion

The objective of this project was to delve deeply into the factors that foster or inhibit collective action in India at different hydrological scales. A conceptual framework was derived from the literature review to analyse national and global cases. Case studies, inherently, provided a nuanced understanding of the factors, which are critical for collective action to occur. As mentioned in the earlier section, the cases were selected on the basis of boundary conditions used for this study, and to test the expected factors for success.

The intensity and criticality of the factors for collective action varied across cases. In order to facilitate a quantitative analysis

Table 4: A summary of our case investigation vis-à-vis the analytical framework

Case analysis	Gundar	APFAMGS	Phagi	Neemrana	Mara	Clear Creek
Hydrological Level	Sub-basin	Macro-watershed	Micro-watershed	Macro-watershed	Sub-basin	Sub-basin
Users	Single-user	Single-user	Single-user	Multi-user	Multi-user	Multi-user
Is there presence of a common water threat/opportunity?						
Are there incentives/penalties towards water management/ pollution?						
Is the heterogeneity of interests among stakeholders narrow?						
Are rights and entitlements re-garding access and use of water resources clearly defined						
Is there a presence of strong leadership?						
Are the social ties and network between stakeholders strong?						
Is there a critical mass?						
Is common interest stronger than individual social (group) identities?						
Is there a strong communication and Coordination mechanism?						
Are there effective accountability and monitoring mechanisms?						

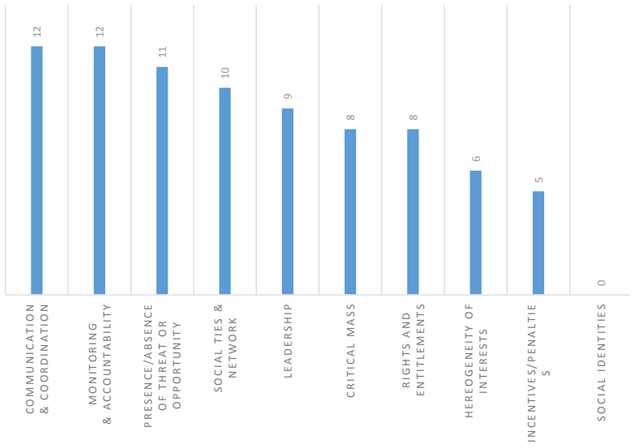
*Green: Yes; Red: No; Grey: Ambiguous/Unknown

Source: CEEW analysis

of the significance of the factors and their bearing in the context of promoting collective action in India, an evaluation scale was developed. On a scale of 0–2, the factors for being critical, important and neutral were measured. Factors critical for collective action were given the highest rating of '2'; while factors whose presence and positive impact improved collective action and made it more effective were rated '1'; and factors with no impact (positive or negative) were considered neutral and were rated '0'. The evaluation used background documents and interviews conducted for each case. The scoring was verified by two coders to eliminate personal biases and provide reliability to the results. Thereafter, scores for each of the factors were added in order to establish a decreasing order of significance (Figure 25).

The factor that scored the highest across all the cases was the presence of a strong **communication and coordination mechanism.** Developing a common understanding of threats or opportunities, or to realise the importance of collective action in the presence of strong incentives or penalties, required intensive communication and coordination among different stakeholders. Communication mechanisms were developed as per the case requirements. For instance, group discussions, panchayat meetings and training sessions were held between the beneficiaries (local communities, industries) and technical bodies for defining the scope of the project, to collect data, to conduct assessments for project design and implementation plan. In the course of project implementation, formalised coordination processes were established at multiple levels to facilitate information dissemination and monitoring, and evaluation of the project among stakeholders. In the case of Gundar Basin, Hindustan Unilever Foundation and DHAN foundation formed Vayalagams (tank associations), cascade level associations and a block level federation to provide a platform for interaction, feedback and conflict resolution among all stakeholders. Multi-stakeholder interactive forums for action were also seen in the global case of the Mara River Basin in the form of a Transboundary Water Users Forum, which included stakeholders and interested parties from both Kenya and Tanzania, along with global NGOs, financial and technical experts. Collective action was possible in the Clear Creek Watershed only because of the pertinent effort of the initial group of stakeholders to communicate their agenda and get feedback on the same. In a multi-user setting, therefore, it becomes even more important for stakeholders to regularly communicate for sharing their concerns and resolve conflicts. As seen in the presented cases, models of communication and coordination may have varied from case to case, but the underlined principle followed universally by them all was to establish transparency, create a sense of ownership, produce a robust feedback mechanism and build trust among the stakeholders.

Figure 25: Factors for collective action on a scale of significance



Source: CEEW analysis

In order to sustain any action-oriented project, **monitoring and accountability** frameworks are an absolute necessity. The results of this study substantiate this claim and have appraised efficient monitoring mechanisms to be one of the most critical criteria for sustainability. Robust and resilient monitoring mechanisms were a common feature across all the cases reviewed, although the models varied from case to case. Many best practices came to the forefront too, such as the one implemented in the Gundar Basin. Associations were created at every level—tank (Vayalagams), cascade (CLA) and block level (Federation) to monitor the progress of the project and resolve conflicts. Furthermore, project monitoring and evaluation was conducted by a third party, ensuring transparency and factual validation of the project outcomes. A similar monitoring system was seen in the Phagi Tehsil at three levels of governance, but it was not formalised. In the Mara River Basin (Kenya and Tanzania) monitoring mechanisms were developed and implemented by the Victoria Lake Basin Commission—an umbrella regional collaboration, in consultation with the Transboundary Water Users Forum (Mara River Basin), WWF-EARPO and FIU.

The factor that gained the third highest rating across all cases (barring one) was the **presence of a threat/opportunity**. In the cases analysed, the existence of a threat was seen varying from human and economic to ecological concerns. Threat to lives and livelihoods due to water scarcity and pollution, low water productivity in agriculture, water unavailability for industrial operations, and ecological degradation due to excessive abstraction were some of the common triggers for collective action to be initiated.

