

Achieving Sustainable and Healthy Water Through Efficient Systems

6th November 2020

JHANSI CITY WORKSHOP A REPORT



ACKNOWLEDGEMENT

The DA team is deeply thankful to Shri Ramteerth Singhal and Shri Avanish Kumar Rai (IAS) from the city of Jhansi for giving us an opportunity to contribute to achieving the developmental goals of the city in the area of water and wastewater management and for co-developing the agenda of the Jhansi city workshop.

We extend our heartfelt gratitude towards Dr. Mahreen Matto and her team member Shri. Parth V Kamath from NIUA for supporting and being a torchbearer for our initiative.

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We feel immense pleasure in forwarding our thankfulness towards all the stakeholders and participants who supported us in successfully conducting this workshop for the city of Jhansi.

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Executive Summary

Indian cities face extreme water stress which stands at more than 54% on an average. Most of the cities face acute water loss in the system caused by ancient and dilapidated infrastructure, illegal connection, pipe and joint leakages, and lack of metering system. The cities are also not equipped with new technologies which can help them achieve resource circularity. 80% of the drinking water in Indian cities is still extracted from groundwater sources which makes it an energy intensive sector.

This report discusses the workshop conducted by Development Alternatives Group for the city of Jhansi in association with the National Institute of Urban Affairs (NIUA) and supported by the Heinrich Boell Stiftung aimed at understanding innovative technologies in the water and wastewater treatment space. Jhansi, also known as the 'Gateway to Bundelkhand' is situated between Pahuj and Betwa rivers in the extreme south of the state of Uttar Pradesh. It faces numerous challenges in achieving safe and adequate water system management. With the lack of adequate water conservation system and monitoring, the city faces acute water shortage, especially during the summer. Under the smart city mission, the HH water supply coverage has increased to 43% with a supply of 106 lpcd (2015-16). The city has 85 % coverage of latrines (individual or community) but the city has no sewer infrastructure. Jhansi Nagar Nigam has initiated various interventions under various national and state schemes such as Smart Cities Mission, AMRUT, etc., to address the identified problems. However, these issues require integration of innovative solutions into the system for efficient operation.

During the discussion, the key challenges of the city were discussed in detail which were found to be in the water supply system, wastewater treatment and reuse, and capacity building and stakeholder participation. Subject matter experts and solution providers put forth their recommendations and solutions which can be feasibly integrated to the city systems to achieve its aspiration. Several new age technologies, nature based solutions, business models, best municipal practices, and resource circularity interventions were discussed.

Background

1.1 Context

With an increasing population in cities, estimated to reach 590 million by 2030, the demand for water is ever increasing. According to a report by the World Resources Institute (WRI, 2015) more than 54% of India is under high or extreme water stress. Non-revenue water in cities is estimated to be around 32% and with 70% installed capacity of sewage treatment, only 35% is treated. According to the NITI Aayog (Composite Water Management Index-2019), about 2 lakh people die every year due to inadequate water, sanitation & hygiene; 820 million people (58%) have less than 1000 m³/capita water availability; and 70% of our water is contaminated. Traces of the Novel Coronavirus found in sewage water of infected population have brought to the fore the risks of diseases spread through water systems. Untreated or inadequately treated sewage water entering water bodies poses high risk to human health through potable and non-potable consumption. The humongous quantity of wastewater generated creates significant potential for treatment and reuse. Researchers tested the treated wastewater from the municipal WWTPs from which the virus was found in an untreated sample, and found no viral genome, thereby validating the efficacy of wastewater treatment systems. The integrated management of water systems that addresses safe water supply, safe management of sewage and water security must therefore be a priority agenda of local governments.

1.2 Need for an Integrated Systemic Approach

It is important to understand that the challenges of each city differ with the context and a universal solution cannot be applied. Each city requires a tailor-made solution. The key challenges in urban water supply include ; 1) Rapid unplanned growth, 2) Non-circularity of treated waste water or not treating waste water, 3) Inefficient water distribution system with plagued distribution losses, 4) limited metering leading to NRW, 5) Low household connection coverage, 6) Poor pricing strategies, 7) Siloed institutional arrangements, and 8) Institutional capacities, both financial and human resources.

The existing water supply priority follows the order engineering, water science, social mobilisation, financial realisation, ecological factors. Whereas, it is to be noted that to achieve a sustainable water system, it is important to prioritise the ecological factors and provide suitable and efficient engineering solutions after considering all other related parameters.

