IAdapt

Integrated Rural Urban Water Management for Climate Based Adaptations in Indian Cities

NEWSLETTER

March 2018 - January 2020

Supported by

IDRC | CRDI Canada

Implemented by

ICLEI Local Governments for Sustainability

ATHENA INFONOMICS

CGIAR Research Program on Water, Land and Ecosystems

IWMI

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Greetings from ICLEI South Asia!

I am delighted to present the second edition of our newsletter for the Integrated Rural Urban Water Management for Climate-Based Adaptations (IAdapt) project supported by the International Development Research Centre, (IDRC) Canada.

The project, which is close to an end, witnessed significant achievements and milestones in the past one and half years. The establishment of the RURBAN platform, one of the major project highlights, enabled us to conduct several meetings with rural and urban catchment managers on integrated water management. A government order has institutionalised the platform in Vijayawada – one of the project cities.

A Decision Support Tool (DST) has also been developed to assess climate-adaptive interventions on water management. In addition, the project has supported gender inclusion by involving women from economically weaker sections and self-help groups through capacity building activities that can engage them in water management effectively.

The IAdapt project was showcased at ICLEI South Asia's Resilient Cities Asia Pacific Congress 2019 in New Delhi, in a session on climate-adaptive water management as well as in other national and international fora. An international conference was organized for sharing the key takeaways and outcomes of the project implementation in Solapur and Vijayawada.

Read on for more updates!

Integrated Rural Urban Water Management for Climate Based Adaptations in Indian Cities (IAdapt) is a three year project supported by International Development Research Centre (IDRC), Canada. It is being implemented by ICLEI - Local Governments for Sustainability, South Asia, in partnership with Athena Infonomics LLC, International Water Management Institute (IWMI) and Indian Institute of Technology Madras (IITM).

The project focuses on empowering cities to transition from traditional approaches of water management (which considers water supply, wastewater and storm water as separate entities to be planned, implemented and operated in silos) to an 'Integrated Approach' based on the principles of Integrated Water Resource Management (IWRM) and Integrated Urban Water Management (IUWM).

Institutionalization of RURBAN Platform

The RURBAN platform is an active cross-sectoral network, comprising decision makers and practitioners from relevant government departments and civil society, besides rural and urban stakeholders. It aims to facilitate inter-agency collaboration and participatory decision making to guide and support the implementation of climate-adaptive water management practices.

RURBAN Meeting, Solapur, Maharashtra

The first RURBAN meetings in the project cities of Solapur and Vijayawada discussed the various steps of preparation of the catchment management plan (CMP) using the IAdapt Framework and the Decision Support Tool (DST). Athena Infonomics organized a second RURBAN meeting in Vijayawada in September 2019, where the CMP and DST were presented. The meeting also led the officials to formalize the RURBAN platform through a government order. At the second RURBAN meeting organized in Solapur in March 2019 by ICLEI South Asia, an action plan was developed and resilient water management interventions were identified and prioritised.

Formulation of Integrated Catchment Management Plan (CMP)

An integrated CMP for shared water resource management by urban and rural authorities has been developed for Solapur and Vijayawada using the IAdapt Framework. The CMP has identified climate risks to water and its allied sectors, as well as the vulnerable areas and populations that may be impacted by such risks. It has also identified and prioritised resilience interventions for water management.

In case of Solapur, the CMP has been designed using the IAdapt framework for the Ekrukh micro-catchment, that includes the Solapur Municipal Corporation and the three villages of Tale Hipparga, Haglur and Ekrukh. The assessments in the CMP regarding the climate vulnerability suggest that institutional integration was still limited, and identified wastewater, stormwater, solid waste sectors and agriculture as the most vulnerable sectors.

Discussions with local stakeholders in Ekrukh micro catchments

The results of the assessment were shared with the RURBAN stakeholders and the core team to identify the zones and actors vulnerable to climate extremes within the micro-catchment. The solutions identified in the CMP, assessed for their contribution to climate resilience, political and financial feasibility and expected impact, include, among others, acoustic leak detection systems to reduce transmission and distribution losses; construction of rainwater harvesting (RWH) pits in waterlogged areas; recharge of local bore-wells through RWH; reuse of treated wastewater in parks; decentalised waste water management systems; and sustainable urban drainage systems for integration of natural sponges in city design.