Building trust and coordination among stakeholders, who were in some cases geographically distant and culturally different and in others had strong historical reputations, was flagged as one of the primary challenges faced. However, **strong social networks and ties** were found among at least two main stakeholder groups to have instigated collective action. In the case of the Phagi Tehsil, for example, the previous working relationship between Advit Foundation and IKEA initiated the conceptualisation of the collective action project in Rajasthan, where IKEA's supplier factories were located. Furthermore, communities were easily convinced of the intervention due to their strong ties with the supplier factories, which provided employment in these areas. Similarly, in the Mara River Basin, strong social ties existed between local communities and WWF-EARPO due to their earlier work in the East African region. This not only initiated the process of collective action, but also facilitated better communication with other stakeholders, strengthening trust for future partnerships. It was also observed in this case that diversity in the network facilitated broader and effective actions. The Florida International University (FIU), a network tie-up of WWF-EARPO, with its international technical and scientific expertise, greatly aided in building a vigorous project design with the help of local scientists. These local scientists, in turn, lent their advanced expertise in hydrological assessments to other areas in the region. Such interaction would not have been possible in the absence of strong ties between WWF-EARPO, local government departments and FIU.

The effectiveness of strong social ties and networks in fostering collective action partly depends on **leadership**. Strong leadership was rated as the one of the critical factors in bringing collective action to reality. Leadership, however, was seen to be changing from one stakeholder to the other in different phases of a project. A clear difference lay between the initiators or prime movers of the project, and the implementations bodies and overall co-ordinators of the project. In all the cases, it was extremely difficult to assign a 'leader' title to a single group. In majority cases, however, the prime movers were either the funding agencies or civil society organisations. Civil society organisations were instrumental in project designing, planning, administrating and overall coordination actions set for the project. With reference to aforementioned roles and responsibilities, the DHAN Foundation was a clear leader in the Gundar Basin project, and Advit Foundation in the Phagi Tehsil project. Other cases ranged between multiple leaderships (especially seen in interventions at sub-basin and basin levels) to individual leadership at micro-watershed levels. A noticeable importance of individual leadership was seen in the case of the Hiware Bazar village in Maharasthra. Mr. Popatrao Pawar, sarpanch (village headman) of the village, undertook the task of mobilising communities and related government departments to collectively act towards watershed management, employment generation, health improvement and education.

Critical mass was graded as the next important factor for the success of collective action. In this study, critical mass refers to the size of the initial member team that conducted pilot projects, which led to the demonstration effect for other stakeholders to join in and commit to the project development. In case of the APFAMGS project, for instance, the initial mix of institutions—such as APSIDC, RNE, Arcadis Euroconsult, IRDAS and marginal farming communities during the APWELL project—are considered to have collectively form the critical mass, which laid the foundation of the APFAMGS project. It was their preliminary work that mobilised other NGOs, government agencies and farmers in the region to join the initiative and upscale the intervention. Demonstration projects achieved by a critical mass of actors are said to be imperative for two reasons—i) to provide a realistic benchmark for project feasibility; and ii) to build trust among members for potential project benefits. This was seen in the case of Neemrana, where SABMiller, CII, ACWADAM and HIPPI with support from the CGWA and local administration constructed recharge structures in the ridge region, which clearly demonstrated increase in groundwater levels. Similarly, at an even lower scale intervention, CURE India in the slum upgradation project in Agra, along with local members, built toilets for a small number of households in the Kucchpura, later expanding to 1,000 toilets for the entire area.

Another important factor in accomplishing collective water action is the presence or absence of **defined rights and entitlements**. around the water resource. Ownership, management and exclusion rights of water in most cases were either not clearly defined or lacked effective implementation, except in the case of the Clear Creek Watershed project. In this case, the water rights were well defined and allocation

was on the basis of historical consumption patterns modified to include allocation for environmental flows. Such defined rights facilitated collective action. In other cases, loosely implemented and defined rights did not seem to critically inhibit collective action. Of the reasons known, strong communication was one. It resolved conflicts arising from water-land rights by creating a sense of ownership and building trust. Two, creation of locally owned rules on access and distribution through consensus, especially at the micro and macro watershed level, addressed any remaining issues regarding rights and entitlements. In the cases related to sharing of groundwater resources, APFAMGS and Neemrana, data played an important role in not only ensuring equitable allocation of water, but also removing mistrust among the users about respective sector consumption patterns. From the case studies, it would be safe to conclude that conflicts arising from ambiguity in water rights and entitlements could be countered by inclusive participation of all stakeholders from the beginning of the project and creating a robust and transparent database of water availability and consumption patterns.

Wide **heterogeneity of interests** among stakeholder groups was expected to inhibit collective action as per the analytical framework. However, despite class/caste differences, socio-economic inequalities, dissimilarity in skills, knowledge and value for the common resource, different group of stakeholders came together to manage the water resource. This is to say that regardless of a wide heterogeneity of interests among stakeholders, collective action did occur in the cases studied. This was primarily attributed to—i)the intensive interaction conducted from the beginning of an intervention that allowed a common understanding towards the threat; ii) subsequent inclusive participatory discussions leading to trust building and conflict resolution. In short, the intensity of threat and transparent communication mechanisms neutralised heterogeneity of interests. We must mention, however, that most of the cases we reviewed had single-user stakeholders, such as in the Gundar Basin, APFAMGS and Phagi Tehsil, where heterogeneity of interests was less evident. In multi-user cases, such as the Neemrana, Clear Creek Watershed and Mara River Basin, heterogeneity was handled through intensive interactive sessions, group discussions and inclusive and participatory deliberations on project objectives and scope.

