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National Institute of Urban Affairs

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FOCUS ON SDG 6.4

By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

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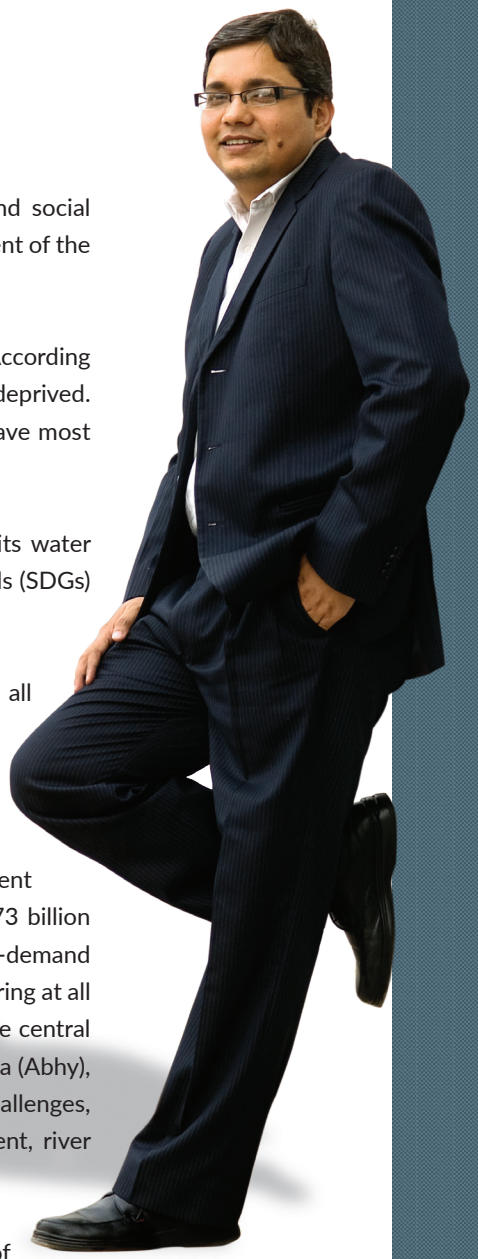
08 COVER STORY

IMPROVING WATER PRODUCTIVITY AND REDUCING WATER LOSSES: KEY TO INDIA'S WATER SECURITY

Water Efficiency: Need for an integrated approach



Water is the driving force of all nature and also a key driver of economic and social development. India, which is home to over 1.4 billion people, has only four per cent of the world's water resources.

Unfortunately, the country is gradually moving towards being water-stressed. According to a 2019 NITI Aayog report, almost 600 million of its population is water-deprived. Moreover, 21 cities — including Bangalore, Delhi, Hyderabad, and Chennai — have most likely exhausted their groundwater resources in 2021.

India's rapid urbanisation and catastrophic climate change are only adding to its water woes. At this juncture, progress toward achieving Sustainable Development Goals (SDGs) has become more urgent and necessary for a better future.

The SDG target 6.4 aims to substantially increase water-use efficiency across all sectors by 2030 and ensure sustainable withdrawal and supply of freshwater to address water scarcity issues and substantially reduce the number of people suffering from water water shortage.

According to the National Commission for Integrated Water Resources Development (NCIWRD), by the year 2050, the total demand for water is expected to be 973 billion cubic meters (BCM) in the low-demand scenario and 1,180 BCM2 in the high-demand scenario. With the help of various schemes/policies and their continuous monitoring at all levels, India is making significant progress in achieving SDG target 6.4. While the central government has rolled out a series of flagship initiatives such as Atal Bhujal Yojana (Abhy), Jal Jeevan Mission and Namami Gange which are addressing water scarcity challenges, state governments are emphasising on water recycling, wastewater management, river rejuvenation, reduction in water use, etc.

This issue of the eGov Magazine, in partnership with the National Institute of Urban Affairs (NIUA), highlights how India is riding over the challenges and is bringing efficiency and sustainability in the water sector with future-ready innovations. It is a compilation of enriching articles and insightful interviews from senior policy-makers, experts and academia.

Happy reading!

DR RAVI GUPTA
Editor-in-Chief, eGov magazine, and
Founder, Publisher & CEO,
Elets Technomedia Pvt Ltd

https://egov.eletsonline.com/editorial/

From the Desk of Director-NIUA

SDG 6.4 – Increase Water-Use Efficiency and Ensure Freshwater Supplies

HITESH VAIDYA
Director, National Institute of Urban Affairs

Water is a finite resource. With rapid urbanisation and the growth of the Indian economy, the demand for domestic water is expected to grow manyfold. In order to meet this demand, India needs to adopt an integrated approach to water-use efficiency by smartly using its water resources through water-saving technologies.

The UN Sustainable Development Goal 6.4 sets the target: **By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.**

The present utilisation of water in India is estimated at around 750 BCM (Billion Cubic Meters), whereas for the year 2050, it is estimated to be 1180 BCM. In the business-as-usual approach, it will be difficult to meet this huge requirement. This is a significant cause for concern. In order to stay ahead of the demand surge, Indian cities need to adopt innovative and sustainable solutions to address these challenges.

The National Water Mission on 'Water Use Efficiency' by the Ministry of Water Resources, RD & GR has emphasised the 'Conservation of water, minimising wastage and ensuring its more equitable distribution both across and within states through integrated water resources development and management'. Likewise, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT 2.0) places high importance on reducing the non-revenue water as a means to improve water supply efficiency.

This edition on SDG 6.4 – Contemporary approaches to enhance water use efficiency – is a compilation of six uniquely articulated articles related to water-use efficiency and sustainable withdrawals and supply of freshwater. The prime objective of this edition of the magazine is to capture and disseminate the perspective of experts on different aspects of water use efficiency in Indian cities. It takes a comprehensive approach to highlight the challenges in achieving SDG 6.4, and ways to overcome them.

NIUA is committed to helping Indian cities improve their performance against each SDG. In addition to leveraging our internal resources, we partner with academic institutions, government and non-government organisations and media houses for research, capacity-building and advocacy outcomes. The collaboration between NIUA and eGov Magazine is a demonstration of the same. To come up with this edition, teams at NIUA and eGov have enthusiastically worked together to collate a diverse range of knowledge-base on the themes of water efficiency and sustainable withdrawals and supply of freshwater to address the issue of water scarcity.

My sincere thanks to all the authors who have contributed to this edition and shared their knowledge to make this possible.