The final copy of the CMP was accepted by the SMC and Solapur District Authority in December 2019.

In Vijayawada, the 284-sq.km micro-catchment has 12 wards and eight villages, spread across the three *mandals* of Vijayawada urban, Vijayawada rural and Gannavaram. The results from the assessment depicted that there was much to do in the participatory process for integration of water sectors. Storm water, water quality, energy and solid waste management were identified to be the sectors which needed immediate attention.

A set of interventions were then prioritised based on technical and financial feasibility, impact-timeframe, impact-criticality and political willingness: development of hazard maps and

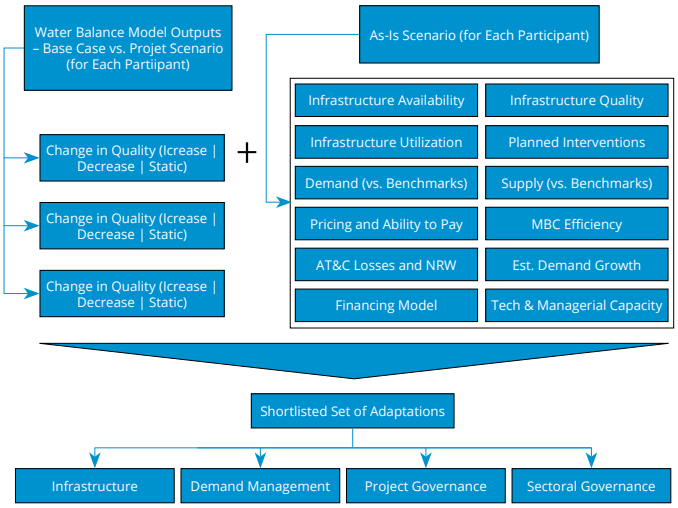
integration of flood zone maps with existing spatial maps; development of a system of micro-dams with a dual purpose of attenuating floods and retaining refuse; strengthening of water quality monitoring and surveillance systems; implementation of rain water harvesting systems and reuse for non-potable uses at household level; and enhancement of the capacity of Sewage Treatment Plants (STP) and also thus the enhancement of the coverage of Under Ground Drainages.

Visit of Solapur officials to Vijayawada

The interventions were discussed and accepted by the stakeholders and decision makers. At present, efforts are being made to make the use of the CMP, a mandatory process in water infrastructure related projects in Vijayawada.

DST to Support Climate-Adaptive Interventions

A decision support tool (DST) has been developed under the project to introduce scientific decision-making in integrated rural-urban water management. It enables stakeholders to understand the impact of climate change, and recommend appropriate solutions and practices to minimise its impacts. The DST has two modules. The first carries out an **assessment of water balance** across user groups **at a catchment level considering** climate change / new investment factors using Water Evaluation and Planning (WEAP) software, which simulates probable scenarios. The second module helps to **develop and prioritize solution pathways**. For each simulated scenario, potential solutions are recommended and prioritized along with best practices on the basis of financial and risk assessments and stakeholder inputs.



Decision Support Tool

The use of the tool's dynamic modelling was illustrated in a Vijayawada canal water purification project in October 2019, wherein suitable recommendations and solutions were suggested, which were accepted by the decision makers.

Pilot Projects in Solapur

Two pilot interventions have been implemented in the Ekrukh micro-catchment to showcase integrated water management approaches. Both interventions aim to build water safety: while rainwater harvesting for groundwater recharge in Solapur urban areas helps to minimise demand of freshwater from the catchment, treatment of rural wastewater using constructed wetlands before its discharge into shared water bodies such as the Ekrukh Lake supports resource conservation.

Both pilot interventions were selected using participatory consultations with the village panchayat, community members, the Irrigation Department and the Municipal Commissioner and other technical officials of Solapur Municipal Corporation.