Incentive and penalty structures were initially considered as a potential trigger factor (in the analytical framework). Despite the presence of incentives in some cases and penalties in others, however, it did not seem to contribute much in instigating collective action. The reasons inferred are redundancy of execution agencies and ineffective governance regimes, which are not strong enough to implement laws and regulations. Incentives and penalties have been categorised as an important factor, therefore, which could foster collective action, but are not necessarily critical. There is an exception to this factor, however. In the case of the SABMiller India Initiative in Neemrana, penalties imposed by the Central Ground Water Authority to recharge the amount of water extracted from the ground initiated the collective action. It would be practical to assume that the cases where incentives and penalties were strongly enforced, they did have an impact on users coming together to collectively act. The case of the Clear Creek Watershed project in the Colarado Basin stands out as an example. The two legal changes—Clear Creek Watershed added to the 303 (d) list for conservation and protection, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) posed severe penalties on acts of disobedience by water polluters. This was further aided by the Colorado Environmental Leadership Programme (ELP) that instigated the industries and other users in the area to reap the benefits of the revised policies and safeguard themselves from getting penalised.

Of all the factors, **social identities** received the lowest appraisal. Given the qualitative nature of the factors, it was a daunting task to assign values to them or assess their significance based on a limited number of interviews. However, it cannot be ascertained that their role in producing collective action is negligible or ineffectual. Due to lack of sufficient data, information and resources, we were also unable to investigate social identities in detail. In this study, social identities did not seem to be an inhibiting factor in the case analyses, presumably, for the same reasons stated for heterogeneity of interests, i.e., the presence of strong communication and coordination in the cases considered for this study.

Section IX

Conclusions and recommendations

Drawing on the national and global cases analysed in this study, the previous section ordered factors in terms of their significance for promoting collective action on water. In this concluding section, how these different factors could be effectively employed for nurturing collective action will be outlined. Recommendations were designed to align with the 2030 WRG's 'analyse, convene, transform' (A-C-T) action framework. The general import of the recommendations would be applicable for other initiatives for collective action as well.

Based on several consultations with experts, key learnings and analyses of the case studies, the key factors for the success of collective action may be categorised as supporting different phases of any intervention:

Table 5: Factors for collective action

Triggers	Presence of threat or opportunity
	Incentives/penalties
	Social ties and networks
Facilitators	Leadership
	Critical mass (demonstration effect)
	Defined rights and entitlements
Sustainers	Communication and coordination
	Monitoring and accountability

Source: CEEW analysis

To be sure, categorising various factors as triggers, facilitators or sustainers is mainly to draw attention to their potential roles when new interventions are designed. By no means should such a categorisation imply prescriptive conditions or processes of collective action. That said, the three categories and the embedded factors signal implications and opportunities for action for programme initiators, facilitators and managers. These recommendations are also outlined below.

Triggers

Triggers refer to the factors that may act as initiators for collective water security projects in different, context-specific socio-economic settings.

Presence of threat/opportunity

The intensity of the threat and the severity of its impact on stakeholders could have a proportional or even disproportional effect on the likelihood of organising collective action. The presence of opportunities also provides impetus for the stakeholder group, which expects to gain the most, to mobilise other stakeholders to act collectively. There is a distinct possibility for threats and opportunities to overlap. Evidently this was the case in most of the projects reviewed. Threats led to opportunities for certain stakeholder groups such as multilateral and bilateral development organisations or NGOs to supplement their organisational mandates, or for industries to enter the market economy of the region. Similarly, lack of real-time, reliable and authentic data with respect to water quantity, usage and quality is one the biggest impediments to project planning and operation but also an opportunity for research institutions and donor agencies to build the databases, which could undergird action in future.

Furthermore, it has been observed that projects with broader objectives attracted more stakeholders and reaped maximum benefits, hence, interventions with holistic yet targeted objectives should be undertaken. For instance, including livelihood issues, vulnerability reduction, mitigating climate change, ecological conservation within the broader ambit of the water security and sustainability mandate is likely to produce much more sustainable and long-term benefits.

Recommendation 1: Analyse Threats/Opportunities

In order to trigger collective action by presenting threats

and/or opportunities, programme initiators should deploy analytical tools such as water risk assessment tool, water footprint, life cycle assessment, and environmental impact assessments to understand the type, intensity, characteristic of threat and the affected population.

Recommendation 2: Convene Stakeholders
Programme initiators should convene scientific and technical bodies, water users groups and other relevant stakeholder groups to undertake participatory data collection. A combination of traditional knowledge and technical scientific skills, employed via participatory mechanisms, should be used for assessments.

Incentives and penalties

The presence of stringent incentives and penalties, mainly imposed by government rules, norms and policies also help to trigger collective action. This factor, however, is dependent on the effectiveness and credibility of enforcement of laws and regulations in the region. It has been seen that in the cases, where they are appropriately and adequately executed, incentives and penalties have nudged the affected stakeholders in the direction of collaboration.

Recommendation 3: Establish Voluntary Standards and Codes
In the absence of credible and effective incentives or penalties, programme initiators should act as a convening body for industries and other major water users to establish voluntary standards and rules for water management. Certification and standards such as Alliance for Water Stewardship could be referred as templates for designing region-specific standards and codes of conduct.

Social ties and networks

Social ties and networks are critical attributes, which can bind various stakeholder groups together. Previous working relationships, a history of preceding projects on which groups have worked jointly, and social and professional contacts play an important role in liaising with key stakeholder groups in conceiving a new project. These ties were specifically important between NGOs working in the field, co-ordinating bodies and funding organisations. It was also observed that ties and networks were subsequently strengthened during the implementation of the projects, promoting supplementary or additional interventions.

Recommendation 4: Transform Collective Decision-making
Programme initiators should identify stakeholders with wider reach, diverse skills and dense networks through various initiatives. One idea is to identify 'Jalbandhu'('water friends') organisations, i.e., existing institutions, which could spread information and create awareness about a project's objectives. Another idea is to organise local 'Pani Mela'('water fairs'), whereby participatory approaches could be used to generate ideas from communities, civil society organisations, government agencies and other interested parties to collectively decide on which projects to initiate.

Facilitators

Facilitators are the factors, which aid in bringing different stakeholders together, build trust and invite commitment for the project. They include factors whose presence would positively impact collective action, especially during the implementation phases.

