

INTEGRATED RURAL URBAN WATER MANAGEMENT FOR CLIMATE BASED ADAPTATIONS IN INDIAN CITIES (IAdapt)

Focus Group Discussion Report for Solapur and Vijayawada September 2017

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Introduction

Under the Integrated Rural Urban Water Management for Climate Based Adaptations in Indian Cities (IAdapt) Project, it has been proposed to select one micro-catchment in each city region and conduct the primary project activities in the selected micro-catchment.

In order to select a micro-catchment from the different catchment areas of the two cities, a framework has been developed as depicted in the diagram below. The framework consists of a three pronged approach, with group discussions with local communities to collect socio-enviro-economic information of the micro-catchments, quadrat sampling in the villages of micro-catchments to assess the biodiversity, as well as interviews with relevant officials of the rural and urban administration to assess the catchment areas that should be focused on for socio-ecological importance based on the interest and awareness of the officials.

This report provides the details of the focused group discussions that have been organized in different villages and urban centres of the micro-catchments of the two cities of Vijayawada and Solapur.

Methodology

The assessment of the socio-economic, cultural and environmental baseline situation of the region was completed with the help of Focus Group Discussions (FGDs) with the residents of the villages located within the micro-catchments. Group discussions were organized in different villages covering the different micro-catchments in the catchment of each city. During the group discussions, villagers were encouraged to share information regarding the demography of the village, land tenure and land use patterns in the village, economic activities, income and livelihood, dependence on local water resources, community perceptions of climate change, traditional ecological knowledge among others as well as general understanding of the water resources and its importance. Information was also collected on the basic services of water supply, waste water and sanitation.

ICLEI South Asia conducted the FGDs in Solapur catchment area. Seven FGDs were conducted in Solapur covering six villages. Athena Infonomics conducted the FGDs in the Vijayawada catchment area. In Vijayawada, 12 FGDs were conducted, with five in rural areas and seven in urban areas. The FGDs covered all the micro-catchments in the region.

The FGD questionnaire included questions on demography, land tenure, land use pattern, economic activities, income, livelihood, accessible water resources, basic physical infrastructure access and changes perceived in climate and water resources. The questionnaires in English and local language - Telugu in is included in the annexure.

Villages from each micro-catchment were selected based on following points:

- Response from the local administrative and political representatives
- Accessibility to the village
- Geographical location
- Interactions with Solapur district administration
- Interaction with Solapur Municipal Corporation

Project team introduced the project activities to the district administration and Solapur Municipal Corporation officials before approaching any villages. Based on these discussions and information on water obtained through these interactions, the team selected about 12 villages in the 4 micro-catchment areas. The Table 1 shows the details of the villages approached. The project was briefly explained to the Sarpanch (Political head of a village) and the Gramsevak (Administrative person responsible for developments in a village) from each of these 12 villages. Based on responses from the villages, FGDs were organized in seven of them. Political and administrative heads of the villages were asked to gather members of Gramsabha (General body, including elected representatives), farmers and vulnerable groups especially women. The team observed remarkable response from the elected representatives, but inadequate response from women. Because of monsoon season most of the villagers were occupied with agricultural activities. During FGDs, the team briefly explained the project and objectives of the discussion. To start discussion, the team asked questions about basic information of the village, land use, livelihood of residents, basic water related services, issues, ecosystem services, experiences about climate change and initiatives that took place earlier related to water sector. During last session interaction with Solapur city, major consumers of water resources, opinion and ideas about water conservation and project activities were also discussed.

Table 1: Villages approached for FGD and Quadrat Survey

Sr	Village	Location		Nearby water body	Arial distance from Solapur city centre (Kms)	Solapur city water interaction
1	Bale (within city)	17°41'50.16"N	75°52'38.40"E	Ekrukh lake	4	Source of water - not in summer
2	TaleHipparga	17°43'8.77"N	75°54'42.06"E	Ekrukh lake	5.26	Source of water - not in summer
3	Haglur	17°44'7.17"N	75°55'55.34"E	Ekrukh lake	7.58	Source of water - not in summer
4	Ekrukh	17°45'33.67"N	75°55'31.88"E	Ekrukh lake	9.91	Source of water - not in summer
5	Kawathe	17°37'51.63"N	75°49'33.86"E	Sinna river	9.47	wastewater discharge by SMC
6	Tartgaon	17°46'48.79"N	75°55'46.18"E	Ekrukh lake	12.28	
7	Hotgi-Sawathed	17°35'27.42"N	75°58'31.61"E	Hotgi lake	11.71	
8	Degaon	17°40'2.36"N	75°51'33.26"E	Shelgi/degaon	4.84	108 MLD

Sr	Village	Location		Nearby water body	Arial distance from Solapur city centre (Kms)	Solapur city water interaction
	(within city)			nala		STP of SMS
9	Pakani	17°43'56.54"N	75°47'22.51"E	Sinna river	13.9	On Ujani pipeline, 80 MLD WTP
10	Gulwanchi	17°44'48.34"N	75°51'57.99"E	Ekrukh lake	9.2	
11	Yatnal	17°36'30.78"N	75°59'55.21"E	Hotgi lake	12.18	
12	Kumbhari	17°39'0.24"N	75°59'18.27"E	Hotgi lake	9.23	

Table 2: Villages where FGD and Quadrat Survey was conducted in the 4 Micro-catchments of Solapur

Sr	Village	Catchment	FGD	Quadrat survey
1	Bale (within city)	S1	--	Y
2	Kawathe	S1	Y	Y
3	Degaon (within city)	S1	--	Y
4	Gulwanchi	S1	Y	Y
5	Hotgi-Sawathed	S2	Y	Y
6	Yatnal	S2	--	Y
7	Kumbhari	S2	Y	Y
8	Tale hipparga	S3	Y	Y
9	Haglur	S3	--	Y
10	Ekrukh	S3	--	Y
11	Tartgaon	S3	--	Y
12	Pakani	S4	Y	Y

Outcomes of Focus Group Discussions (FGDs)

A total of 7 FGDs were conducted covering the four micro-catchments of Solapur to develop a basic understanding about the micro-catchment and its interaction with the Solapur city on water and allied sectors and to understand how a community or village thinks about water resources, their opinions and ideas for basic water related services, the inconsistencies and the disparity that exists in terms of water availability, and interaction with Solapur city (Municipal Corporation area) - a major water consumer of the region.