C. R. Babu, Professor Emeritus, Centre for Environmental Management of Degraded Ecosystems, University of Delhi, and former Pro-Vice Chancellor; and Dr. Vijay Kumar, Assistant Professor, Shivaji College, Delhi University, supported ICLEI South Asia team to select the sites for construction of the artificial wetland for treatment of waste water in rural areas. A constructed wetland of the capacity of 10000 lpd has been set up under the project in Tale Hipparga village, to clean up the waste water flowing into the Ekrukh Lake. The initial analysis of influent and effluent water samples showed the efficiency of more than 90% and is expected to stabilize at 70-80% if maintained properly. The plant has been handed over to village administration for maintenance. It has directly benefitted about 40 families living beside the wastewater stream and indirectly the entire village by improving health and hygiene in the area. The neighbouring Solapur city that shares this water resource with the village will be also benefitted due to improved water quality in the lake. The project has supported the rejuvenation of the lake water and reduction in its pollution load. The district administration has decided to replicate this model under the Namami Chandrabhaga (River cleaning) Mission of the state government to reduce the pollution load of the river by low cost, decentralized facilities.

Detailed assessments of 25 public buildings were conducted to estimate the rain water harvesting potential of these buildings to select sites for ground water recharge using rain water. Finally, water harvesting structures have been set up

in 3 municipal schools in Solapur city. Through the project, about 19,800 sq. ft. roof top has been used having ground water recharge potential of about 675 m^3/year. This is about 58% of the total annual water demand of the selected schools. It is envisaged that this will result in greater access to quality water for the students, and lead to improved health and hygiene for students. Future climate challenges of greater demand of water can also be addressed by recharging the ground water and reducing dependence on shared sources.

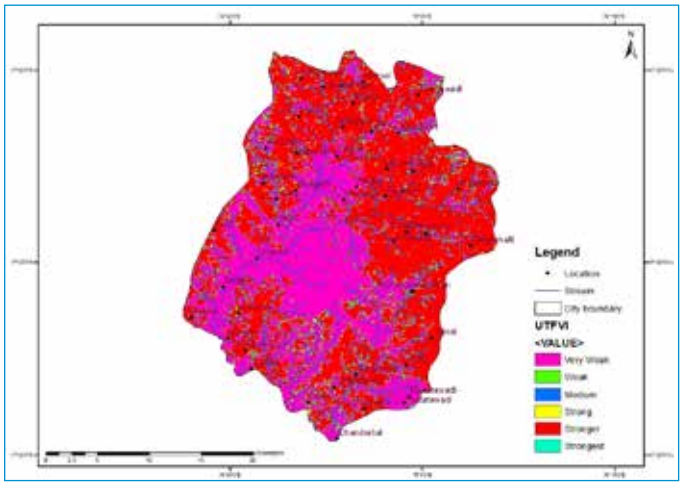
Construction of artificial wetland system at Tale Hipparga village, Solapur, Maharashtra

Climate Modeling for Solapur and Vijayawada

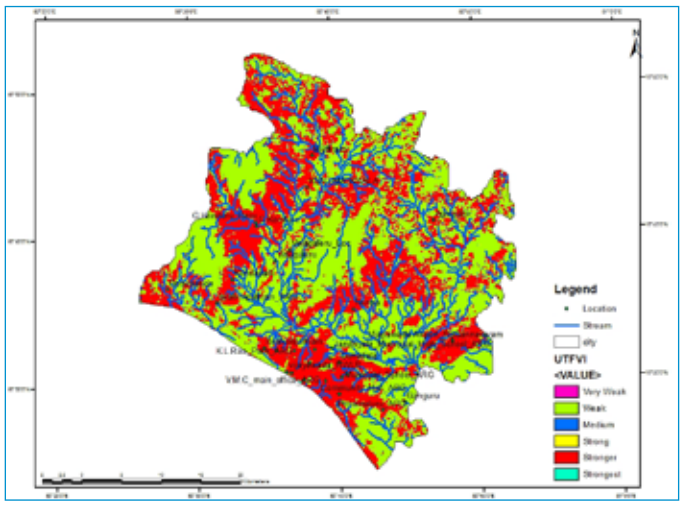
Under the project, a climate model has been developed for city level climate projections for the two project cities. This projection, developed by IIT Madras, is a novel initiative. Since majority of the climate projections are at a regional level, its precise application to the smaller city level areas is limited. The local projections developed under the project helps to overcome this challenge and provide accurate city level climate projections that have been used in the development of the catchment management plan for the two city regions.