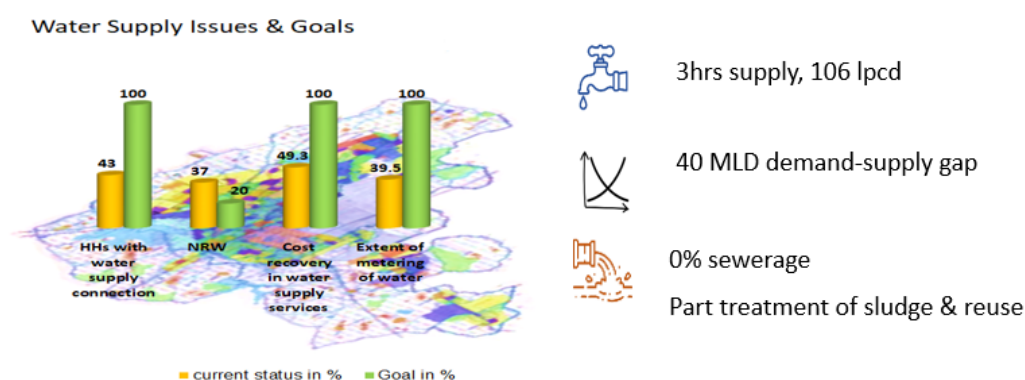
A systemic approach to look at the issues will bring in a value addition to the urban water and wastewater system management. It will help in comprehensive understanding of the functioning of the interconnected elements of the system, enhance capacity to integrate designed to fit smart and efficient solutions, enhance streamlined coordination among actors of the value chain, and enhance tracking and monitoring mechanisms for continuous system improvement. Resource equity can be maintained through participatory, transparent and accountable governance system. Achieving an integrated system allows city to efficiently identify pain points, areas of interventions, required customized solutions and opportunities for stakeholder engagement.

Jhansi City Workshop

A virtual round table discussion was organised by Development Alternatives Group on 6th November 2020 for the city of Jhansi, a culturally rich and historic tourist place in the state of Uttar Pradesh. This dialogue was conducted in association with the National Institute of Urban Affairs (NIUA) and was supported by the Heinrich Boell Stiftung. It aimed at understanding innovative technologies in the water and wastewater treatment space. It also focused on how collaborations can be leveraged to complement each other's aspirations and provide support to meet the challenges in achieving sustainability through efficient water systems.

2.1 Key Issues of Jhansi City

The city of Jhansi faces numerous challenges in providing a safe and adequate water supply, managing wastewater generated and checking non-revenue water. Currently, the city faces acute water shortage. The Non-revenue water of the city stands very high at 37%. Under the smart city mission, the HH water supply coverage has increased to 43% with a supply of 106 lpcd (2015-16) which is still lesser compared to CPHEEO standards. The city has 85% coverage of latrines (individual or community) but the city has negligible or no sewer infrastructure. Many houses are equipped with septic tanks, however majority of these are unscientifically constructed or dilapidated structures. Drains running through the city has become solid waste and industrial waste disposal sites.



Picture 1: Jhansi Existing Scenario

The Smart City plan as well as the Jhansi Nagar Nigam have initiated various interventions to address these problems. Under AMRUT, 26 MLD STP was sanctioned by MoEF under NLCP which is under-construction as part of Laxmi Tal Pollution prevention and conservation scheme. 4MLD will be released in to lake and 22 MLD will be used for agriculture/ horticulture activities. The city installed a Faecal Sludge Treatment Plant (FSTP) in 2018 with a design capacity of 6KLD with institutional setup laid for desludging, transportation and safe disposal of sludge collected. The project was showcased as a best practice at ULB level in various forums. However, the plant covers only 4% of the total population. Treated water is used in horticulture and the generated by-product is to be used as manure.

However, these issues require integration of innovative solutions into the system for efficient operation. The challenges of dilapidated infrastructure, economics of traditional solutions, ULB staff capacities, procurement systems must be dealt with. Integration of new age technologies with real time data tracking, awareness on WASH practices, and knowledge on the entire water system value chain - water conservation, storage, supply and waste water treatment and re-use can help city to overcome its current situation.