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COVER STORY

Improving Water Productivity and Reducing Water Losses: **Key to India's Water security**

Hitesh Vaidya, Director, National Institute of Urban Affairs brings to light GoI and NIUA's policy implementation initiatives to achieve SDG 6.4 which entails that by 2030, mandated countries will substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

» **HITESH VAIDYA**
Director, National Institute of Urban Affairs (NIUA)

Water use efficiency is key to addressing the issue of water security. The concept of **Reduce Reuse and Recycle** can majorly help solve the problem. Besides producing the benefits of conservation of supplies, optimisation of water use can result in a host of environmental, public health, and economic benefits. It will help improve water quality, maintain aquatic ecosystems, and protect drinking water resources.

A two-pronged approach is vital for improving water use efficiency. Firstly, **water productivity needs to be increased** (i.e, the value of output compared to the quantity of water consumed in agricultural and highly industrialised economies). Secondly, **water losses need to be reduced,** for example, by tackling leakages in municipal distribution networks and optimising industrial and energy cooling processes.

The UN figures indicate, approximately 57 percent of countries registered a water use efficiency equivalent to 20 USD/m3 or less in 2019, compared to 58 percent in 2015[1]. While more than half of Asia has showcased the highest growth rates, Latin America and the Caribbean show a decrease in water use efficiency.

In the Indian context, the overall water use efficiency (across all sectors- Agriculture, Industries and Services) has improved from 2.45/ USD m3 in 2015 to 3.12/USD m3 in 2019[2]. However, Water Use Efficiency in the Agricultural sector in India is only 38%[3]. A lot needs to be improved further. The knowledge of the efficiency and sustainability and the conscious use of water is paramount to ensure that it is available in abundance for future generations.

With the rapidly growing population, the demand for water (for domestic, agriculture, industrial and municipal use) is constantly escalating too. As per UN World Water Development Report 2019, the global annual water consumption has been increasing by approximately 1% since the 1980s[4]. If the scenario persists, there will be up to 30% increase in water use by 2050.

Accordingly, the total water requirement of India for various activities around the year 2050 has been assessed to 1450 km3/yr. This is significantly more than the current estimate of utilisable water resource potential (1122 km3/yr) through conventional development strategies. Water scarcity is looming large. We can prevent this scenario by adopting sustainable and integrated practices across various sectors. Therefore, embracing water efficiency measures is necessary to meet the increasing demand for water.

The National Institute of Urban Affairs, through its Water and Environment Vertical, has been pushing the agenda for Water Use Efficiency through research, capacity building, and advocacy

1. https://bit.ly/3G57Bcm
2. https://bit.ly/3TpvePS
3. https://bit.ly/3UR61yR
4. https://bit.ly/3tmobNl

There are several policy measures taken by the central government to address water use efficiency. Starting with the National Water Policy (2012) that has a section devoted to water demand management and water use efficiency. Similarly, the National Water Mission emphasises improving water use efficiency by 20% as a climate change adaptation strategy.

NITI Aayog in its **'SELECTED BEST PRACTICES IN WATER MANAGEMENT'** report of 2017, has highlighted various measures undertaken in India to increase Water Use Efficiency[5]. From restoration and maintenance of water resources as a continual process and involvement of local people and training them to manage their resources, to increasing the storage capacity of tanks and other water bodies, conjunctive use of ground and surface water and establishment of integrated irrigation system that comprises of canal systems, micro irrigation facilities and a network that even handles the problems of salinity, soil moisture, drainage etc.

The global annual water consumption has been increasing by approximately 1% since the 1980s. If the scenario persists, there will be up to 30% increase in water use by 2050.

The National Institute of Urban Affairs (NIUA), through its Water and Environment Vertical, has been pushing the agenda for Water Use Efficiency through research, capacity building, and advocacy. Some of the work undertaken in this area, which is aligned with the target 6.4 of the Sustainable Development Goals are:

- The Urban River Management Plan URMP) framework designed by NIUA is a holistic approach for sustainable management of rivers and their associated elements in a city. One of the thrust areas of the URMP is to look at reuse of treated wastewater to reduce the need for fresh water sources. Cities like Kanpur, Aurangabad, and Moradabad have adopted this effectively in their URMPs.

- Recommendations are being made for city Master Plans to enhance water reuse efficiency. For example, the draft Master Plan for Delhi (2041) advocates an integrated urban water management approach for the city that makes judicious and efficient use of all water resources available. This is through a mix of incentives (e.g. subsidies for reduced use of water) and regulatory measures (e.g. mandatory provisions for reuse of treated wastewater).

- Adequate and sustainable supply of fresh water in the communities, is one of the parameters being considered under the *Participatory and Inclusive Water Sensitive Urban Design for Sustainability and Resilience* project, while promulgating water-sensitive communities in Delhi.

Adopting sustainable and smart water management practices NOW will avert the water-starved scenario and help us build a water-secure future for the generations to come.

5. https://bit.ly/3DTP7J6

Localizing Joint Accountability Mechanism to Achieve SDG 6.4

» PURNANJALI CHANDRA (WORLD RESOURCES INSTITUTE INDIA)

» PRATHNA TC (WORLD RESOURCES INSTITUTE INDIA)

» ASHWATHY ANAND (WORLD RESOURCES INSTITUTE INDIA)

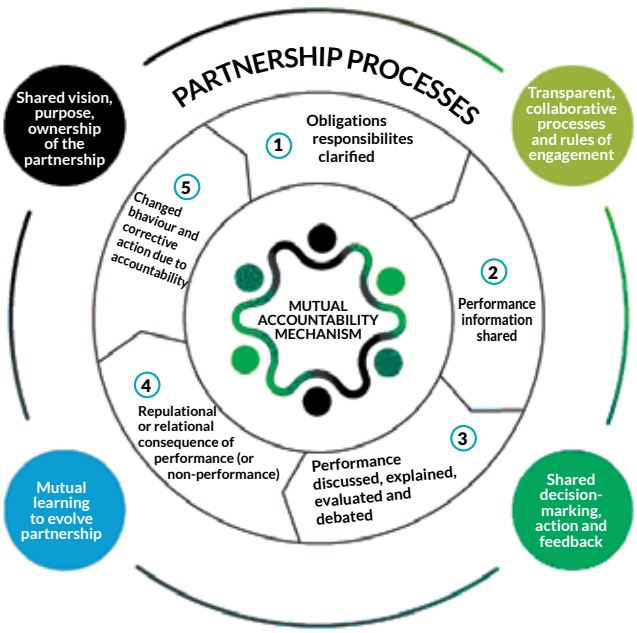

Figure 1: Pathways of Mutual Accountability Mechanism (MAM). Image credit: Sanitation and Water for All

600 million people across India[1] are facing high to extreme water stress of the magnitude 40%-80% [2]. Water security is decreasing as water demand rapidly outpaces available resources due to demand from multiple competing sectors such as urbanisation, agriculture and industrial growth. The UN SDG 6.4[3] emphasises the need to promote water-use efficiency in order to minimize water consumption and enhance water security. Water security[4] is defined by the UN as safeguarding access to good quality and quantity of water that sustains livelihood, socio-economic development, and human well-being in a politically-stable environment.