A total of about 47 people were consulted through the FGDs. Key stakeholders involved in the FGD included:

- Sarpanch (Political head of a village)
- Gramsevak (Administrative person responsible for developments in a village)
- Members of Gramsabha (General body, including elected representatives), farmers and vulnerable groups especially women

Based on the location of water resources and village, each FGD provided different outcomes. The outcomes of each FGD are summarized in the following sections.

FGD 1	Catchment	S3	Solapur city water interaction		Seasonal source of water	
	Name of Village	Tale Hipparga	Population/ Families		6000/1400	
	No. of participants	9	Male	6	Female	3
	<ul style="list-style-type: none"> TaleHipparga is a village situated close to the Ekarukh lake locally known as Hipparga lake formed because of an earthen dam built in 1879. Ekrukhh reservoir is located 6km to the North of the city and has a storage capacity of 61.1 Mm³. In 1879, the water works of settling tanks at Bhavanipeth was constructed of capacity 27.5 MLD which supplied drinking water to citizens of Solapur. Water from Ekrukhh lake was supplied through pipes to the town and this led to the development of the Solapur city along with industrial development in early 90s. About 40% agriculture and 50% contractual work serve as the main occupations Land Use shows about 70% private including agricultural and remaining govt. land Water supply: 1 private and 2 community wells, supplying alternate day Wastewater : About 90% toilets are equipped with septic tanks and 70% open drainage Storm water : Natural runoff towards Ekrukhh lake Irrigation : About 50% with traditional flooding pattern and 30% drip irrigation TaleHipparga village is highly dependent on Ekrukhh lake because of its close proximity. Solapur Municipal Corporation and 10 more villages are sharing this water resource. Due to siltation over time and inadequate rainfall, capacity of Ekrukhh lake has nearly halved from its original. Hence, in summer (from January onwards) Solapur city is not allowed to lift water from this source. Unavailability of wastewater treatment plant leads to pollution of the lake due to gray water and septic tank discharge. The ground water quality and quantity in nearby villages depend on the lake's capacity. Solid waste treatment plant of the Solapur Municipal Corporation is defunct and leachate from this place might be adding pollution of the lake. Earlier Hipparaga temple was present and people used to worship water over there. Village is taking initiatives for plantation, water conservation projects like constructing weirs to recharge ground water, recharge pits through various state level programs. Agricultural land of many villagers is about 2-4 kms away from this village. Measures to prevent pollution by sewage and agricultural runoff to Ekrukhh lake are extremely required. 					

FGD 2	Catchment	S2	Solapur city water interaction		-	
	Name of Village	Hotgi and Sawatkhed	Population/ Families		6737/1417	
	No. of participants	10	Male	8	Female	2
	<ul style="list-style-type: none"> Hotgi and Sawatkhed villages are situated in South- East direction of Solapur city close to Hotagi Lake. This is a second prominent lake in the region, serving for drinking water, irrigation and industrial uses. The Sidhsheshwar sugar industry is very close to the village and hence Hotgi 					

	<p>village is sharing problems and benefits of the industry.</p> <ul style="list-style-type: none"> • Hotgi and Sawatkhed village has joint political and administrative body. • About 50% agriculture and 50% employed at Sugar industry form the major occupation. • Land use shows about 85% private including agricultural and remaining govt. land • Water supply: Through wells for drinking and borewells for other usage supplying on alternate day • Wastewater: About 90% toilets are equipped with septic tanks and 40% underground drainage • Storm water: Natural runoff • Irrigation: About 60% with traditional flooding pattern and 40% drip Irrigation. • Sugarcane is a major cash crop and covered more than 60% agricultural area of Hotgi. • Participants raised issue of water pollution due to sugar industry. Oil on water surface, odour and sometimes colour are prominent characteristics noted by villagers. Villagers have filed many complaints to the Pollution Control Board against the industry. • Nearly half of the population is employed in the sugar industry and associated works. • Acid rain is a common phenomenon noticed due to heavy vehicular traffic and air pollution from the industry. • 40% agricultural land and Sawatkhed village faces critical water pollution issues due to industrial development (near the Akklakot road industrial area and sugar industry) resulting in abridged agricultural production, mosquito problems. • Water pollution in Hotgi lake leads to loss of fisheries and about 100 families experienced reduced income from fishing. • Village has initiated water conservation projects like constructing weirs to recharge ground water under various schemes of government and CSR activities of industries. • Participants also informed that birds, especially House Crows are becoming uncommon as they worship in a religious belief.
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FGD 3	Catchment	S1	Solapur city water interaction		Wastewater discharge by SMC		
	Name of Village	Kawathe	Population/ Families		3246/620		
	No. of participants	6	Male	5	Female	1	
	<ul style="list-style-type: none"> • Kawathe village is located at South- West direction of Solapur city and close to sewage treatment plant of Solapur Municipal Corporation. This 75 MLD STP is designed to treat wastewater discharged by underground drainage and wastewater discharged by Degaon nallah (stream) flowing from Solapur city. Planning is in progress to treat this wastewater till tertiary level and reuse for industrial purposes at National Thermal Power Corporation's plant near Solapur. This will reduce stress on Ujani reservoir and increase water share for Solapur city. • Major occupation includes about 40% agriculture and 60% working on daily wages • Land use shows about 90% private including agricultural and remaining govt. land • Water supply: Drinking water is supplied by 2 bore wells at 7 kms away (Pratap Nagar) and for other usage 11 hand pumps are available in village area. Water is supplied daily. 						