2.2 Priority Issues Discussed

1. Wastewater Treatment and Reuse

- a) Sewage and Faecal Sludge Management (centralized or decentralized treatment, monitoring, smart metering, data collection and analysis, reuse of treated water)
- b) Septic Tanks and Management (on-site treatment, septic tank cleaning and management services, collection & transportation solutions for faecal sludge, reuse of sludge and wastewater)

2. Online monitoring and tracking of water systems

- a) Automation of all water infrastructures (WTP, STP, FSTP) including valves and pipelines to monitor these systems for checking any malfunctions such as leakage, unauthorised connection, etc.,
- b) Determine plant utilisation rate and understand equitable distribution of resources
- c) Study data and gain insights on the functioning of the infrastructure for better management

3. Capacity Building and Stakeholder Participation

- a) Capacity building of ULB and line department officers
- b) Awareness generation and participation of citizens and other stakeholders

2.3 Enabling Response to Challenges

The workshop brought the challenges of water and wastewater management faced by the city on the forum for discussion. The variety of new age solutions presented provided an opportunity for a lively exchange. The discussions also brought forward the key barriers to testing, piloting and deploying new age innovative solutions and service providers in the traditional space occupied by large scale infrastructure approaches of the city.

During the discussion, it was understood that, currently, the existing sewage network in the city is only 4-5 km which is under review for diagnosing the existing condition of the pipelines to determine its functionality. The existing STPs in the city are also under review to determine its rate of utilization to plan for additional demand. The wastewater generated from the sources not equipped with onsite treatment system is flushed untreated into nearby nallas which further takes it to the Pahuj river. During monsoon, these drains overflow making this a hot bed for transmission of various diseases. The existing FSTP in the city has only 4% coverage which needs to be enhanced. The city is in dire need of an efficient and sustainable treatment system to serve its fixed as well as the floating population.

Considering the ground conditions, various solutions were discussed for issues identified such as energy efficient and compact systems addressing land scarcity, resource circularity, leakage and online monitoring systems, resource resilience and capacity building. The city has to adopt a holistic

and participatory approach with all stakeholders involved in every stage from conceptualization of a project through implementation, operation and maintenance.

Key opportunities that the new age solutions for water and waste water management offer are:

- Small scale, decentralised and customisable solutions with lower capital and operational costs
- Agile service providers with faster ROIs and new payment models making solutions and services affordable to the city and citizens
- Dynamic data provision for tracking, monitoring and improving the system over time.

All solutions that were discussed were indigenous, developed in India at labs and research institutes and start-up incubators.

While addressing the management system capacity issues, the barriers that need to be addressed in bringing the deploying the solutions on ground are:

- Information, comparison and selection of solutions.
- Procurement system design for piloting projects.
- Mechanisms for PPP models with start-ups and new age service providers.

2.4 Summary of Solutions Discussed

Once the challenges were clearly laid down by the city, innovative and cost-effective technologies were discussed which could enable the city to have an efficient water management system. Since the city of Jhansi has a rocky terrain with mostly granite, it is not viable for the city to have large networks of underground pipelines.

The solutions discussed were decentralised, compact, containerised/mobile, and plug and play systems. The solutions discussed used various technologies such as vermiculture, electro-coagulation, electro-oxidation, biomimicry, and tethered sensors, etc.

The systems are characterised by low or no energy requirement as they run on solar power, gravitational flow, etc. The capital and operational cost for these systems stood at minimum compared to conventional systems and has faster ROIs.

From the discussion, it was understood that data availability is an important factor to effectively operate and manage these units. And therefore tracking and monitoring systems that provide dynamic data to operators and managers were discussed. Solutions to automate the operation and monitoring the WTP, ETP and STPs were shared. These solutions give insights to operators, managers, and decision makers on understanding the functioning, utilisation rate, areas of improvement, and methodology changes required for effective operation.