India has invested heavily in augmenting and improving urban Water Supply and Sanitation (WSS) services to improve water security. Since the early 2000s, missions such as Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Swachh Bharat Mission, Smart Cities etc. have typically focused on city-wide supply and network extension for formal and authorised developments. Almost one-third of the urban population[5], who

1. Press Information Bureau, 2019. Niti Aayog Report on Water Crisis. Available at: https://pib.gov.in/newsite/PrintRelease.aspx?relid=195635
2. Aqueduct Water Risk Atlas (wri.org). shorturl.at/bHI09
3. United Nations, 2019. UN Water.Available at: https://www.sdg6data.org/en/indicator/6.4.1
4. UnitedNations, 2013. UN Water.Available at: https://www.unwater.org/publications/what-water-security-infographic
5. The World Bank, 2021. Population living in slums, India. Available at: https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?locations=IN

live in more precarious conditions such as in slums and other informal settlements, typically do not have adequate access to these essential services. Initiatives such as the Basic Services to the Urban Poor have tried to address these issues, but factors such as the lack of accountability mechanisms for long-term operations and maintenance, inadequate finances and ineffective community participation have led to limited success[6].

Figure 3: (a) Baseline Household survey being undertaken (b) engagement with community members during training and sensitization programs (c) Spatial mapping exercises being undertaken with the participation of the community. Image credit: WRI

Trust and Transparency through Accountability Mechanisms

Accountability mechanisms and participatory practices are identified as critical components in the water and sanitation sectorto ensure integrity, improved water service delivery and sustainable governance, particularly forthe most vulnerable populations.[7,8] The Mutual Accountability Mechanism (MAM) is a global instrument developed for the water and sanitation sector that includes multi-sectoral and multi-stakeholder groups at the national or international levels. The MAM provides a platform to jointly-develop 'specific, measurable, achievable, realistic and time-bound actions'[9] to meet the water and sanitation goals. The core elements of this accountability process are: (a) developing a shared vision, purpose and agenda; (b) a transparent and collaborative process to monitor and review mutual commitments; (c) providing space for dialogue and negotiation around decision-making, and (d) learning together to work towards better outcomes. The Joint Accountability Mechanism (JAM) is adapted from the MAM to be deployed at a community or local scale. Instead of hard sanctions, the JAM relies on trust and transparency and fosters collaboration by creating a shared space for dialogue and negotiations.

Thus, accountability mechanismswhen undertaken in meaningful ways enable the effective realisation of SDG 6.4.

Figure 2: Re-imagining improved WASH and healthy space interventions for vulnerableand disadvantaged communities using a water-sensitive cities approach. Image credit: WRI

Applying Joint Accountability Mechanisms at Community Scale

JAM presents enormous prospects for a successful community engagement and long-term effectiveness of Water, Sanitation and Hygiene (WASH) programmes. It can lead to mutual trust, complementarity, government coherence, efficient capacity building, and credible incentives. These can be achieved through dialogue, clear agreements, pronounced leadership and mutual respect to fulfil obligations[10]. The collaborative project of World Resources Institute India, Australia-India Water Security Initiative Community Demonstration Project (AIWASI CDP)[11] is a promising endeavour to implement JAM while adhering to its core values of a Water Sensitive City (WSC) approach and the Gender Equality, Disability and Social Inclusion (GEDSI) principles. The project intends to achieve two specific outcomes: a) By 2025, the two vulnerable communities become water-secure; b) Key agencies and communities adopt collaborative water governance arrangements.

The approach of a JAM is explored in two selected demonstration sites of Bakkarwala and Mubarikpur Dabas in

6. ESID, 2015. Lessons from India's Basic Services for the Urban Poor programme, Delhi: Effective States and Inclusive Development. ESID Briefing Paper No. 13.
7. Kjellén, C. S. a. M., 2015. Accountability in WASH - Explaining the concept, s.l.: UNDP Water Governance Facility and UNICEF.
8. Fonseca, L. v. d. L. a. C., 2018. Global Review of National Accountability Mechanisms for SDG 6, s.l.: End Water Poverty and Partners.
9. Mutual Accountability Mechanism Global Report - 2021, Sanitation and Water for All
10. Mutual Accountability: Emerging Good Practice - 2016, OECD
11. Please read more about the AIWASI CDP work at https://aiwasi-cdp.wricitiesindia.org

Figure 4: Highlights from outcomes of the Baseline Household Survey. Image credit: WRI

Delhi, where government, civil society organisations and communities co-work and negotiate to establish values, roles and responsibilities.

In AIWASI, the community engagements are designed to build trust and integrity between the community, the project team and the government agencies. This process was initiated with in-depth baseline household surveys and spatial mapping exercises.

Another practice in this project, as part of building trust and engagement with the community, is the development of a project-centric 'Community Water Forum'. This forum brings key members of the community together including community action groups, local government bodies, ward-level elected representatives and youth. Delhi Jal Board (DJB), a key government partner in this collaborative process, engages directly with the communities through these fora.

A City Water Forum has also been set up to extend the community learnings to the city. After the formal launch of the forum, it will help in Delhi's transition to a water-sensitive city and provide a platform for stakeholder dialogue.

Figure 5: Community Water Forum to ensure Joint Accountability Mechanism in the AIWASI project. Image credit: WRI

Figure 6: Delhi Water Forum as a platform to ensure joint accountability at the city level. Image credit WRI

Collaborating on Water-Sensitive Approaches for Water Security

Technical solutions alone are insufficient to ensure water security in vulnerable and disadvantaged communities. Solutions may not sustain in the long run as operational challenges arise, municipal priorities shift, and adequate budgets fall short. Solutions which include technical and governance components in tandem are likely to witness more success.