	<ul style="list-style-type: none"> • Wastewater: Less than 50% houses are equipped with septic tanks and 50% underground drainage has been laid. • Storm water : Natural runoff • Irrigation: About 90% with traditional flooding pattern and 10% drip Irrigation. • Kawathe village carries up the benefits and problems of sewage discharged by Solapur. • Major part of the untreated sewage discharged by Degaon stream and underground drainage near Kawathe village is being used for irrigation from last more than 15 years. Sugarcane is a major crop in these fields. Hence farmers are requesting Solapur Municipal Corporation to discharge some quantity of treated sewage for irrigation; if not, few hectares of land would become uncultivated resulting in a loss of income. • At the same time village is facing issues like increased hardness of the ground water, smell, mosquito and sometimes colour in water. • Participants informed that the number of birds and insects are reduced in last 10 years. • About 50% farmers' agricultural land is situated 5-7 kms away from the village. • Village has undertaken water conservation works like nallah (stream) widening, ground water recharge pits for 1 open well and 1 bore well under various schemes by government.
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FGD 4	Catchment	S1	Solapur city water interaction		-	
	Name of Village	Gulwanchi	Population/ Families		2607/350	
	No. of participants	9	Male	8	Female	1
	<ul style="list-style-type: none"> • Gulwanchi village is located in the North - West direction of Solapur city towards Nannaj (Great Indian Bustard Sanctuary). The village is also close to Chincholi Maharashtra Industrial Development Corporation (MIDC) area having textile, automotive industries. 20 hectares land of the village area belongs to Forest Department. There are 7 water storage tanks within 1 km distance from the village constructed earlier for agriculture and other purposes. Out of these 7 tanks 4 are dried because of siltation and development, while 3 tanks are in use. • Major occupation includes about 60% agriculture and 40% working on daily wages and contractual work. • Land use shows about 80% private including agricultural and remaining govt. land • Water supply: Drinking water is supplied by Ekarukh lake (8 kms) on daily basis (Water supply scheme executed in 1997). There are 7 borewells and 2 open wells in village. • Wastewater: About 80% houses are connected to septic tanks and part of the village has drainage system for wastewater • Storm water: 70% area of village has natural runoff • Irrigation: About 90% with traditional flooding pattern and 10% drip irrigation. Most of the field is based on monsoon water. • Gulawanchi village is near to Chincholi industrial area and experience adverse impacts of air pollution. Participants mentioned that black spots on leaves of plants and crops are clearly visible because of air pollution from the industries and subsequent deposition of pollutants reducing agricultural production. • Being close to wildlife sanctuary, farmers' faces issue of antelopes. Damage to the crops and 					

	<p>loss of Jawar, Bajara, Gram and leafy vegetables from the agricultural field attracts wildlife like deers and wild boars. Damage to crops and loss in net yield from the agricultural activities are common issues faced by farmers. Few cases of wildlife hunting were also reported from the region. This entire region is an example of man-animal conflict which is a habitat of endangered Great Indian Bustard bird.</p> <ul style="list-style-type: none"> • Most of the farmers' land is within 2 kms distance from the village. • Village has undertaken water conservation works like construction of weirs, recharge of open well, plantation under various schemes by government. • Villagers are aware about water conservation and efforts are made to avoid wastage. • Participants informed that the number of house sparrows and house crows are reduced over the last few years, but apparently the number of peacocks are increasing may be because of awareness in villagers and management of Forest Department.
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FGD 5	Catchment	S4	Solapur city water interaction		On Ujani pipeline, 80 MLD WTP	
	Name of Village	Pakani	Population/ Families		3905/600	
	No. of participants	7	Male	6	Female	1
	<ul style="list-style-type: none"> • Pakani village is located in the North - West direction of Solapur city near National Highway 9 connecting Solapur and Pune. The village is also close to Chincholi Maharashtra Industrial Development Corporation (MIDC) area having textile, automotive industries. The strategic location of Pakani attracted developments like Railway station, Storage depots of petroleum companies (HPCL and IOCL) and water treatment plant of the Solapur Municipal Corporation for Ujani water supply scheme with 80 MLD capacity. Sinna river, a tributary of the Bhima river, flows close to village. Earlier Sinna river used to be a perennial river but construction of a dam, industrial development and wastewater discharge transformed it in a seasonal water resources. • Major occupation includes about 75% agriculture and 25% working on daily wedges and contractual work. • Land use shows about 95% private including agricultural and remaining govt. land • Water supply: Drinking water is supplied by open wells in the village. 16 hand pups in village for other uses • Wastewater: About 90% houses are connected to septic tanks and part of the village has drainage system for wastewater discharge • Storm water : Natural runoff • Irrigation: About 90% with traditional flooding pattern and 10% drip Irrigation. Most of the field is based on Sinna river and 3 nallahs (streams) flowing close to village. • Pakani village having plenty water during monsoon grows more than 50% of available agricultural field with sugarcane crop and remaining with Jawar, Wheat. • Industrial development, wastewater discharge and increased number of consumers resulted in pollution and stress on the available water resources. • Visible layer of oil on water surface of the open wells is an outcome of leakages and spills at storage depots of petroleum companies established near to village. • Wastewater from industrial areas resulted in colour and odour problems in the agricultural 					