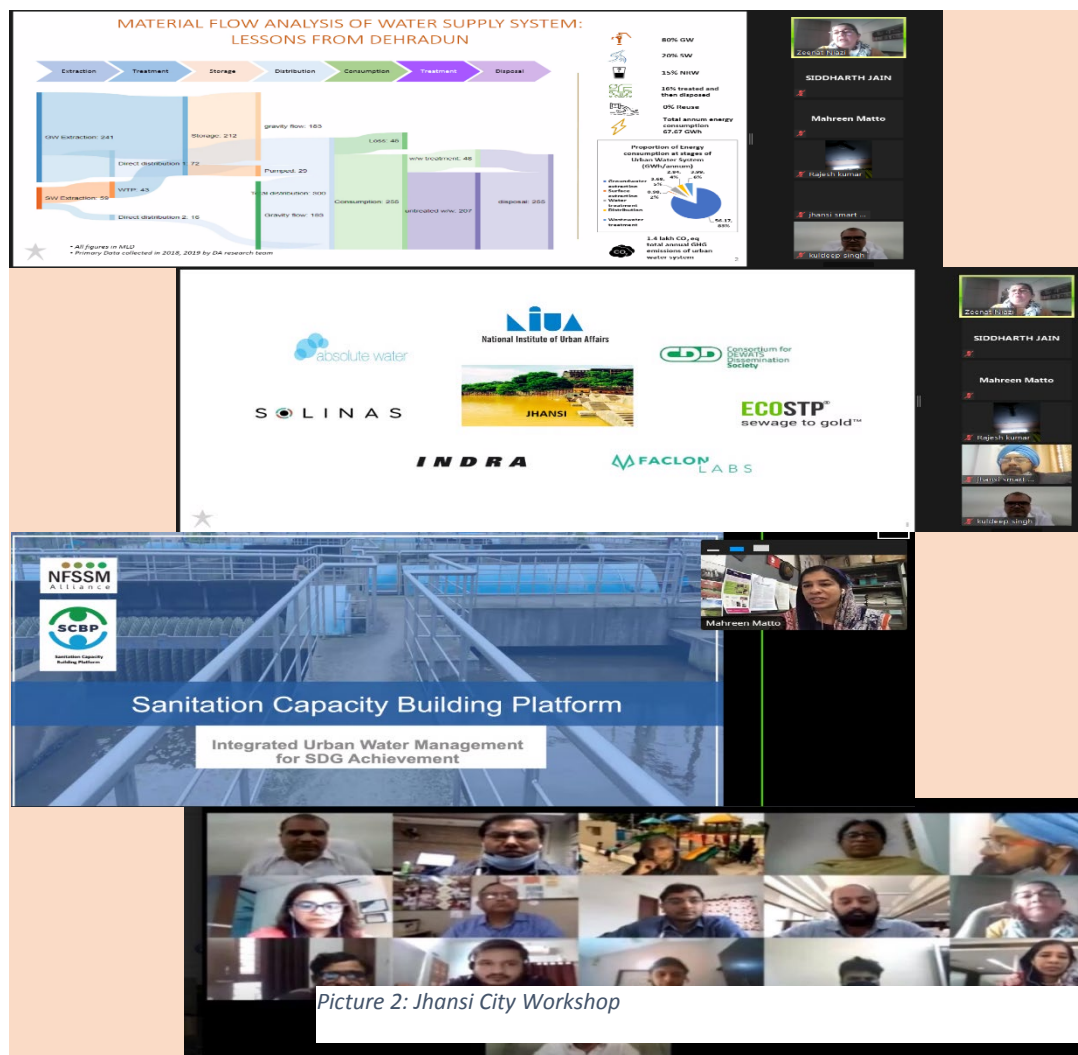
Solution providers also introduced a new business model of “use and pay” where the city could pay per litres of water treated. Such models could go a long way for cities like Jhansi. With urban design and aesthetics in mind, solutions that enable landscaping over the treatment system were also discussed. The importance of adopting circular consumption model and capacity building of the municipal officials were also emphasized during the discussion.

Read more about the technologies discussed [here](#).

Way Forward

The workshop conducted for Jhansi city was a knowledge enriching session for all the entities participated. A stakeholder discussion had been held and the city has attained approval to set up a 24 MLD Sewage treatment plant. The said treatment plant will collect wastewater from 4 major nallas with dozens of feeder drains each. During the discussion, it was made clear that the city has to adopt decentralised approach for new interventions in parallel to the existing centralised systems. For a decentralised system to be sustainable, the system should be of the scale 15000 sqm with a population of not more than 500. Along with smart and sustainable technologies, innovative business models and interventions were discussed. The importance of sensitizing and training the field officials on the emerging technologies were also discussed. In order to help the city to adopt a feasible solution and achieve its goals and aspirations as laid out in the Jhansi Master Plan, we are looking forward to having;

- Continued dialogue with city officials to facilitate integration of efficient solutions to their system
- Workshops and training for municipal capacity development for material flow and life cycle analysis of the resource
- Social media campaigns and awareness programmes through various platforms
- Continued engagement with solution providers
- Documentation and publication of the learnings, findings and best practices with relevant communities and stakeholders.