The AIWASI project is an example of how a JAM can be designed and implemented in a local context to ensure effective community engagements and WASH outcomes within the framework of WSC and GEDSI. Through JAM, the community alongside government and non-governmental organisations, and technical experts, become equal stakeholders and contributors to the design, implementation and monitoring of interventions. This project will ensure that contextually-appropriate solutions are implemented by leveraging the strengths and knowledge of the local community. Hence, making the community and implementing agencies the joint stewards of such innovative new interventions.

*Views expressed by **Purnanjali Chandra, Prathna TC, Ashwathy Anand**, (World Resources Institute India).*

Decentralized Nature Based Solutions – A Pathway to SDG 6.4 Acute water stress in Urban India

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By the year 2050, half of India's population will be urban. If current trends with respect to water supply and usage continue, India could experience a drop of 6% in its GDP due to water scarcity alone. A WWF scenario analysis carried out in 2020 concluded that 30 Indian cities fall into the category of "grave water risk" by the year 2050[1]. Going by the Composite Water Management Report, by Niti Aayog, 2019[2], most of urban India might face a similar predicament. This report estimated that, as of 2019, 600 million people in India faced high to extreme water stress, with demand likely to outstrip supply 2 times over by the year 2030. As most of us are aware, India has only 4% of global water resources[3] for a population that accounts for 17% of the global population. And these water resources are rapidly shrinking. In the upcoming 20 years, an estimated 50% of all India's aquifers will be at critical or over-exploited levels.

The Government is rapidly working towards a water secure future for the country - through the Jal Jeevan Mission, Smart City Mission and AMRUT Mission. An important policy measure among them is the direction for all AMRUT cities to reuse/recycle 20% of used water by the year 2026. Given that urban India only treats 28% of its sewage and the remaining is disposed unsafely into the environment, the target to reuse 20% of used water may appear a tall ask.

1. https://www.wwfindia.org/?19602/Cities-across-the-globe-face-an-alarming-rise-in-water-risks
2. https://www.niti.gov.in/sites/default/files/2019-06/Final%20Report%20of%20the%20Research%20Study%20on%20%20Composite%20Water%20Resources%20Management%20Index%20for%20Indian%20States%20conducted%20by%20Dalberg%20Global%20Development%20Advisors%20Pvt.%20Ltd_New%20Delhi.pdf
3. Water security must be enhanced in India, The Statesman,25th October 2022

However, this is transformative in its potential – only if we learn from a decade's experience of small-scale, decentralized wastewater treatment units in urban centers like Mumbai, Bengaluru, Delhi and the like.

Reuse of treated water and SDG 6.4

Reuse of treated wastewater directly impacts SDG 6.4. By reusing treated wastewater, sustainable withdrawals can be ensured thereby helping conserve freshwater resources. It is pertinent to note that in urban India, the physical losses related to water transmission and distribution are at least 20%[4]. By reusing 20% of wastewater by treating it, directly lessens the burden on the supply infrastructure which is already overstressed. This reduces long term investments in the supply and distribution of freshwater disproportionately. More importantly, 20% of treated wastewater can be easily reused, close to the point of generation, for two major purposes:

1) Flushing
2) Urban Greening/Landscaping

Flushing and Urban Greening requirements can account for anywhere between 20-40% of the water use requirements in residential areas depending on the population, income levels, climatic conditions etc.

Decentralisation lessons from the last decade

Wastewater reuse for urban greening or flushing is not a new idea. Recognising wastewater as a valuable resource, most of the metropolitan cities have adopted guidelines and helped implementation of decentralized small scale STPs in their respective cities. However, a majority of the treated wastewater is not being reused. Moreover, it is found that in most cases the STPs are performing inefficiently, unable to meet the mandated standards[5]. This happens due to two key reasons among many:

1) Preferring systems which are low on capital expenditure to begin with but are eventually high on life cycle costs. Once developed these are handed over to residential associations for operation and maintenance. Owing to high maintenance costs of the same, the associations are usually not able to afford continuous upkeep and maintenance.
2) STPs are complicated to operate and maintain, especially by unskilled operators who are often at the helm of STP upkeep and maintenance.

Role of nature-based solutions & the way forward

The challenges are thus myriad and complex. The time is ripe to relook at solutions that utilize natural processes extensively and effectively, consider life cycle costs of infrastructural solutions and the circular nature of designs implemented. Today's solutions must take into consideration not just accessibility of clean water for all but also design solutions that ensure clean air for all.

Nature-based solutions utilise different natural elements like microbes; gravity; sun light while being easy to operate and maintain. At the same time, they can be aesthetically pleasing – which helps create a sense of ownership among the community. These solutions consume less energy and are less resource intensive compared to traditional methods. Nature Based Solutions can enable life cycle cost savings to the tune of 70% when compared to conventional STP systems, as in the case of Aravind Eye Hospital, Pondicherry.[6] Also, with limited but focused hybridization, aimed at tertiary treatment, Nature Based Solutions can also be deployed in space constrained, densely populated settings – like a public toilet in a Mumbai Slum.[7]

Thus, our inability to reuse treated wastewater effectively is not due to lack of technological solutions but due to a lack of awareness and accessible resources that can ease decision making for the communities. The following first principles can help enable various communities to choose the right solution for their decentralized wastewater treatment system:

- Adopting life cycle approach to ensure long term cost recovery.
- Choosing systems that are easier to operate and maintain with optimal automation, considering that it is difficult to find and train skilled operators on a continuous basis
- Choosing modular designs that provide the users with flexibility, scalability and eventually cost effectiveness.
- Making Nature-Based Solutions the preferred choice, given that they also help mitigate climate change.
- Incentivising the owners for adopting, implementing and maintaining sustainable decentralised systems through reduced water tariffs, property taxes.
- Making design and development of decentralized wastewater treatment systems and reuse planning fundamental to city planning departments of each city. A classic example is the Slum Rehabilitation Authority (SRA), Mumbai having undertaken the same approach. This ensures that the poor and vulnerable can also aspire to water security, improving their quality of life.

Views expressed by ***Krishna Swaroop Konidena, Aditi Pandey & Bijoy Jose*** *(CDD India)*

4. "The Challenge of Reducing Non-Revenue Water in Developing Countries," The World Bank, dated December 2006
5. https://bengaluru.citizenmatters.in/bengaluru-apartments-stp-sewage-treatment-8888
6. https://www.researchgate.net/publication/344326092_Decentralized_Wastewater_and_Fecal_Sludge_Management_Case_Studies_from_India_Decentralized_Wastewater_and_Fecal_Sludge_Management_Case_Studies_from_India
7. https://www.adgully.com/hul-launches-its-6th-suvidha-centre-in-partnership-with-bmc-hsbc-india-109082.html .