For the study, catchment delineation was done using ArcGIS, which classified the catchment into various sub zones based on land use, soil type, and infiltration capacity. A trend analysis using linear regression method was carried out to check if there is any significant change in hydrological variables with time. To assess the impact of climate change on rainfall and temperature, suitable GCM model has been adopted for different RCP scenarios of carbon emission. Runoff generation is calculated using HEC-HMS model. Preliminary runoff estimation was done using the SCS-CN method or in some cases using empirical equations. The temperature variation over the different months was used to assess the urban heat island effect. Based on the estimate, a further sustainable management plan is made.

As per the study, the average temperature of Solapur is projected to rise and the average rainfall is projected to decrease in most RCP scenarios, and the number of floods and droughts are projected to decrease. In Vijayawada, although temperatures are projected to rise and rainfall is projected to fall on an average, the number of extreme droughts and floods are at the risk of increasing.



Urban Heat Island Index map for Solapur city



Urban Heat Island Index map for Vijayawada city

A training programme was organised in February 2020 to enable local officials from Solapur and Vijayawada to use a software to assess the likelihood and impacts of floods or droughts in their cities. The training was organised in IIT Madras.

Financial Modeling for Waste Water Reuse in Project Cities

Most of the wastewater in Indian cities is treated up to secondary level as Urban Local Bodies (ULBs) are not obliged to go beyond it. Municipal wastewater treated up to secondary level cannot be utilized for industrial use and it is also not suitable for agricultural purpose in most cases. International Instititute of Water Management, Sri Lanka (IWMI) developed a financial compendium illustrating different financial resources for ULBs to tackle urban infrastructure towards wastewater reuse via PPPs such that it can generate both

sufficient water quality and adequate revenue stream through proper tariffs. In this compendium, financial modelling has been carried out for Solapur and Vijayawada city, after consultation with the ULB personnel and engineers working in the wastewater reclamation towards reuse for industries and agriculture. Financial feasibility analysis was used to explore whether upgrading existing secondary treatment plants to tertiary level is financially feasible and which tariffs applicable to industry and agriculture sector should be set to make the model more sustainable in the long run. Within

A waste water treatment plant

the financial models, we propose different PPP mechanisms that can be utilised for reclaiming wastewater from cities for industries and agriculture.

In Solapur, with a 10 percent growth in adoption rate in subsequent years, industries need to pay Rs.25.85 /m^3 if sand filtration is used for tertiary treatment and Rs. 33.60 /m^3 if reverse osmosis is used instead. Similarly, in Vijayawada, with a 10 percent growth in adoption rate, industries need to pay Rs.24.80/m^3 and Rs. 31.60 for sand filtration and reverse osmosis process respectively with UASB technology at the secondary level. The cost of treated water will be slightly higher in case of MBBR technology being used at secondary level where the estimated tariff are Rs. 26.10 and 32.95 per m^3 for sand filtration and reverse osmosis respectively.

Building Capacities and Global Awareness

During the implementation of the IAdapt project, it was realized that local authorities are challenged by poor capacity and jurisdictional restrictions in the management of water resources. In order to address this knowledge gap, peer learning exchange visits, trainings and workshops have been taken up through various activities under the project.

Exposure and Awareness Programmes

To understand best practices in water conservation and urban water management, a team of administrative and elected representatives from Tale Hipparga, Ekrukh and Haglur villages visited BibiDarfal and Wadala villages in June 2018 to learn about decentralised waste water treatement options.

Exposure visit to Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB)

In July 2018, a few programmes were organised with children and women in Solapur region. 120 school children from more than seven schools in Solapur participated in the programme that was designed to spread awareness on water conservation, sanitation, hygiene and solid waste management. Children took part in quiz and drawing competitions and were shown videos to promote handwashing as basic hygiene measures.