	<p>fields of the village.</p> <ul style="list-style-type: none"> Village has undertaken water conservation works like construction of weirs, widening of streams, recharge of open well, recharge pits and plantation of about 1600 local trees under various schemes by government and NGOs.
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FGD 6	Catchment	S2	Solapur city water interaction		On Ujani pipeline, 80 MLD WTP	
	Name of Village	Kumbhari	Population/ Families		33000/5500	
	No. of participants	6	Male	5	Female	1
	<ul style="list-style-type: none"> Kumbhari village is situated in West direction of the Solapur city near state highway 151 connecting Solapur and Akkalkot cities. Construction of Ashwini Rural Medical Collage and Hospital – a largest medical facility in the region is in progress near to the village. Kumbhari is one of the largest villages with 33,000 population. Major occupation shows about 50% agriculture and 50% working on daily wages and contractual work Land use shows about 80% private including agricultural and remaining govt. land Water supply: Drinking water is supplied by open wells in the village Wastewater: Less coverage of septic tanks and drainage system Storm water: Natural runoff Irrigation: About 90% with traditional flooding pattern and 10% drip Irrigation. Village is experiencing water scarcity issue from last decade due to increased industries and population. Ground water level is decreasing day by day and presently reached below 500 feet. Discharge of untreated sewage and industrial wastewater have polluted nearby water bodies like Ramwadi pond. Agriculture area is reducing due to unavailability of water for irrigation. 					

Key personnel interviews

Meetings were held with various officials in Solapur District and in the Solapur Municipal Corporation to introduce the project and its activities, particularly to engage during the FGDs. However, formal interviews with in depth discussions were conducted with the Senior Officer in Collector's Office in Solapur and with the Public Health Engineer of Solapur Municipal Corporation. A summary of the discussions are given below:

Designation	Senior officer for watershed area development and agricultural information, Collector office, Solapur
Area of Jurisdiction	Solapur district
Date	31 st July 2017

- Maharashtra state has launched a water conservation project – ‘Jalyukt Shivar’ for draft prone rural areas in the state.
- Solapur district is performing well under this project and worked on open well recharge, nallah (stream) widening, nallah de-siltation, farm ponds, ground water recharge.
- Corporate Social responsibility funds are also diverted for projects on water conservation.
- Solapur district faced severe drought in 2015 and water was supplied by tankers to more than 75% villages.
- The schemes and projects focusing on water resources are imperative for the district parting consumer centric approach.

Designation	Public Health Engineer, Solapur Municipal Corporation, Solapur
Area of Jurisdiction	Solapur city (Municipal area)
Date	1 st Aug. 2017 and 30 th Aug. 2017
<ul style="list-style-type: none"> • Solapur city is facing water scarcity issue because leakages (and thefts) from old water supply network. Transmission and distribution losses are more than 35%. • Though having 3 water resources Ujani reservoir is the only reliable and perennial source of water. • Siltation and pollution problem of the Ekrukh lake must be controlled. • City is in process to sign an agreement with National Thermal Power Corporation Ltd (NTPC) for selling treated sewage of city and getting fresh water from Ujani reservoir allotted to an industry. • City has proposed to recharge 200 bore wells under AMRUT mission of central government. 	

Primary outcomes

All the FGDs conducted in 4 identified micro-catchments delivered information about available water resources, infrastructure, issues, changes experienced by villagers in climate and ecosystem. The common facts shared by participants are as follows:

- Temperature is increasing in all the villages, especially from last decade. Villagers are facing heat waves and aged people experience health issues during peak summer season.
- Ground water level is decreasing day by day escalating criticality of water scarcity issue especially, in the villages away from water bodies.
- Due to increased consumption of water, water bodies are under extreme stress and experiencing problems to maintain minimum flow or storage required for ecology during summers. Siltation and changed land use resulted in reduced capacities and runoff towards water bodies.
- Groundwater abstraction is rapidly increasing and major part is used for irrigation which is a serious problem for soil health.

- Cropping pattern, promotion and research on crops consuming less water, advanced irrigation systems and control over cash crops consuming higher water quantities are vital issues of concern.
- There is an extreme need to gather all the consumers to discuss their issues and solutions for effective and efficient catchment management.
- Women representation in FGD was found limited and their concerns are less highlighted in public fora.

Overall information collected from all the FGDs would be discussed with the Solapur Municipal Corporation. It will help project team to identify a vulnerable micro-catchment to focus for further project activities.

Focus Group Discussion in Micro-catchments of Vijayawada

Approach

The catchment delineation based on hydrological factors indicated presence of seven micro-catchments (refer Figure 2) in Vijayawada urban and rural areas. The catchments have been numbered from V1 to V7 for reference purposes. Revenue ward boundary maps within the three Circle divisions of Vijayawada Municipal Corporation and Mandal boundary maps of Krishna district were overlaid with the hydrological micro-catchments to identify the rural and urban wards. Of the seven micro-catchments, three micro-catchments are observed to be mostly urban (V5 – V7) whereas the remaining four micro-catchments (V1 – V4) are observed to comprise both urban and rural areas as indicated in the table below.