Leadership

The essence of leadership was seen in several cases, especially at the micro and macro watershed levels. Issues of trust, coordination, organisation and conflict resolution could be resolved with relative ease when a leader (whether an individual or an institution) with high integrity and accountability was present. In fact, the leadership role could be assumed by different individuals or entities at different stages or for different roles. A stakeholder group with particular skill-sets and expertise, for instance, could take the lead in planning and designing the project, while another group could lead in the execution of it.

Recommendation 5: Identify and Nominate Leaders
Programme facilitators should use their convening power to evaluate and nominate specific institutions to lead on initial stages of a planned intervention, based on the interest, capacity and capabilities of the institutions available.

Recommendation 6: Build Leadership Skills at Local Levels
Programme facilitators should build technical, financial, organisational and management capacities of local representatives to create village level leaders, through training workshops and modules for continuous skill improvement. Such a base of local water leaders could ensure that projects are properly executed at a community level, rather than remaining reliant on external.

Critical mass

A critical mass of stakeholders who are resourceful (economically, socially and politically) enough to produce noticeable impact is very likely to facilitate collective action. Together, such a critical mass of organisations and individuals produces a demonstration effect through pilot projects.

Recommendation 7: Build Critical Mass for Different Programme Stages
Programme facilitators should convene key representatives from each of the relevant stakeholder groups to be involved in project design to form a critical mass. Specified roles for each of the groups should be determined, as per their skills and expertise, for executing different phases of the project such as design, piloting, review and debugging, and scaling up the programme's operational footprint.

Rights and entitlements

When the rights and entitlements for water use, management and exclusion are found to be well defined, conflicts are reduced, facilitating collective action. In cases where there are ambiguities, however, conflicts were resolved by creating rules through inclusive participatory mechanisms.

Recommendation 8: Formulate Rights and Responsibilities through Participatory Means
Where rights and entitlements are unclear or ambiguous, programme facilitators should convene stakeholders at an early stage to define clear rules and norms for water allocation and distribution in an inclusive participatory manner.

Recommendation 9: Formalise Rights with Local Governments and Stakeholders
Once the stakeholder-generated rights and responsibilities demonstrate more effective collective action, programme facilitators should work with the relevant government departments and ministries to institutionalise these rules and norms in order to end unsustainable practices and transform local relationships among various water stakeholders.

Sustainers

Sustainers include factors that support the project outcomes to ensure they remain sustainable in the long-term, even after the prime movers or funders have exited from or concluded the initial interventions. It is to be noted that although these factors are important during the entire intervention process, they are being included in the category of sustainers because without them the longevity of any programme would be at risk.

Communication and coordination

Communication and coordination among interested parties and stakeholders is the backbone of any water management project. The underlying principles of communication and coordination models include transparency, inclusiveness, resilience and continuity. It is also important for communication and coordination procedures to be socially acceptable to and adopted by user groups. Equitable participation of stakeholders in decision-making, creating a sense of ownership and building trust are the fundamental elements for sustaining collective action.

Recommendation 10: Establish Forums for Communication and Learning
Programme managers should maintain a continual and interactive process between funders, technical and scientific bodies, programme participants and partners by creating both formal and informal channels of communication and coordination. This can be achieved by establishing forums, committees or federations as per the requirements of the programme to provide a platform for continual learning and improvement.

Recommendation 11: Formalise Communication and Coordination Channels
Programme managers should facilitate the involvement of government organisations, departments and ministries necessary for legal, administrative and political support for formalising the communication and coordination processes.

Monitoring and accountability

Rigorous mechanisms for monitoring, review and accountability are imperative for collective action to become self-sustaining and resilient to changing socio-environmental conditions. Regular monitoring is needed to build confidence that the respective rights and responsibilities of various stakeholders would be guaranteed and delivered. Periodic reviews of data and observations during a programme's execution create a feedback mechanism to build in modifications and necessary corrections during the programme's lifecycle. Accountability, on the other hand, helps to maintain trust, assign responsibility and ensure performance.

Recommendation 12: Commission Independent Third Party Evaluations
Programme managers should commission independent third party evaluations to monitor and analyse successes/failures of the interventions at different phases, through periodic reporting and demanding disclosure statements.

Recommendation 13: Facilitate Collective Review and Accountability Procedures
Programme managers should convene all relevant stakeholders to review the evidence provided by the independent monitoring report and create accountability measures for addressing the concerns.

Table 6: Recommendations for collective action programme initiators, facilitators and managers

Factors for collective action	Analyse		Convene		Transform	
	Recommended action	Implications	Recommended action	Implications	Recommended action	Implications
Threat/opportunity	**Analyse threats/ opportunities:** Deploy analytical tools: water footprinting tools, water risk assessment, lifecycle assessment tools, EIA, SEA.	To understand the type, intensity, & characteristic of threat.			**Convene stakeholders:** Participatory data collection; combination of traditional knowledge and technical scientific skills; training for data collection and assessment.	Knowledge (technical and scientific) value creation would sustain the project and upscale and upgrade it.
Incentives and penalties			**Voluntary standards and codes:** Review and establish voluntary standards and certification systems (AWS & UN CEO Mandate).	Incentives/penalties would give necessary impetus for improvement in water management practices, outline processes to follow and penalise for acts of disobedience.		
Social ties and networks			**Transform collective decision-making:** Organise 'Jal Bandhu' movements (water friends) and 'Pani Mela' (information fairs on water).	This would help in stakeholder identification and create the required social networking for relevant stakeholders and interested parties to share ideas and bring in their expertise and resources.		
Leadership			**Identify and nominate leaders:** Evaluate and nominate specific institutions to lead on initial stages of a planned intervention, based on the interest, capacity and capabilities of the institutions available.	Without group leadership, Coordination, communication, design and execution strategies might be difficult to achieve.	**Build leadership skills at local levels:** Build technical, financial, organisational and management capacities of local representatives through training workshops and modules for continuous skill improvement.	Would ensure that projects are properly executed at a community level, rather than remain reliant on external and expensive consultants.