Picture 2: Jhansi City Workshop

3. Annexures

Annexure 3.1–Solution Providers and Technologies



I. Inphlox Water Systems Pvt Ltd

INDRA Water makes economical, compact & smart water treatment systems for recycling domestic & industrial wastewater for non-potable reuse applications. Founded in 2017, INDRA water is already recipient of several accolades including Winner of Urban Works Innovation Challenge 2018 by Columbia University & RMZ Corp, winner of global 2019 urban water challenge at world water week, and recently the Millennium Alliance Award 2020 under WASH sector.

Products

a. INDRA Flow series

Indra Flow Series is an Electro-Coagulation (EC) based system designed to remove pollutants from residential, commercial, municipal or industrial wastewater. Flow Series provides a low energy, chemical free alternative to chemical coagulation and other membrane or biological enzyme based processes.

b. INDRA Activated Flow series

Indra Activated Flow Series is a treatment system which combines our pioneering 'Sludge Activated Flocculation' (SAF) technology and 'Activated Treatment' process with the Flow Series system to treat effluents with very high content of COD, BOD, TDS, turbidity, coloration and harmful chemicals from industrial wastewater streams.

c. INDRA Electro series

The 'Electro Series' is our most advanced industrial wastewater treatment system. It combines Activated Flow Series with Electro oxidation technology to achieve multi-stage controlled wastewater treatment. The Electro Series is extremely effective in treating wastewater with very high content of organic carbon and oxygen demanding substances. It also effectively deals with a host of other pollutants present in the industrial wastewater effluent stream.

Features

1. Less sludge production
2. Electro-coagulation, electro-oxidation technology
3. Less footprint
4. Plug and play
5. Module capacity 5-200 KLD
6. 40% savings on operational costs, 35% savings on lifecycle cost
7. 95% water recovery with zero chemical
8. Meets CPCB and state norms

Highlights

1. **Reduced sludge production:** Produces 60% less sludge compared to conventional system. The sludge produced is stored in a separate storage unit after disinfection which can later be used as manure/fertilizers.
2. **Pay as you use business model:** INDRA water is coming up with a new business model where in the client has no capex but paid in form of water treatment bill in terms of the amount of water treated.
3. **Decentralised approach:** Containerised and compact solution with standardised plant capacity specially designed for regions facing land scarcity or difficult geographical terrains.

II. Absolute Water Pvt Ltd



Absolute Water Pvt. Ltd. provides green water recovery system that converts raw sewage into drinking water quality as per WHO standard. We provide organic waste water solutions for Institutions, Industry, Municipal Authorities, and Commercial properties. Founded in 2013, Absolute Water has received several accolades including Aqua Foundation's Excellence award 2019, Action for India- Best Indian Social Enterprise Award, 2019. We were selected by the Prince Charles Sustainability Markets Initiative in collaboration with the World Economic Forum, as the top 100 in the World for treating water pollution in a green manner.

Products

a. Bio-Filter Green STP

Specially bred worms are introduced in this technology. Once the worms have broken down the micro-pollutants present, the filtration system additionally uses completely organic and inorganic media, such as woodchips, pebbles and sand. The resultant water is suitable for agricultural, ground water rejuvenation, river replenishment and horticultural use. On advanced treatment, the treated water can be used for toilet flushing, laundry, washing maintenance, AC tower cooling, etc.

b. Water Recovery System

Water Recovery System is a further advanced treatment to the above, with a very high recovery (> 85 %) of water. The specially designed Membrane not only filters out various contaminants but also the harmful bacteria, Viruses & other Pathogens without any sludge generation. Treated potable water quality is WHO and BIS standard.