Climate change: Setting the priorities for optimal water use efficiency in urban systems

In the last few decades, I have rarely seen a household that is blessed with enough domestic water supplies, to whole-heartedly welcome a family visiting them during summer holidays. Just reverse the clock decade by decade and see the misfortune, due to water scarcity, of the present generation of us in comparison with earlier times, when society was in better position. Such an experience has a sorrowful influence on inter-family or friendly relationship, especially on children and youth, as they lack fond memories of times spent together, like their parents.

The future is even grimmer. Water woes are on the rise as we traverse our villages and towns; different

tiers of cities and metros. As residents face severe shortage for enough water supplies for domestic use, actually, civic bodies are struggling to provide minimum supplies for drinking water, especially in summer during which the risk of waterborne diseases is high. Exploiting this huge gap in demand and supply, local private players are minting money.

With their business unchecked for, public safety is at risk and may impact health. If such is the current situation, unless things are reversed and remedial measures are placed in the urban systems which serve more than half of the nation's population, the future is highly worrying as coming generations can't sustain and may suffer unimaginable hardship to life and health.

Hence, the mood of United Nations General Assembly in 2015 to adopt a blue print of 17 sustainable Development Goals (SDGs), towards achieving peace and prosperity of nations of world, is a welcome direction. Accordingly, every nation and its constituents need to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater, as per SDG 6.4, to address water scarcity by 2030. This requires efficient supply and delivery systems along with smart domestic gadgets that control water faucets and appliances that depend on water in domestic use. With increasing affordability of tools based on advances in information technology (IT) and internet of things (IoT) for use in SCADA systems or monitoring and operation systems at households, it is certain to improve water use efficiencies and conserving water. So, all stake holders must realise and come together to make every citizen's life easy and sustain the development of urban systems for a better future.

The geographical area of India is 2.4% of the world's land area but has about 17% of its population. There is only 4% of water on global scale to provide for its population and livestock for different uses. In addition, 80% of the annual rainfall is received from June to September and it is highly variable as some places receive less than 100 mm annual rainfall.

The geographical area of India is 2.4% of the world's land area but has about 17% of its population. There is only 4% of water on global scale to provide for its population and livestock for different uses. In addition, 80% of the annual rainfall is received from June to September and it is highly variable as some places receive less than 100 mm annual rainfall. The renewable surface and ground water are only dependent on precipitation. In general, it is classified as 'water scarce', when the per capita availability of water is below 1000 m3 per year. However, scarcity can be experienced in pre-monsoon months, commonly. Prolonged dry spells expected during the monsoon season due to climate change may also increase the scarcity period.

Various estimates indicate the proportion of groundwater is about 1/3 of total utilizable water. Whereas groundwater is readily available in places where it occurs, surface water can only be stored or diverted for our uses. As the supply side component is minimal and when the delivery side has the best mechanisms, groundwater systems are highly efficient. But as they are dependent on energy, solar-based pumping setup is proper for overall efficiency. This is important,

especially in urban systems, as groundwater is the safest resource for residents in most towns and cities.

Coming to surface water systems, as they are mostly open gravity systems, lot of instrumentation is necessary to monitor and check the losses during storage, conveyance, in-situ etc. In surface water-dependent urban water systems, both supply and delivery components are crucial and need to be considerably instrumented systematically to help improve water use efficiency.

For over a decade, the vagaries of weather due to the effects of climate change are being faced in some critical hydro-climatic regions, which are important storehouses of India's water resource. 'Climate change' is the noticeable response on Earth's surface, to the stimulus of disturbance that changed the global energy balance. It is supposed to be the resultant of prolonged increased levels of greenhouse gasses from the use of fossil fuels. Its effects can be evidenced in the form of rise in global temperature and sea level; glacial retreat and decline of ice sheets; warming of oceans and ocean acidification etc.

As these have direct impact on hydrological processes at basin scale, the surface and groundwater occurrence and distribution are to be modeled based on recent recommendations of the Intergovernmental panel on climate change (IPCC). Urban areas, especially cities being hotspots of impacts due to climate change, when adhered to efficient renewable and green measures, may make huge difference to mitigate such impacts.

Thus, while undertaking hydrological modeling at river-basin

Climate Change effects can be evidenced in the form of rise in global temperature and sea level; glacial retreat and decline of ice sheets; warming of oceans and ocean acidification etc.

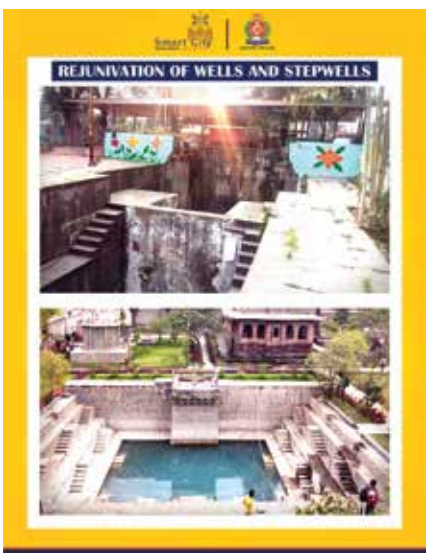
scale, it is to be ensured that these are for recommend scenarios from projections of downscaled suit of latest global climate models developed under coupled model inter comparison project (CMIP) of world climate research programme (WRCP). It is often found that the modeled output simulated for a site varies over a large range. So, the challenge for practicing engineers is to address and justify the increase in project costs as the design practices are not yet standardized while preparing detailed project report (DPR) that addresses the risks of climate change. A scheme that is designed for a risk of a given return period may fail its expectations, as the climate change effects might have resulted in early failure than designed for.

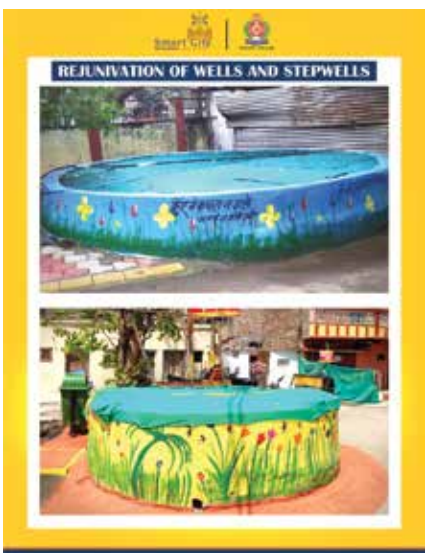
It will be proper to specify the likely hood of failure of the design, under a range of reasonable occurrences simulated under climate change conditions in the river basin possible at the project site. Else, additional storage and costs necessary, to meet requirements under reasonable scenarios for projected climate change conditions of the river basin possible at the project site may be evaluated for decision makers to finalize upon. Thus, it is necessary to undertake studies to model supply and demands, considering the future under climate change scenarios for optimal water security under severe scarce situations to meet the goals under sub-theme SDG 6.4.