Factors for collective action	Analyse		Convene		Transform	
	Recommended action	Implications	Recommended action	Implications	Recommended action	Implications
Critical mass			**Build critical mass for different program stages:** Convene key representatives from each of the relevant stakeholder groups to form critical mass. Specified roles for each of the groups should be determined, as per their skills and expertise, for executing different phases of the project.	Critical mass would execute different phases of the project such as design, piloting, review and debugging, and scaling up the programme's operational footprint.		
Rights and entitlements			**Formulate rights and responsibilities through participatory means:** Define clear rules and norms for water allocation and distribution in an inclusive participatory manner.	Without local ownership of rules and norms, conflicts would arise.	**Formalise rights with local governments and stakeholders:** Through involvement of relevant government departments and political leaders.	Would create political, social and administrative support for the newly formed rules.
Communication and coordination			**Establish forums for communication and learning:** Maintain a continual and interactive process between funders, technical and scientific bodies, project participants and partners by creating forums, committees or federations.	Would provide a platform for continual learning and improvement.	**Formalise communication and coordination channels:** Facilitate involvement of government organisations/ departments/ ministries etc. in the process.	Would create political, social and administrative support for formalising communication and coordination mechanisms.

Factors for collective action	Analyse		Convene		Transform	
	Recommended action	Implications	Recommended action	Implications	Recommended action	Implications
Monitoring and accountability			**Commission independent third party evaluations:** Through periodic reporting and demanding disclosure statements. **Facilitate collective review and accountability procedures:** convene all relevant stakeholders to review the evidence provided by the independent monitoring report and create accountability measures for addressing the concerns.	Would monitor and analyse success/ failure of the intervention at different phases for further improvement.	**Formalise legal accountability:** Facilitate involvement of government organisations/ departments/ ministries etc.	Would create political, social and administrative support for formalising the monitoring and accountability measures.
Exit strategy					**Develop and communicate exit strategies:** Ensure that all relevant stakeholders devise their respective exit strategies, in consultation with all other stakeholders.	Would ensure that the exits of one or the other party is well communicated, predictable, contingent on building the capacity of other stakeholders to carry forward the programme; and Would ensure that rights and responsibilities are institutionalised, monitored, reviewed and every party is held accountable for its commitments.

Section X
Endnotes

Section II

1. AISLUS (1988) *Watershed Atlas of India, All India Soil and Land Use Survey*, New Delhi.
2. Please note that average figures were taken to combine two or more levels suggested by AILSUS for the purposes of simplification. Only basin, sub-basin, macro and micro watershed were, therefore, included in this study (the water resources level was removed, while catchment and sub-catchment levels were combined to form the sub-basin level).
3. Olson, M. (1965) *The logic of collective action: Public goods and the theory of group*. Cambridge: Harvard University Press, pp. 2.
4. UN Global Compact (2013) "The CEO Water Mandate: Guide to Water-Related Collective Action," available at: http://ceowatermandate.org/wp-content/uploads/2013/09/guide-to-water-related-ca-web-091213.pdf, accessed 25 May 2014.
5. Roschelle, J. and S. Teasley (1995) "The construction of shared knowledge in collaborative problem solving," in C.E. O'Malley (ed.) *Computer supported collaborative learning*. Heidelberg: Springer-Verlag, pp. 69–97.

Section III

6. Dillenbourg, P., M. Baker, A. Blaye and C.E. O'Malley (1996) "The evolution of research on collaborative learning," in E. Spada and P. Reiman (eds.) *Learning in humans and machine: Towards an interdisciplinary learning science*. Oxford: Elsevier, pp. 189–211.
7. Olson, M. (1965) *The logic of collective action: Public goods and the theory of group*, Cambridge: Harvard University Press, pp. 2.
8. Hardin, R. (1982) *Collective Action*, Johns Hopkins University Press, pp. 17–20.
9. Olson, M. (1965), *op. cit.,* pp. 53–60.
10. *Ibid*.
11. Udehn, L. (1993) "Twenty-five years with the logic of collective action," *Acta Sociologica*, 36(3): 239–261.
12. Oliver, P. E. and G. Marwell (1988) "The Paradox of Group Size in Collective Action: A Theory of the Critical Mass," *American Sociological Review* (II):pp. 1–8.
13. Taylor, M. (1987) *The possibility of cooperation*, Cambridge: Cambridge University Press, pp. 56–192.
14. Oliver, P. E. (1980) "Rewards and punishments as selective incentives for collective action: theoretical investigations, "*American Journal of Sociolology*, p. 85.
15. Coleman, J.S (1988) "Free riders and Zealots: The Role of Social Networks," Sociological Theory (Vol 6.): pp. 52–57.
16. Muller, E.N. and K.D.Opp (1986) "Rational Choice and Rebellious Collective Action," Amaerical Political Science Review (80): 471-487. Cited from: Dehn, L. (1993) "Twenty-five years with the logic of collective action," *Acta Sociologica*, Vol. 36(3): 248.
17. Hardin, R. (1982) "Collection Action as an Agreeable n-Prisoner's Dilemma", *Behavioural Science* (Vol 16.): 472–481.
18. Taylor, M. (1976) *Anarchy and Cooperation*, London: John Wiley. Cited from: Dehn, L. (1993) "Twenty-five years with the logic of collective action," *Acta Sociologica*, Vol. 36(3): 243.
19. Axelrod, R. and R. O. Keohane (1985) "Achieving Cooperation under Anarchy: Strategies and Institutions, "*World Politics*(38): 226–254.
20. Taylor, M. (1987) *The possibility of cooperation*, Cambridge: Cambridge University Press, pp. 56–192.
21. Wu, J. and R. Axelrod (1995) "How to cope with noise in the iterated prisoner's dilemma," *Journal of Conflict Resolution*, pp. 183–189.