Features

1. No sludge generation, the product is nutrient rich humus
2. No reject for non-potable treated water, 15% reject for drinking water, but the reject is converted into nutrient rich liquid fertiliser.
3. Minimal electricity consumption and works on solar power as well.
4. Low operation and maintenance cost and unskilled labour can operate
5. Smart footprint, civil or modular space according to space availability
6. No odour and noise
7. No chemicals
8. High ROI and shortest stabilization period

Highlights

1. Reduced Sludge production: Produces no sludge. The treatment by-product on replenishment is converted into rich humus fertiliser
2. Decentralised model: Containerised and compact solution for regions with land scarcity or difficult terrain. Also provides mobile bio-filter STP system to fulfil urgent wastewater treatment. Civil based units are also designed where space is no constraint and where larger communities water needs are fulfilled

ECOSTP's unique patented technology treats sewage in a decentralised, self- sustainable way in underground chambers without power, chemicals or human intervention. Using Biomimicry, regenerative innovation inspired by nature, the ECOSTP utilises functional principles and strategies of microorganisms and ecosystem found in a cow's stomach. ECOSTP Technology was discussed in the 8th World Water Forum (Brasilia, 2018) and subsequently selected as a Best Practice case study for United Nations SDG Sustainability Asia Pac report.

Product

a. Cow's Stomach Engineering STP

The technology is 4 staged process in which cows stomach bio-mimicry is adopted. Just like how the ruminant stomach in a cow turns grass into milk. We biologized the same method to convert "bad" water to "good" water using exactly the same ruminant stomach process. The 4 stages are primary sedimentation chamber, up flow baffled reactor chamber, attached growth biological filter with high surface area, and plant bio-filter.

Features

1. No power required
2. No moving parts
3. No chemicals, odours, noise
4. One unit treats 8 KLD-1 MLD
5. No operation and maintenance cost
6. Less sludge production, biproduct is digestate used as a manure

Highlights

1. **Less or no maintenance & reduced sludge production:** The technology works on gravitational infiltration and hence require no maintenance or operational skill and cost. The sludge produced is too low that it has to be emptied only once in two years.
2. **Promotes usage of local resources:** ECOSTP provides design, consultation and other technical assistance. The STP is constructed with local resources and labour reducing the construction cost.
3. **Aesthetics:** The land used for underground STP could be landscaped into a garden, playground, etc., in accordance with the client's interest.

Solinas build inline inspection robotic technologies for critical pipeline infrastructure to detect existing defects and also prevent failures, maximising the lifespan of assets. Solinas serve O&G, Petrochemical, Power plants, Water, Sanitation and Process Industries. Solinas won National Bio Entrepreneurship Award 2019 and was also featured in widely respected outlets such as Forbes, LinkedIn, Yourstory, Singapore International Foundation & other media houses.

Products

a. Endobot

Endobot helps water utilities to identify leaks and defects in underground water pipelines and reduce non-revenue water. It helps in preventing undesirable excavations and costly pipeline replacements.

b. HomoSEP

Septic tank inspection and cleaning robot to prevent manual scavenging.

Features

1. Visual inspection
2. Leak detection
3. Corrosion estimation
4. In-pipe cleaning
5. GIS mapping
6. Septic tank inspection and cleaning

Highlights

1. Reduced Manual intervention: The technology is a tethered robot aimed at inspection, maintenance of water pipelines and cleaning septic tank. It carries multiple sensor payloads for detection of leakages, estimate the corrosion, GIS mapping and sedimentation at an early stage thereby reducing NRW and increasing revenue

Faclon Labs has developed powerful & flexible IoT platform with features that are customized & configured to redefine operations and decision intelligence. The technologies at Falcon helps in giving insights to operators, managers, and decision makers on understanding the functioning, utilisation rate, areas of improvement, and methodology changes required for effective operation of the utility under consideration. Faclon Labs was the Global finalist at Dubai Electricity and Water Authority (DEWA) Future Utility Cup, 2016. Faclon's solutions were featured in forums like Money Control and SWARAJYA Magazine's Smart Cities Series.

Product

Smart resource management with I/O sense Technology

Features

1. Water supply analysis
2. Storage management
3. Intelligent pumping
4. Dynamic water balance
5. Automated metering
6. Automation of pumps and valves
7. WTP, ETP and STP Digitization

Highlights

1. Real time monitoring
2. Automated report
3. One-click Automation
4. Dashboards for complete visibility
5. Secure cloud data storage
6. Hierarchical structure
7. E-mail and SMS alerts
8. Scalable and inter-operable software

Annexure 3.2 – Subject Matter Expert Organisations

I. Consortium for DEWATS Dissemination Society



CDD Society is a non-profit organisation dedicated to innovate, demonstrate and disseminate decentralized nature-based solutions for the conservation, collection, treatment and reuse of water resources and management of sanitation facilities. CDD's works are widely appreciated through-out the country in wastewater treatment, faecal sludge management, waterbody rejuvenation, and solid waste management. It has already installed more than 400 plants in residential, institutional as well as industrial sectors. It is a pioneer in nature based wastewater treatment having implemented in 8 unique designs. CDD is key technical partner in the National Faecal Sludge and Septage Management alliance and various State Governments.