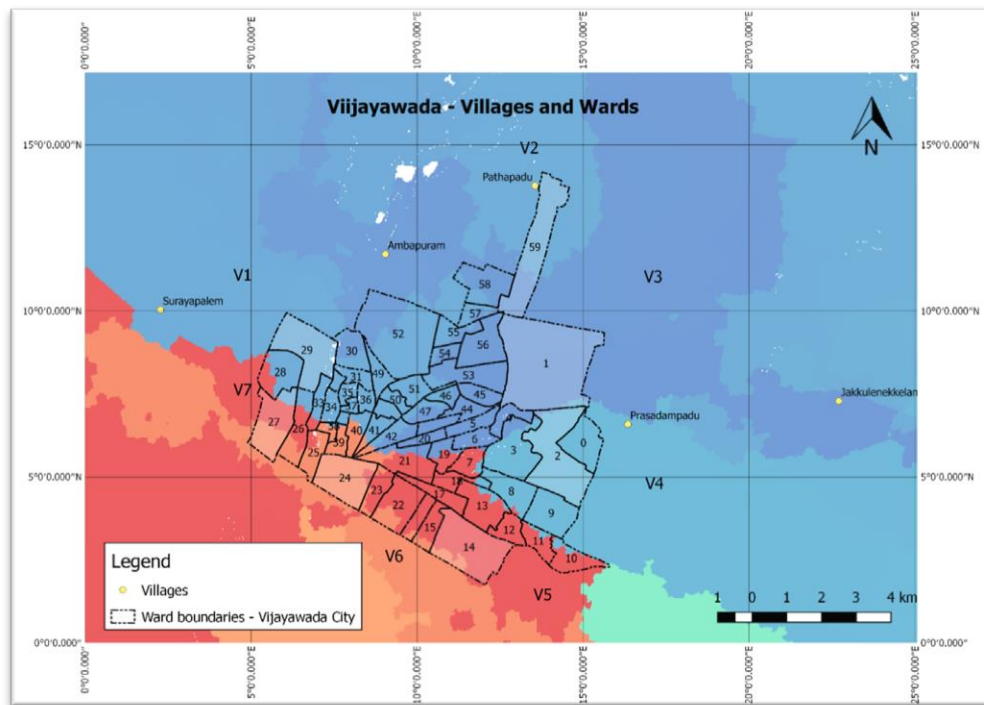


Figure 2: Map indicating the spatial location of the wards and villages within the micro-catchments where the FGD and Quadrat Sampling were conducted (Source: Athena Infonomics (2017), VMC (2014))

Subsequently, consultations with representatives from the Government (Key Informant Interviews) and citizens (Focus Group Discussions) were carried out in select villages and wards from the rural and urban areas of the catchments, respectively. The inputs from these consultations would feed into assessment of the strength, weakness, opportunity and threat analysis (SWOT analysis) of each of the micro-catchments.

Table 3: Select Villages and Wards where FGD and Quadrat Sampling were conducted¹

Catchment	Rural			Quadrat Survey	Urban		
	Mandal	Village	FGD		Circle	Ward	FGD
V1	Vijayawada Rural	Surayapalem	F	Q	Circle I	29	F
V2	Vijayawada Rural	Pathapadu	F	Q	Circle II	59	F
V3	Vijayawada Rural	Ambapuram	F	Q	Circle II	1	F
	Gannavaram	Jakkula Nekkulam	F				
V4	Vijayawada Rural	Prasadampadu	F	Q	Circle III	2	F
V5	--	--			Circle III	14	F
V6	--	--			Circle III	24	F
V7	--	--			Circle I	27	F

F – FGD conducted; Q- Quadrat sampling conducted

Outcomes of Focus Group Discussions (FGDs)

A total of 12 focus group discussions were conducted – seven in the urban areas and five in the rural areas covering the seven micro-catchments to collect inputs from the local community on status and issues related to water management and climate change. FGDs in the urban areas were conducted at a ward level and in the rural areas at a village level.

Key stakeholders involved in the FGD included,

- Rural villages – Panchayat Secretary, Sarpanch, Villagers with representation from both male and female
- Urban wards – Ward Corporator, ward community officer, women Self Help Group members with representation from males.

A total of about 178 people were consulted as per part of the consultative process with 64 from rural areas and 114 from the urban areas.

Summary of the major issues identified from each of the FGDs are listed as below,

FGD 1 (Rural)	Catchment	V1	Name of Mandal	Vijayawada Rural			
	Name of Village	Surayapalem	Population/HHs	1100/300			
	No. of participants	12	Male	7	Female	5	
	• Apart from agriculture, livelihood include skilled work and fishing in Krishna river						

¹ (a) Within the micro catchments, the villages which are adjacent to the city are in Vijayawada Rural and Gannavaram mandals of Krishna district. (b) The villages and wards within the micro catchments were chosen based on suggestions from the Mandal officers and Project Officer, Urban Community Development along with secondary literature review on the disaster situation. (c) There are three circle divisions within which the 59 revenue wards are distributed

	<ul style="list-style-type: none"> • Main crop: Paddy (one crop per annum) • Agriculture Yield: Increased due to usage of high yield variety seeds, fertiliser (3000 kg yield per acre) • Irrigation – Tummalapalem lift irrigation – water release based on upland condition • Water released from Pattiseema is beneficial compared to water release from Sagar and Srisailem projects • Households have tap connections from Over-head tanks (OHTs) for drinking and domestic purposes. • Water quality is poor in the area hence the village depends on Panchayat run Reverse-osmosis (RO) plant for drinking water but households need to collect water from the plant • Respondents stated that there has been an increase in the average temperature and reduction in rainfall over the past 20 years in their area • Village has witnessed cyclone in the past that have resulted in crop damage • One of the issues cited by the respondents pertained to blockage of open drainage in the village area • There is rampant breeding of mosquitos often leading to outbreak of vector-borne diseases
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FGD 2 (Urban)	Catchment	V1	Name of Circle		Circle I	
	Name of Ward	29	Population		25341	
	No. of participants	12	Male	1	Female	11
	<ul style="list-style-type: none"> • Krishna water is supplied by the VMC • On average, water supply is for only two hours each two times in a day • In the hilly regions of the ward, water is received for only 15 minutes twice a day; About 5000 HHs are in the hilly terrain • Post Pattiseema project, water has become muddy and unfit for drinking • Drinking water from private water plant are purchased at INR 20/20 litre • Respondents stated that drainage cleaning is irregular and there has been instance of flooding of waste water in the area • Other issues reported include open dumping of municipal solid waste and rampant breeding of mosquitoes in the area and there has been several out-breaks of dengue in the ward • Respondents stated that average temperature has increased over the past 20 years in the area 					