22. Hoffmann, R. (2000) “Twenty years on: The evolution of cooperation revisited,” *Journal of Artificial* Societies and Social Simulation, 3(2): 1390–1396.
23. Hardin, G. (2009)“The Tragedy of the Commons,” *Journal of Natural Resources Policy Research*, 1(3): 243–253.
24. Ostrom, E. (1990) *Governing the commons: The evolution of institutions for collective action*, Cambridge University Press: Cambridge, pp. 103–110.
25. Berkes, F (2009) “Evolution of co-management: Role of knowledge generation, bridging organisations and social learning,” *Journal of Environmental Management* (vol. 90): 1692–1702.
26. Ostrom, E (2007) “A diagnostic approach for going beyond panaceas,” *Proceedings of the National Academy of Science* (vol. 104): 15181–15187.
27. Poteete, A. R. and E. Ostrom (2007)“Fifteen years of empirical research on collective action in natural resource management: Struggling to build large-N databases based on qualitative research, ”*World Development* (vol. 36): 176–195.
28. Van Zomeren, M., T. Postmes and R. Spears (2008) “Toward an integrative social identity model of collective action: a quantitative research synthesis of three socio-psychological perspectives,” *Psychological Bulletin*, 134(4):504.
29. Kawakami, K. and K. L. Dion (1995) “Social Identity and Affect as Determinants of Collective Action Toward an Integration of Relative Deprivation and Social Identity Theories,” *Theory & Psychology*, 5(4): 551–577.
30. Goldstone, Jack A. and Charles Tilly (2001) “Threat (and Opportunity): Popular Action and State Response,” in R. Aminzade, J. Goldstone, D. Mc Adam, E. Perry, W. H. Sewell, S. Tarrow, and C. Tilly (eds.) *The Dynamics of Contentious Action in Silence and Voice in the Study of Contentious Politics*, Cambridge, MA: Cambridge University Press, pp. 179–94.
31. Maher, T. V. (2010) “Threat, Resistance, and Collective Action: The Cases of Sobibór, Treblinka, and Auschwitz,” *American Sociological Review*, pp. 252–272.
32. Oliver, P. E. , G. Marwell and R. Teixeira (1985) “A theory of the critical mass. I. Interdependence, group heterogeneity, and the production of collective action,” *American Journal of Sociology*, pp. 522–556.
33. Ibid.
34. Oliver, P. E. and G. Marwell, op. cit., pp. 1–8.
35. Tajfel, H. and J. C. Turner (1979) “An integrative theory of intergroup conflict,” *The social psychology of intergroup relations*, pp. 33, 47.
36. Melucci, A. (1995) “The process of collective identity,” *Social movements and culture* (4):41-63.
37. Van Zomeren, M., T. Postmes and R. Spears, (2008) “Toward an integrative social identity model of collective action: a quantitative research synthesis of three socio-psychological perspectives,” *Psychological bulletin*, 134(4):504.
38. Gilbert, Margaret (2006) *A Theory of Political Obligation: Membership, Commitment, and the Bonds of Society,* Oxford University Press.
39. Turner, J. C. and K. J. Reynolds(2010)“The story of social identity,” in T. Postmes and N. Branscombe (eds) *Rediscovering Social Identity: Core Sources*, Psychology Press.
40. Reynolds, K. J., J. C. Turner, N. R. Branscombe, K. I. Mavor, B. Bizumic and E. Subašić (2010)“ Interactionism in personality and social psychology: An integrated approach to understanding the mind and behaviour,” *European Journal of Personality*, 24(5):458–482.
41. Bourdieu, P. (1986) “The forms of capital,” in *Handbook of theory and research for the sociology of education*, pp. 241, 258.
42. Putnam, R. (2001) “Social capital: Measurement and consequences,” Canadian Journal of Policy Research, 2(1), pp. 41–51.
43. Coleman, J. S. (1989) Social capital in the creation of human capital, University of Chicago Press: Chicago, pp. 105–108.
44. Portes, A. (2000) Social capital: Its origins and applications in modern sociology. LESSER, Eric L. Knowledge and Social Capital, Boston: Butterworth-Heinemann, pp. 43–67.
45. Ibid.
46. Colomer, J. M. (1995) “Leadership games in collective action,” Rationality and Society, 7(2), pp. 225–246.
47. Frohlich, Norman, Joe Allan Oppenheimer and Oran Young (1971) Political Leadership and Collective Goods, Princeton: Princeton University Press. Cited from: Esteban, J., and E. Hauk (2008) Leadership in Collective Action, pp. 2.
48. Bianco, W. T. and R. H. Bates (1990) “Cooperation by design: Leadership, structure, and collective dilemmas,” The American Political Science Review, pp. 133–147.
49. Guttman, J. M. (1982)“Can political entrepreneurs solve the free-rider problem?” Journal of Economic Behavior & Organization, 3(4), pp. 357–366.
50. Calvert, R. (1992) “Leadership and its basis in problems of social coordination, ”International Political Science Review, 13(1), pp. 7–24.
51. Ostrom, E., loc. cit.
52. Midgley, J. (1987) “Popular participation, statism and development,” Journal of Social Development in Africa, 2(1), pp. 5–15.
53. Claridge, T. (2004) “Social capital and natural resource management, ”Doctoral dissertation, School of Natural and Rural Systems Management, University of Queensland, pp. 36–48.
54. Conley, A. and M. A. Moote (2003) “Evaluating collaborative natural resource management,” Society &Natural Resources, 16(5), pp. 371–386.