*Views expressed by **S. V. Vijaya Kumar**, Scientist G, National institute of Hydrology, North Eastern Regional Centre, Guwahati, Email: vijayakumar.nihr@gov.in*

Indore Embracing Smart Solutions to Revive Water Bodies

Water is a precious resource churning the growth of cities and is one of the determining factors for sustainable development. However, with unprecedented urbanisation and drastic impact of climate change, the world is facing severe water woes that require immediate action. Indian cities are taking consistent efforts to address the challenges.





Ever since the Smart Cities mission has been launched, Indore, with its global standard initiatives and projects, has been constantly getting featured in the country's top position under the mission. From solid waste management to meticulous traffic handling, efficient urban mobility to result-oriented citizen engagement, Indore has set a standard that other states are contemplating following suit.

The Road Taken

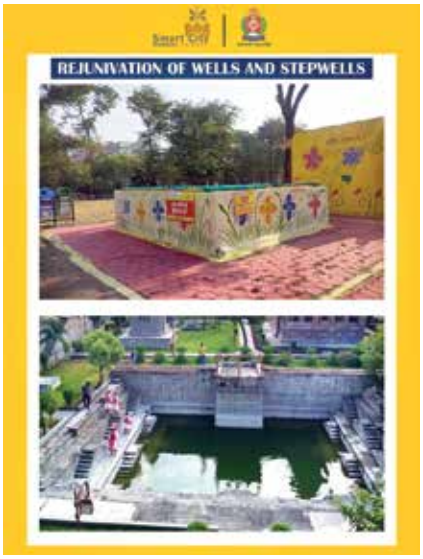
They say prevention is better than cure. Underscoring the practicality of this theory and keeping the rising effects of climate change in mind, Indore has been doing everything possible to tackle any such challenges associated with the water. It has recently undertaken a mammoth exercise of rejuvenating and restoring its water bodies.

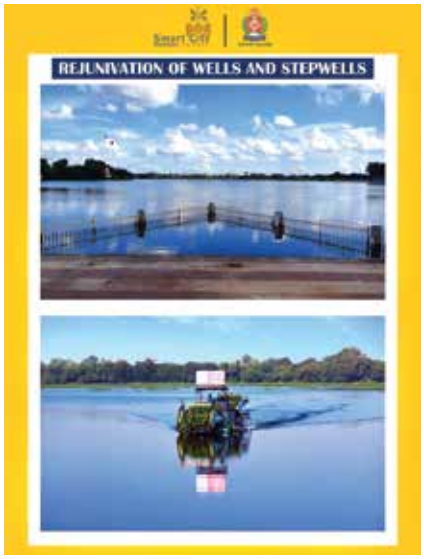
Indore has 455 wells, 25 stepwells and 29 lakes across the city. Its water bodies rejuvenation project began with cleaning and beautification of Hari Rao Holkar Chhatri Stepwell under the heritage conservation efforts of Indore Smart City.

An initial survey was conducted to assess the present condition of these water bodies, specially to identify the major issues which hamper the quality and quantity of water. Thereafter, a concerted action plan was made by Indore Smart City to comprehensively rejuvenate its water bodies through activities like desilting, deepening and clearance of catchment channels.

Systematic & Technical Measures

Indore Smart City started geo tagging these water bodies according to the rejuvenation plan. It identified illegal establishments that drained their wastewater in these water bodies, resulting in accumulation of silt which in turn led to reduction in storage





capacity and non-potability of water. After consultation with local stakeholders, illegal constructions were removed, after which rejuvenation of these water bodies began in systematic and technical manner.

After desilting, cleaning of the water body, outputs of proximate rainwater harvesting structures were connected to city;'s wells through recharge shafts, after which stakeholders like nearby RWAs, NGOs and Garden teams were handed over the responsibility of plantation surrounding the water bodies which would help in reducing the soil erosion and increasing the accumulation of their water storage, by inducing a sense of ownership to the beneficiaries.

Indore citizens enthusiastically responded to the call of cleaning the city's wells and stepwells. Multiple social groups joined the initiative.

The Smart City started IEC drives including chalking out activities like weekend cleaning events. Finally, completing the whole circle, the rejuvenated wells, stepwell were covered with green net and water connections were made at nearby gardens, dividers and green belts which would further reduce the wasteful expenditure of Municipal Corporation on water tankers.

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Waste to Wealth

Following the principles of Waste to Wealth and 4R (reduce, reuse, recycle & recover), the Indore Smart City indigenously developed a weed harvester in IMC's workshop to arrest the consistent issue of weeds in lakes and ponds using body parts and chassis of old vehicles and local spare parts. The expense of this weed harvester was even less than Rs 8 lakhs against the market price of a new harvester of more than Rs70 lakhs. The weed harvester has proven to be a boon for Indore's lakes.

Additionally, in order to maintain water level and aquatic ecosystem throughout the year, a reuse network has been laid and treated water of STP is draining into ponds like Pipliyapala ,Pipliyahana and Patthar Mundla.

Moreover, the Smart City has taken up multi-dimensional activities like construction of cascaded Stop Dams across major rivers of Indore and using treated water from STPs to make the channels perennial and constructing multiple stretches of Riverfronts.

The quality of water in these water bodies is regularly tested through portable testing kits. Also, ban on single-use plastic is being strictly

implemented in Indore to prevent plastic bottles and polybags ending up clogging our precious water bodies.