Catchment managers from the Vijayawada micro-catchment visited Hyderabad in January 2019 where they visited a sewage treatment plant and a lake restoration site, and discussed with the Hyderabad Metropolitan Water Supply and Sewerage Board about the SCADA system in the city.

Training Workshops

Training and capacity building was an integral part of the project. Because several novel concepts and methodologies were introduced and developed under the project, local stakeholders from the two project areas were provided trainings to enable them to use these ideas and tools more effectively.

Thirty rural stakeholders in Gannavaram mandal of the pilot micro-catchment in Vijayawada attended a training session in July 2018 on the issues and challenges of watershed

Training Workshop on Solid Waste Management and Rain water Harvesting Techniques

management, participatory groundwater management and rain-fed agriculture. Group discussions were conducted with the Mahila Bachat Mandal group from the Tale Hipparga, Ekrukh and Haglur villages in July 2018 in Solapur to identify the challenges faced by them.

ICLEI South Asia and SMC jointly organised a training programme in September 2018 on techniques of solid waste management and rainwater harvesting for more than 70 women from economically weaker sections and self-help groups under the National Urban Livelihood Mission (NULM).

A two-day training workshop on acoustic leak detection system for water supply networks was organised in Solapur city in September 2018. TAISEI International, Hyderabad, provided technical training to more than 40 municipal engineers and 20 zonal heads of water works. The trainings encouraged officials from the Solapur Municipal Corporation to understand the impacts of water losses from the system.

The RURBAN committee members of Solapur attended a training workshop on catchment management planning, DST and financial modelling in Solapur city in December 2019. The participants included representatives from Zilla Parishad, Solapur; various departments of SMC; Gram Sevak, Tale Hipparga Village; and students of Dayanand College, Solapur. Trainings were provided by staff from ICLEI South Asia, Athena Infonomics and IWMI.

Dissemination of Project Outcomes

The IAdapt project outcomes were disseminated at national and international platforms to share learnings and disseminate the project outcomes. The project was showcased in global events such as the UN Climate conference or COP 24 in December 2018 and COP 25 in December 2019, as well as in two sessions in the ICLEI World Congress in 2018, where ICLEI South Asia presented the project outputs and outcomes. The project was presented at events organized by the Ministry of Water Resource, River Development and Ganga Rejuvenation and the Ministry of Jal Shakti, Government of India at the India Pavilion in the COPs. Besides this, global events such as the Resilient Cities Bonn conferences of 2018 and 2019 featured the project and its outcomes. In 2018 Resilient Cities Bonn conference, the project highlighted the RURBAN platform, the decision support tool and the city level climate and hydrological models developed under the project. In the 2019 conference, the RURBAN platform was presented as a model for tackling complex urban challenges.

The project outcomes were shared at a session on climate-adaptive water management at the 4th Asia-Pacific Forum on Urban Resilience and Adaptation - Resilient Cities Asia Pacific Congress 2019 in April in New Delhi. The session focused on governance and technological interventions that support water management in a changing climate.

IAdapt presented at Annual Global Forum on Urban Resilience and Adaptation in Bonn, 2019

The project outcomes were disseminated at the International Conference under IAdapt in November 2019 in New Delhi. More than 100 participants, representing government authorities, institutions and organisations, besides practitioners from India, Nepal and Bangladesh attended this event, where the takeaways from Solapur and Vijayawada were shared. The project was highly appreciated by the National Mission for Clean Ganga, Ministry of Jal Shakti, Government of India, and the Water and Sanitation Organization, Rajasthan, at this event. There were demands to replicate the RURBAN platform, vulnerability assessment and pilot interventions on rainwater harvesting for groundwater and wastewater treatment through constructed wetlands from a number of local authorities in Nepal and Bangladesh upon learning about the project.

A number of local and state level meetings have been conducted in Solapur and Vijayawada, including meetings with the Water and Sanitation Support Organisation of Maharashtra in Navi Mumbai and focus group discussion at the Zilla Parishad, Solapur in February 2019.

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This work was carried out with the aid of a grant from the International Development Research Centre, Ottawa, Canada. The views expressed herein do not necessarily represent those of IDRC or its Board of Governors.