Section IV

55. Wade, Robert (1994) Village Republics: Economic Conditions for Collective Action in South India, San Francisco, California: ICS Press.
56. Varughese, G. and E.Ostrom (2001) “The contested role of heterogeneity in collective action: some evidence from community forestry in Nepal,” World development 29(5), pp. 747–765.
57. Singer, Milton B. (1959) (ed.)“Traditional India: structure and change,”American Folklore Society(Vol. 10), Philadelphia.
58. KPMG India (2008) Corporate Social Responsibility – Towards a Sustainable Future, A White Paper, pp. 64.
59. Based on information reported in JMP (2010). Basic services are as defined by the WHO-UNICEF’s Joint Monitoring Program for tracking the MDG targets. Available at: http://www.pas.org.in/Portal/document/ResourcesFiles/pdfs/Working%20Paper%20Accountability%20&%20Incentives.pdf
60. Kathpalia,G.N. and Rakesh Kapoor (2002) “Water Policy and Action Plan for India 2020: An Alternative, ”November 2002. Available at:http://planningcommission.gov.in/reports/genrep/bkpap2020/10_bg2020.pdf,accessed on 20 May 2014.

Section VI

61. All the tanks which are connected to each other in a cascade pattern
62. HUF (2013)Project report ofGundar Basin, Bangalore: Hindustan Unilever Foundation.
63. Sen, Romit and Ashish Bharadwaj (2013), “Compendium of entries – FICCI Water Awards 2012,”Federation of Indian Chambers of Commerce and Industry, August 2013.Available at http://www.ficci.com/publication-page.asp?spid=20289, accessed on 22 May 2014.
64. Rao, S.C (2011) “Droughts in India and Andhra Pradesh” Chapter II. Available at: http://shodhganga.inflibnet.ac.in/bitstream/10603/1597/9/09_chapter%202.pdf, accessed on: 10 July, 2014.
65. Government of Andhra Pradesh (2011) “Andhra Pradesh at a glance”, Department of Agriculture, Government of Andhra Pradesh. Available at: http://www.apagri.gov.in/apglance.htm, accessed on 11 July, 2014.
66. Institute for Financial Management and Research and Centre for Development Finance (2011) “Environmental Sustainability Index: Andhra Pradesh” Available at: http://cdf.ifmr.ac.in/wp-content/uploads/2012/06/Environmental-Sustainability-Index-2011-Andhra-Pradesh1.pdf, accessed on 11July, 2014.
67. Burton, Martin A., Rahul Sen, Simon Gordon-Walker, Anand Jalakam and Arunabha Ghosh (2011) “Working Paper 5 - Managing Ground Water for Multiple Uses,” National Water Resources Framework Study: Research Report Submitted to the Planning Commission for the 12th Five Year Plan, New Delhi: Council on Energy, Environment and Water, p. 284.
68. Farmer Field School is a training school focusing on agriculture, water management and conservation. Different modules include data assessment techniques, soil moisture conservation methods, information on crops, rights, laws and constitutional provisions for water.
69. Crop Water Budgeting is a process for calculating the water draft in a given area by assessing the groundwater levels at different intervals of time. This ‘water draft’ evaluation aids farmers in taking informed decisions on the crops to be sown in the immediate season. CWB is practiced twice a year for rabi and kharif crops by HUNs.
70. Interview with Mr. Valleperia Rao, Founding Director, BIRDS
71. Rao, P.Somasekhar,S.Govardhan Das, I. Arjun Kumar and P. Radhakrishna (2006) Monitoring & Evaluation of Capacity Development programme as part of APFAMGS project, India, APFAMGS publication.
72. Government of Rajasthan (2013) “Statistical Information of Jaipur District,” available at: http://jaipur.nic.in/stat.html,accessed on 20 June 2014.
73. Confederation of Indian Industries (2010) “Breaking the Boundaries in Water Management: A Case Study Compendium,” pp. 9. Available at: http://www.sabmiller.in/pdfs/CaseStudyCompendium%20Final.pdf,accessed on 25 June 2014.
74. Ibid.
75. Advit Foundation (2008) Sustainable Water Management in Rajasthan – Project Implementation Report, Haryana, India.
76. Interview with Ms. Charu Jain, Advit Foundation on 5 July 2014
77. Confederation of Indian Industries, loc. cit.
78. CII (2013) SABMiller India Initiative for Sustainable Management of Water Resource in Neemrana, Rajasthan, Annual Progress Report, New Delhi
79. Refer Annex 1 the UP Slum Areas (Improvement and Clearance) Act, 1962.
80. Project background has been largely taken from National Institute of Urban Affairs (NIUA) (2011) “Reforming Agra by Re-imagining through Slum Up-gradation, Best Practices,” available at: http://indiagovernance.gov.in/files/slum-agra.pdf, accessed on 29 June 2014.
81. Interview with Dr. Renu Khosla, Director, CURE India, on 2 July 2014.
82. IDFC (2012) “Hiware Bazar: A water-led transformation of a village,”Quarterly research note (No. 16 | June 2012), policy group – IDFC Foundation, New Delhi.

83. Srivastava, Kanchan (2013) “Model villages like Ralegan Siddhi and Hiware Bazar not the best, finds study,” DNA, 15 December. Available at: http://www.dnaindia.com/mumbai/report-model-villages-like-ralegan-siddhi-and-hiware-bazar-not-the-best-finds-study-1935313, accessed 30 June 2014.

84. Yashada (2009), “Hiware Bazar: Lessons in participatory planning,” Submitted to Ministry of Panchayati Raj, Government of India, September 2009, Pune.

Section VII

85. Background data of Mara River has been largely taken from: Krhoda, George O. (2005) “Hydrology of Mara Basin. Mara River Research Database,” WWF-EARPO Mara River Catchment Basin Initiative, pp. 19–23. Available at: ftp://ftp.globalwaters.net/mara.globalwaters.../Khrhoda%202005.DOC,accessed on 5 July 2014.

86. Ibid.

87. WREM International Inc. (2008)“Mara River Basin Investment Strategy, Mara River Basin Transboundary Integrated Water Resources Management and Development Project,” Final Technical Report, Atlanta, pp. 12.

88. Ibid.

89. United Republic of Tanzania (2013) Performance Audit of Management of Fisheries in Lake Victoria, National Audit Office, Ministry of Fisheries and Livestock Development, January 2003, Tanzania, pp. 1,2.