Smart Innovations

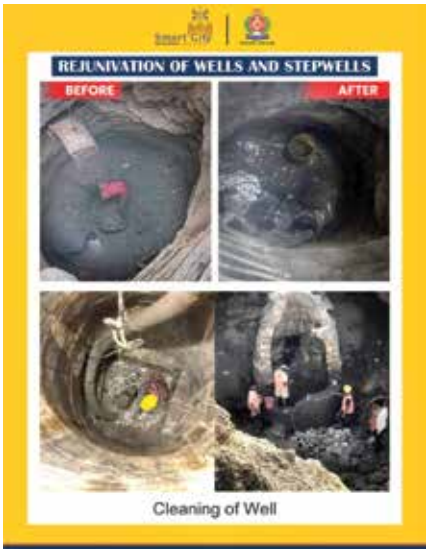
- Involvement of RWAs, Social groups and NGOs in rejuvenation of their own water bodies.
- Aerial Survey of water bodies through Drone for mapping of their Catchment channels.
- In order to monitor and provide maintenance support, geo-tagging for water bodies with photographs is done through the ICT application.
- Installing fountains to maintain dissolved oxygen in water bodies.
- Construction of cascaded stop dams to increase the percolation of water and reducing run off.
- Construction of in-house de-weeding machine at around 10 % of market cost.
- Reuse of STP water and use of water from wells, stepwells in gardens, dividers and green belts.

Quantifiable outputs

- Conservation of 25 stepwell and 455 wells completed.
- More than 01 lakh trees planted near water bodies.
- 100% wells and stepwells covered with green net,so that dry waste is not dumped.
- Reuse of water from STPs, wells and step-wells through hydrants, thereby reducing dependence on water tankers leading to saving of crores of revenue annually.
- Construction of Stop Dams on Kahn and Saraswati Rivers.

Outcomes and Impact achievement

- Increase in citizen participation for conservation of water bodies.
- Providing better living standards to people residing near nallahs and rivers
- Clean water in rivers throughout the year, and afforestation improves climate of city



Cleaning of Well

The Smart City started IEC drives including chalking out activities like weekend cleaning events. Finally, completing the whole circle, the rejuvenated wells, stepwell were covered with green net and water connections were made at nearby gardens, dividers and green belts which would further reduce the wasteful expenditure of Municipal Corporation on water tankers.

- Planned reuse of treated water helps in judicial use of water
- Preservation of old stepwells, wells preserves heritage value of our city in the younger generation.
- Treated water of STP is drained into water bodies like Pipliyapala, Pipliyahana and Patthar Mundla lake which is maintaining the Ground Water Table in the nearby area.
- Cleaning of lakes has led to increase in morning walkers and joggers

Sustainable Development Goals

- Rejuvenation of water bodies and capturing rainwater boosts the quality of groundwater thereby promoting clean water. (Goal 06)
- Clean water accessibility to everyone helps in proper health and hygiene. (Goal 03)
- Conservation of water bodies helps in balancing ecosystem thus combats climate change and its impacts (Goal 13)
- Conservation of water bodies helps in envisaging sustainability in the city. (Goal 11)
- Saving and reusing water creates consciousness while using water which results in responsible consumption of water resources (Goal 12).

Ever since the Smart Cities mission has been launched, Indore, with its global standard initiatives and projects, has been constantly getting featured in the country's top position under the mission. From solid waste management to meticulous traffic handling, efficient urban mobility to result-oriented citizen engagement, Indore has set a standard that other states are contemplating following suit.Indore has constantly been awarded as the best smart city in India. This year also, it bagged the coveted award. Recently, it also clinched the Innovative Idea Award in the carbon credit financing mechanism. Technology like artificial intelligence, machine learning, robotics and drones are playing phenomenal roles in transforming urban governance. It has done remarkably well in rejuvenating and restoring several waterbodies in the district. As a result, it is well poised to show the light to other cities in shaping their developmental and innovation planning.

Managing water efficiently in urban India

In the era of the 'Anthropocene', water will be at the heart of the impact of climate change. Adaptation and preparing for increasing variability will be necessary for water managers and those responsible for water governance in urban India. A river basin level approach where the city works to protect catchments ensuring quantity and quality of flows in rivers and also works to provide treated used water for basin level use such as agricultural, environmental and urban-industrial will be an imperative.

India has already launched an ambitious project to get a functional tap to every household and this is a time for large scale impact and change. Getting water supply and sanitation services is perhaps one of the most gender positive infrastructural service delivery, relieving the burden of waiting and

» S. VISHWANATH
Director at Biome Foundation

carrying water to households as also reducing the disease burden associated with bad water and sanitation systems.

What will be the efficiency measures needed to be in place to prepare for this future?

The first goal of water supply and sanitation is universal coverage. Some water for all rather than all water for some. These metrics should ideally be measured democratically in an open transparent manner. At a ward level, discussions and indicating status of connections for the particular ward in a ward-sabha would be best. Barriers to connection – whether legal, financial or technical can be overcome through discussions and fine-tuning policy. Special attention is needed for the poorer sections of the populace, those living in informal settlements and those who are homeless or migrants.

The second goal is institutional strengthening. Institutions, whether parastatal or local, should have the requisite human resource capable of designing, implementing and managing water and sanitation facilities. Only a strong water supply institution can deliver water and sanitation facilities to all.

The third goal is perhaps the technical goal. Multiple sourcing of water, from river sources or reservoirs, from groundwater, from rainwater and from treated used water, will become the way to de-risk water from the impact of climate change. Water is piped, supplied in tankers and taken from the ground through tube-wells and bought in plastic bottles or barrels. While multiple sourcing of water exists already in practice, it is more a question of self-provisioning in the absence of the state to supply piped water. A formal system of understanding ALL sources of water and putting in place a decentralized technical management and governance framework will be the way ahead for the future.

The basic elements of metering – at bulk level and at retail level will be necessary and essential to understand consumption and to send signals for demand management.

The fourth goal is financial efficiency. A system of tariff which captures the human right to water but also the nature of it being an economic good will need to be put in place. An increasing block tariff with cross subsidization of domestic consumption through higher pricing for commercial use will need to be put in place based on the local context.

"Institutions, whether parastatal or local, should have the requisite human resource capable of designing, implementing and managing water and sanitation facilities. Only a strong water supply institution can deliver water and sanitation facilities to all."

The polluter pays principle will need to be followed through with cost recovery of collection, conveyance and treatment of domestic sewage and commercial and industrial effluents.

The fifth goal would be legal efficiency. Without a legal framework, connections to all households may become difficult. Building bye laws and other regulations are already making rainwater harvesting, aquifer recharge, setting up of wastewater treatment plants for apartments and industries, the use of water efficient fixtures, the reuse of treated wastewater with zero liquid discharge, the use of automatic level controllers mandatory. A whole slew of legal obligations will make the sustainable and efficient use of water more likely.