FGD 3 (Rural)	Catchment	V3	Name of Mandal		Vijayawada Rural	
	Name of Village	Pathapadu	Population/HHs		2000/700	
	No. of participants	10	Male	9	Female	1
	<ul style="list-style-type: none"> • Primary Occupation: Agriculture • Crops and Plantation: Paddy, Maize (2 crops per annum), Mango orchards • 1500 acres of agricultural land • Agriculture yield has increased due to usage of high yield variety of seeds and usage of fertiliser (3000 kg yield per acre) • Irrigation – Pattaseema project canal (better than Gollapudi canal which was the previous source) • There are three tanks in the village but none of them are functional 					

	<ul style="list-style-type: none"> • HHs depend mostly on borewell for meeting their domestic water supply requirements. –HHs have tap connections but supply is not assured by the Corporation. There is one OHT installed by the VMC at the boundary of ward. This OHT is also used by the surrounding village for collecting drinking water. Respondents revealed that there have been conflicts over sourcing of water from this OHT. • It was reported that there are three private RO plants in the area that cater to mostly the high-income group HHs that pay about INR 10-15 for 20 litres of water. • Respondents stated that average temperature has increased whereas average rainfall has decreased over the past 20 years in their area. • During summer, respondents face water scarcity due to fall in the ground water level • Respondents stated breeding of mosquitoes as a huge menace in the ward • Ground water is getting polluted due to dumping of solid waste in abandoned quarries by the Corporation • Soak pit construction money promised by Panchayat but not released
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FGD 4 (Urban)	Catchment	V2	Name of Mandal		Circle II	
	Name of Ward	59	Population		35854	
	No. of participants	22	Male	4	Female	18
	<ul style="list-style-type: none"> • Krishna water is supplied by the VMC • Respondents stated that VMC has provided borewell based hand pumps at few locations for use during periods of water scarcity but they are unable to access the handpumps • It was reported that post Pattiseema project, water has become muddy and not fit for drinking • Respondents stated that they rely on water tankers during summer • Respondents stated that use of motors to draw water by some households results in poor supply of water to other HHs that often leads to conflicts in the ward • Supply of water has been severe due to leakage in the distribution pipelines • During rains, Budameru canal often overflows causing flood in the surrounding areas • Respondents reported that average temperature has increased over the past 20 years. • Irregular drainage cleaning • Underground drainage is currently under construction and only few houses have septic tanks; irregular cleaning of drainage by the authorities has resulted in poor living conditions • There is rampant breeding of mosquitoes in the area and respondents see incidence of dengue as a major health issue arising out of stagnant and polluted water. • Households also reported skin related diseases due to poor quality of water. 					

FGD 5 (Rural)	Catchment	V3	Name of Mandal		Vijayawada Rural	
	Name of Village	Ambapuram	Population/HHs		2247/600	
	No. of participants	12	Male	3	Female	9
	<ul style="list-style-type: none"> • Primary occupation: Agriculture • Main crop: Paddy (two crops per annum) • Water from Krishna river is the main source for irrigation but is available for only one crop; there is shortage of water for the second crop • Area was earlier prone to floods leading to loss of crops but situation has improved after 					

	<p>construction of canals</p> <ul style="list-style-type: none"> • During summer, water from nearby canals is not released for irrigation from upland (GPS, Bundalem canal) • Residents use borewell water for domestic purpose • The village has a water plant constructed under the NTR Sujala scheme; residents can draw up to 20 litres of water at a cost of INR 5 /20 litre. However, water is supplied through tankers for public functions free of cost. • Households are awaiting individual water connections under the Janmabhoomi program • There is high prevalence of vector borne diseases such as dengue in the area especially during rainy seasons due to large number of mosquito breeding hotspots. • Respondents stated that the average temperature has increased and the average rainfall decreased over past 20 years in their area. There have been a few heat wave related deaths in the village. • Respondents also reported that forest cover has decreased over the past years
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FGD 6 (Rural)	Catchment	V3	Name of Mandal		Gannavaram	
	Name of Village	Jekkula Nekkulam	Population/HHs		550/250	
	No. of participants	11	Male	7	Female	4
	<ul style="list-style-type: none"> • Primary livelihood: Agriculture • Main crop: Paddy, Sugarcane (2 crops per annum) • 800 acres of agricultural land • Irrigation is through Polavaram/Eluru canal but less amount of water released from the uplands • Additional water for irrigation is sourced from borewell but due to ground water depletion, farmers use diesel pump sets to draw water resulting in higher irrigation costs to them. • Further, the ground water is getting polluted due to percolation of drainage water; there is also over flow of drains in the area • It was reported that the agricultural fields are getting polluted due to industrial waste water and polluted ground water • The area has also witnessed drought in the past • Residents rely on borewell for domestic water use and purchase water from a private RO plant water • Village is a hotspot of mosquito breeding • Respondents stated that the average temperature has increased and the average rainfall decreased over past 20 years in their area. The area has been affected by cyclone in the past damaging the houses. About 2-3 old people have lost their lives due to severe heat wave • Tata Trust constructed individual toilets – 29 no.s 					

FGD 7 (Urban)	Catchment	V3	Name of Mandal		Circle II	
	Name of Ward	1	Population		17698	
	No. of participants	28	Male	5	Female	23
	<ul style="list-style-type: none"> • VMC provides bore water • Most of the households use bore water for drinking even though quality is poor as they cannot afford to pay for RO water • HHs have health concerns due to the adverse impact of drinking bore water 					