90. United Republic of Tanzania (2013) Mara Region Investment Profile, Prime Minister’s Office, Tanzania, pp. 17.

91. Project background and objectives are largely taken from:Global Water for Sustainability (GLOWS) Program 2012,“Trans-boundary Water for Biodiversity and Human Health in the Mara River Basin, Project Summary Report,” available at: http://www.globalwaters.net/projects/project-regions/kenya/transboundary-water-for-biodiversity-and-human-health-in-the-mara-river-basin-kenya-tanzania-twb-mrb/,accessed on 1July2014.

92. Ibid.

93. Dublin, Holly T.(1991) “Dynamics of the Serengeti-Mara woodlands: an historical perspective,” Forest & Conservation History 35 (no. 4):169–178.

94. Interview with Anne-Marie Ran, Water Sector Reform Program, GIZ Nairobi on 11 July 2014

95. Interview with Anne-Marie Ran, Water Sector Reform Program, GIZ Nairobi on 11 July 2014

96. Largely taken from information available on Clear Creek Watershed Foundation Website: http://www.clearcreekwater.org

97. Clear Creek Watershed information available at: http://coyotegulch.wordpress.com/category/colorado-water/south-platte-basin/clear-creek-watershed/, accessed on 11 July 2014.

98. Interview with David Holm, Executive Director, Clear Creek Watershed Foundation, Denver, 16 July 2014.

99. Interview with David Holm, Executive Director, Clear Creek Watershed Foundation, Denver, 16 July 2014.

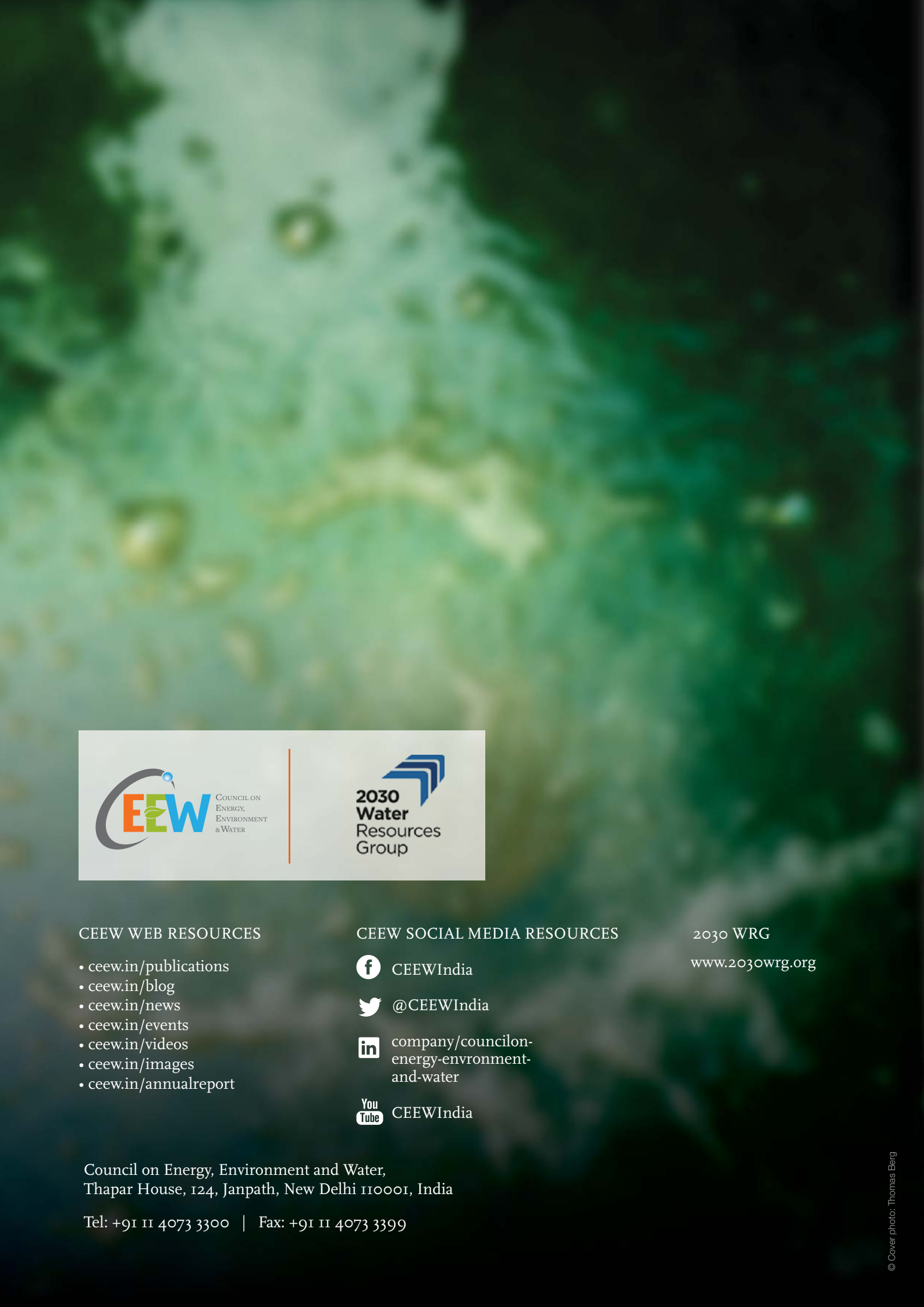
100. The CEO Water Mandate (2012) “Guide to Water-Related Collective Action,” available at: http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/wrca_full_report3.pdf, accessed on 11 July 2014.

101. Interview with David Holm, Executive Director, Clear Creek Watershed Foundation, Denver, 16 July 2014.

102. CCWF (2007), Exploring Watershed Sustainability - 2007 Clear Creek Watershed Report, Clear Creek Watershed Foundation, Denver.

Section IX

103. Two of the factors—heterogeneity of interests and social identities—which were expected to act as inhibitors for collective action, were removed from this list.



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