Services

a. Technical solutions

1. Feasibility studies
2. Planning, design and engineering
3. Tendering and implementation support
4. Operation and maintenance support
5. Monitoring and evaluation of the system
6. Post implementation trouble shooting of treatment plants

b. Capacity Building

1. Flagship training programmes for DEWATS, FSM, WBR covering Design, Planning, Implementation & O&M Support for WATSAN systems
2. CDD Professionals are sought after as Subject Matter Experts in the WATSAN Ecosystem
3. Customized training programmes to suit the needs of different stakeholders
4. Participatory approach that encourages learning and knowledge sharing
5. World class training materials for practitioners

c. Applied Research

1. Research targeted at improving efficiency and upgradation of water and sanitation systems.
2. Continuous monitoring of implemented DEWATS/FSTPs and their performance.

d. Knowledge Publications & Dissemination

1. Curating content aimed at informing practitioners about sustainable ways of problem solving.
2. Capturing on ground implementation and innovation experience

Annexure 3.3 – Presentations

I. Presentation by Development Alternatives Group



JHANSI

ACHIEVING SUSTAINABLE & HEALTHY WATER
THROUGH EFFICIENT SYSTEMS

JHANSI CITY WORKSHOP- TECHNOLOGIES

6TH NOVEMBER 2020



II. Presentation by NIUA



Sanitation Capacity Building Platform

Integrated Urban Water Management
for SDG Achievement

ANNEXURE 3.4 : Agenda

Date: 6th November 2020

Venue: Virtual Meeting

Time: 11am – 12:45pm

11:00 AM – 11:05 AM	Introduction to the Webinar and Welcome – Ms Zeenat Niazi, Vice-President, Development Alternatives (DA)
11:05 AM – 11:15 AM	Opening remarks - Shri Ramteerth Singhal, Mayor, Nagar Nigam Jhansi
11:15 AM – 11: 25 AM	Jhansi city challenges and issues – Shri Avanish Kumar Rai (IAS), Municipal Commissioner, Municipal Corporation Jhansi
11:25 PM – 11: 35 AM	Integrated Urban Water Management for SDG achievement – Special Address – Dr. Mahreen Matto Programme Manager (SCBP) NIUA
11:35 AM – 11:45 AM	Jhansi's Strategy as a Smart City for Urban Water and Wastewater Management - Mr Manvinder Singh Team Leader - Project Management Consultant, Jhansi Smart City Ltd.
11: 45 AM – 12:30 PM	Discussion Forum: (1) The challenges in water and wastewater management faced by city authorities and service providers (2) Solutions for treatment and reuse promoting circularity and efficiency in wastewater management systems. (3) Institutional capacities and citizen participation
12: 30 – 12: 40 PM	Expert respondent: Mr Parth V Kamath Technical Programme Officer (SCBP) NIUA
12:40 PM – 12:45 PM	Vote of Thanks and Concluding Remarks - Ms Zeenat Niazi, Vice-President, Development Alternatives

Annexure 3.5 – Speakers Contact List

Speaker	Name of the organisation	Address and Contact
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About Development Alternatives

Delivering eco-solutions for people and the planet

Development Alternatives (DA) is a premier social enterprise with a global presence in the fields of green economic development, social empowerment and environmental management. It is credited with numerous innovations in clean technology and delivery systems that help create sustainable livelihoods in the developing world. DA focuses on empowering communities through strengthening people's institutions and facilitating their access to basic needs; enabling economic opportunities through skill development for green jobs and enterprise creation; and promoting low carbon pathways for development through natural resource management models and clean technology solutions.



About Heinrich Boll Stiftung

The Heinrich Böll Stiftung is a German foundation and part of the Green movement that has developed worldwide as a response to the traditional politics of socialism, liberalism, and conservatism. We are a green think-tank and an international policy network, our main tenets are ecology and sustainability, democracy and human rights, self-determination and justice. We place particular emphasis on gender democracy, meaning social emancipation and equal rights for women and men. We are also committed to equal rights for cultural and ethnic minorities. Finally, we promote non-violence and proactive peace policies. To achieve our goals, we seek strategic partnerships with others who share our values.

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