	<ul style="list-style-type: none"> • Due to proximity to agricultural lands, some households practice farming and use Gollapudi and Bodemuru canal for irrigation • Waste water is diverted to Ryves and Eluru canal • Respondents reported that average temperature has increased over past 20 years
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FGD 8 (Rural)	Catchment	V4	Name of Mandal		Vijayawada Rural	
	Name of Village	Prasadampadu	Population/HHs		10000/6000	
	No. of participants	19	Male	5	Female	14
	<ul style="list-style-type: none"> • Primary livelihood: Occupation is seasonal with people practice farming during monsoon season and work as contractual labour during other seasons • Main crop: Paddy (one crop per annum) • Canal irrigation from Eluru and Ryves and since it is in a delta area, there is no shortage of water • Ground water is depleting as well as getting polluted by the Guntatippa drainage system; the drainage lines are more than 30 years old and waste water percolates down to ground water • Waste water from the Autonagar industrial area waste is discharged into into the Eluru and Ryves canals canal that flow through Enekepadu, Ramavarapaadu, Prasadampadu and Nidamanuru • Residents are not aware about the quality of bore water quality • Drinking water is purchased from RO plant provided by the Village Panchayat at a cost of INR 5 per 20 litre. • There is no water tank in the village • The area is also witnessing rapid increase in concrete based construction due to urbanisation • Rampant breeding of mosquitoes • The area is prone to flooding due to waste water from upper land • Respondents stated that the average temperature has increased and average rainfall decreased in the surrounding area over the past 20 years 					

FGD 9 (Urban)	Catchment	V4	Name of Mandal		Circle III	
	Name of Ward	2	Population		26763	
	No. of participants	15	Male	3	Female	12
	<ul style="list-style-type: none"> • VMC provides bore water • Most of the households use bore water for drinking even though quality is poor as they cannot afford to pay for RO water • HHs have health concerns due to the adverse impact of drinking bore water • Due to proximity to agricultural lands, some households practice farming and use Gollapudi and Bodemuru canal for irrigation • Waste water is diverted to Ryves and Eluru canal • Respondents reported that average temperature has increased over past 20 years 					

FGD 10 (Urban)	Catchment	V5	Name of Mandal		Circle III	
	Name of Ward	14	Population		29695	
	No. of participants	12	Male	1	Female	11
	<ul style="list-style-type: none"> Chlorinated bore water is provided by the VMC to the households; Households reported that quality of water supplied by the VMC is poor (polluted) and unfit for drinking; households purchase water from private RO plants There is heavy exploitation of ground water by RO plants causing depletion of ground water During summer season, the supply of water by VMC is reduced due to drawing of ground water by the private RO units. The ward has an underground wastewater drainage system Respondents reported prevalence of vector borne disease causing fever due to a large number of mosquito breeding hotspots in the area The area witnessed floods twice in the last ten years that damages houses and schools Respondents stated that average temperature in the area has increased over the past 20 years 					

FGD 11 (Urban)	Catchment	V6	Name of Mandal		Circle III	
	Name of Ward	24	Population		17666	
	No. of participants	14	Male	2	Female	12
	<ul style="list-style-type: none"> Krishna water is provided as Municipal water through public taps and supply is irregular and post Pattiseema, the colour of the water has changed. Every household tap is connected to a bore and water is provided from there During Pushkar excavation, tankers were brought in Ward on banks of Krishna river – Washer men use the Krishna water for their occupation The area has not witnessed incidence of floods as it is an upland Drainage is blocked and pipe sizes are small There is an underground drainage system for carrying sewerage Malaria, Dengue is rampant due to stagnant water and mix of drain and bore water Respondents stated that the average temperature in the area has increased over the past 20 years 					

FGD 12 (Urban)	Catchment	V7	Name of Mandal		Circle I	
	Name of Ward	27	Population		20389	
	No. of participants	11	Male	1	Female	10
	<ul style="list-style-type: none"> Krishna water distributed as Municipal water However, post the implementation of Pattiseema project, water supplied by the VMC is unfit for drinking The area does not get water on Monday morning due to filtration of water Most households are unable to afford RO water and hence rely on water supplied by VMC for both domestic and drinking purposes. As the ward is on the bank of river Krishna, some women access the river bank to wash their clothes. There is open dumping of waste and blockage of drains in the area 					

<ul style="list-style-type: none"> • The area witnessed floods five years back causing loss of few lives and household items; Washer families were rehabilitated from the embankments. • There have been incidents of heat waves due to which a few people have lost their lives. • Prevalence of vector-borne diseases such as Dengue is high in the are • Respondents also reported rampant sand mining • Respondents reported that average temperature in the area has increased over the past 20 years

Key Informant Interviews (KIIs)

Interviews were conducted with Government officials at the State, district, Mandal and city/village level to assess their interest, awareness and current interventions for enhancing the management of water in the urban and rural areas.

Summary of the major issues identified from each of the interviews is presented in the table below:

Designation	State Emergency Operations in-charge, Andhra Pradesh State Disaster Management Authority (APSDMA)
Area of Jurisdiction	Andhra Pradesh State
Micro-Catchment	NA
<ul style="list-style-type: none"> • Krishna district gets water from Krishna and Godavari rivers (through Pulichintala and Pattiseema projects) Climate change incidents such as sudden downpours severely affects Vijayawada city • However, damages to agriculture in surrounding areas due to climate change incidents have not been reported so far • APSDMA prepared the Andhra Pradesh State Disaster Management Plan (APSDMP) with support from UNDP and UNICEF • The agency undertakes capacity building and training exercises for all staff on a regular basis • It also carries out drought mitigation activities which are agriculture focused – mainly input subsidies • It undertakes heatwave awareness programs 	

Designation	Executive Engineer, Public Health and Municipal Engineering Department
Area of Jurisdiction	Andhra Pradesh State
Micro-Catchment	NA
<ul style="list-style-type: none"> • Prakasam barrage is one of the major sources of water for Vijayawada • PHMED is concerned with constructing water supply systems to cities, towns and habitations • Water is supplied through pumping stations and stored in man-made tanks • Surrounding villages receive water through piped supply to village tanks • ~15% of water is lost as non-revenue water • Instances of water-borne diseases is very low • There is no issue of poor water quality as chlorination of water is undertaken below supply • No known damages to agriculture in surrounding areas due to climate change incidents • Regular capacity building and training exercises are carried out for all staff • The Department is targeting to increase the supply of water from 78 lpcd currently to 135 lpcd in the near future 	

- Depleting groundwater and rainfall levels is an issue in the state as a whole – not so much in Vijayawada region

Designation	Executive & Superintending Engineers, Rural Water Supply & Sanitation
Area of Jurisdiction	Krishna District
Micro-Catchment	NA
<ul style="list-style-type: none"> • Majority of the households in Krishna district gets drinking water from surface water, about 4-5 households are dependent on sub-surface water • Households are served through various schemes: Comprehensive Protected Water Supply – 36; Protected Water Supply and Mini-PWS – 2198; • About 1,116 households use handpumps • Targeted supply per household increased from 40 lpcd to 55 lpcd, and planned to increase to 70 LPCD with 100% household connections • The Department is exploring the possibility of redesigning network grids 	

Designation	Commissioner and Addl. Commissioner, Vijayawada Municipal Corporation
Area of Jurisdiction	Vijayawada Municipal Corporation
Micro-Catchment	NA
<ul style="list-style-type: none"> • Water supply in hill areas of the city are irregular • Industrial pollution due to Auto Nagar (industrial area) affects canal water • Bhavanipuram area undergoes flooding during monsoons 	

Designation	Deputy Superintending Engineer, Water Resources Department
Area of Jurisdiction	Vijayawada Circle
Micro-Catchment	NA
<ul style="list-style-type: none"> • No separate storm water and sewage drains, because of which reuse of water is not possible • Overexploitation of groundwater in Vijayawada • Lack of Sewage Treatment Plants outside the city • Pattiseema project has affected the quality of Krishna water owing to intermixing with Godavari waters 	

Designation	Mandal Officer
Area of Jurisdiction	Gannavaram Mandal
Micro-Catchment	NA
<ul style="list-style-type: none"> • Except for few villages, majority get water from Godavari through Pattiseema project; some villages rely on borewells • Water supply charges: Different for residential, industrial and agricultural uses • No instances of water borne diseases in recent years • No major climate change incidents in the mandal – since it is upland, no flooding issues. Minor 	

droughts are offset by supply of water from the canal
<ul style="list-style-type: none"> • Mandal is taking up solid waste management through construction of waste treatment plant and attempting to introduce vermicomposting; however, no wastewater recycling • Relevant schemes implemented in the mandal: Comprehensive Protected Water Supply (CPWS) which supplies treated water CPWS • Conducting government sponsored training for village organisations – primarily self-help groups

Designation	Panchayat Secretary
Area of Jurisdiction	Ambapuram Village
Micro-Catchment	V3
<ul style="list-style-type: none"> • Water is provided from overhead reservoirs, and a few handpumps are present • Water is supplied two times in a day • There have been a few cases of dengue but otherwise no incidence of water borne diseases • Major crop grown is paddy • Relevant schemes implemented in the village: NTR Sujala Sravanthi water supply • Swachh Bharat Awareness programmes have been carried out 	

Designation	Sarpanch
Area of Jurisdiction	Prasadampadu village
Micro-Catchment	V4
<ul style="list-style-type: none"> • Source of water to the village is Prakasam barrage, located about 15 km from the village • Water is supplied daily to residents • For drinking water, population relies on purchased RO water • No instances of water borne diseases • No major climate change incidents observed 	

Designation	Sarpanch
Area of Jurisdiction	Gollapudi village
Micro-Catchment	V1
<ul style="list-style-type: none"> • Water source is Prakasam barrage, located 5 km from the village • Water supplied through separate canals for agriculture and drinking water • Approx 60000 population covered by services • Water is supplied daily 	

Primary outcomes

Urban Areas

- Lack of separate storm water drains in the city leads to mixing of storm water with the open sewage drains.
- Untreated waste water including industrial waste is discharged into the Eluru, Bandar, Ryves canals of the city. These canals also serve irrigation purposes in the adjacent rural areas thereby polluting the agricultural fields.

- Irregularly cleaned open drains, causes overflow of the waste water into households and streets causing health concerns to the residents in the event of rains, especially in the case of the faulty Guntatippa sewerage drain.
- Most of the city relies on bore water rather than Krishna water especially when Vijayawada has surface water in abundance from the Krishna and Godavari rivers.
- Citizens do not have access to assured supply of drinking water as most of them purchase RO water from private water vendors for drinking purposes.
- Hilly areas (ward: 2,29 as revealed from sample FGDs) within the city are found to have irregular water supply.
- Lower income group households are observed to be relatively less aware about water conservation methods.
- The city gets affected recurrently by floods arising either from the Krishna river or Budemeru canal (ward: 14, 27, 29, 59 as revealed from sample FGDs).

Rural areas

- Pattiseema Project is perceived as a boon by the men who are engaged in agricultural livelihoods as quantity of water available for irrigation has increased.
- Women reveal that the water is not healthy for drinking because after linking the Krishna and Godavari rivers through the Pattiseema project, water has become muddy and polluted.
- Krishna water is used mostly for irrigation purposes but the supply is dependent on release from the upland areas thereby restricting the agriculture to cropping of only one crop per annum.
- While villagers primarily rely on borewell for domestic water, it is not preferred for drinking purposes due to the level of pollution in it.
- Villages do not have access to assured supply of drinking water as most of them purchase RO water from private water vendors for drinking purposes.
- Flooding and cyclone have affected few villages namely, Ambapuram, Prasadampadu, Surayapalem and Jekkula Nekkulam (Cyclone has occurred 4 times in the past 17 years in these areas).
- Using open lands of villages near to the city as a dumping space for the city's waste pollutes the ground water affecting not only the villagers but also the city residents who largely depend on bore water supplied by the VMC.
- Temperature is found to have increased with erratic rainfall patterns over the past several years thereby affecting agricultural productivity.
- Awareness about conserving rainwater is low in the village.