The last goal is ecological. Lakes, wetlands, streams and rivers in urban areas will need to be protected, rejuvenated and restored. A vibrant city will need these socio-ecological spaces for the ecosystem services they provide but also the socio-cultural and recreational facilities they offer. Aquifers are the bearers of groundwater and often neglected as a resource. Both shallow and deep aquifers will need understanding, protection and management. City master plans and building bye laws will need to ensure that areas of high groundwater potential are recognized as environmentally important zones. Basement and underground construction will need to be regulated based on the presence or absence of aquifers.

Conclusion:

A water efficient city is not merely a technical construct. It is primarily a socio-ecological construct with technology to support equitable and just distribution of the resource and the protection of what is environmentally fragile. The best water efficient cities are those that deliver services of water and sanitation to all , mitigate against drought and floods and finally celebrate water in its biodiversity enhancing, aesthetic, cultural and spiritual forms. Our citizens and our cities deserve such urban spaces.

Water use efficiency: Steps taken by Delhi Jal Board

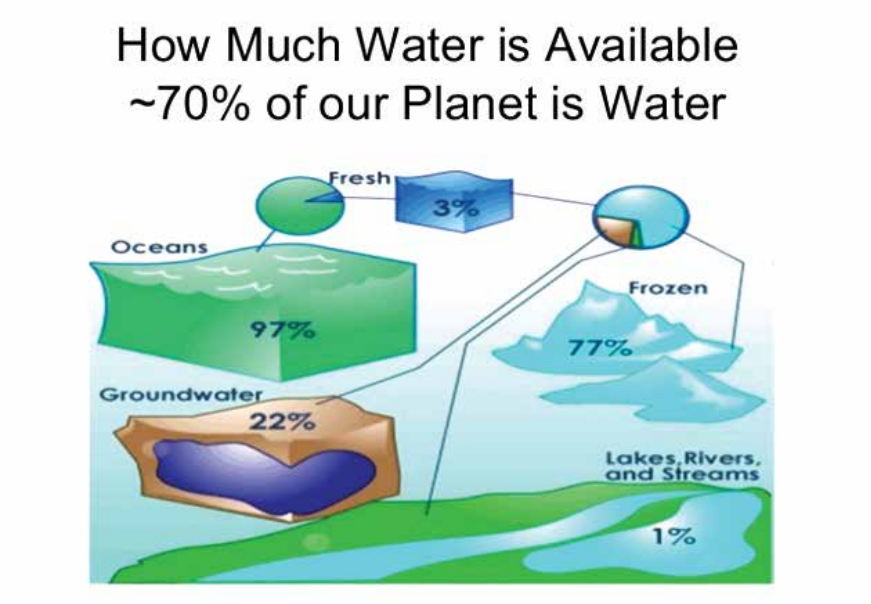
Water plays a pivotal role in sustainable development, including poverty reduction. The use and abuse of increasingly precious water resources has intensified dramatically over the past decades, reaching a point where water shortages, water quality degradation and aquatic ecosystem destruction are seriously affecting prospects for economic and social development, political stability and ecosystem integrity. Currently, over 1 billion people lack access to water which is lowest in Africa and also critical in India. This water crisis is largely our own making. It has resulted not from the natural limitations of the water supply or lack of financing and appropriate technologies, even though these are important factors, but rather from profound failures in water governance. In every city, by every government and any political set up, the drinking water coverage is given more priority, whereas; sanitation, disposal of waste is given the last priority. Even in India, if we see the percentage of sewage collection and its treatment, the situation is very pathetic. In metro cities hardly 50-55% sewage is collected and treated, in class-I cities, its percentage is 30-35% and Class-II cities only 8-10%. With this data, the micro level picture is also not convincing. Whatever, the capacities of treatment is there, hardly 30% Sewage Treatment Plants perform satisfactorily. Remaining untreated waste definitely flows out into natural streams and pollutes surface water. While wastewater flows in the natural streams, it also pollutes ground water through percolation.

» **ER. R.S. TYAGI**
Former Member (WS),
Delhi Jal Board

Delhi Jal Board: It is one of the largest water utilities in the world serving more than 25 million people with water supply and managing sewerage system of entire Delhi, the National Capital Territory. It has 10 water treatment Plants of total production capacities of 860 MGD and more than 5000 Raneey wells and Borewells drawing around 90 MGD water from the ground. There are more than 1000 water tankers supplementing drinking water supply in water deficit areas. Similarly, it has 36 Sewage

Treatment Plants at 24 Locations of total capacities 640 MGD whereas; 550 MGD sewage is being collected and treated.

Need of Water use efficiency: Water is of course a natural resource. But when it is made worth drinking and made available to the individuals, it becomes a scarce commodity. Scarce means that water is not in abundance on this planet. It is a well known fact that hardly 3% water of this Planet is worth drinking out of which 77% water is stored in glaciers, 22% in ground and 1% in Rivers, lakes and ponds. Ignorance in handling wastewater is polluting this precious drinking water available in ground and surface. Climate change also poses a major threat to human development.



Delhi Jal Board has taken many steps for improving water use efficiencies as under:

Reduction in seepage and evaporation losses in raw water conveyance system: The raw water for Delhi's drinking needs is brought from Bhakra, Nangal Dam, Tajewala Headworks and Tehri Dam which are located 300 to 400 Kms away from Delhi. All the conveyance systems of carrying raw water from these sources are the earthen canals where 15 to 35% losses are through seepages and evaporation. Delhi Jal Board has constructed 108 Kms cement line canal from Munak Head works in Haryana upto Haiderpur Water Treatment Plant saving around 120 MGD raw water in seepage. With this saving, DJB commissioned and operationalized three water treatment plants of total 90 MGD at Dwarka (50 mgd), Bawana (20 MGD) & Okhla(20 MGD). Similarly, around 250 MGD Raw water is conveyed through Cement Concrete circular ducts from Muradnagar (Upper Ganga Canal) to Sonia & Bhagirathi Water Treatment Plants covering a length of 33 Kms. Hence. There are no seepage and evaporation losses in this stretch.

Water Reclamation from waste water resulting from treatment process: there is 8 to 10% raw water is lost during the process of treatment of water i.e in backwashing of filters and cleaning of storages etc. Delhi Jal Board set up recycle Plants to reclaim the water from that waste water, thus saving of 49 MGD of filter water as under:

i.	Wazirabad WTP	:	12 MGD
II.	Haiderpur WTP	:	16 MGD
III.	Bhagirathi WTP	:	10 MGD
IV.	Chandrawal WTP	:	7 MGD
V.	Nangloi WTP	:	4 MGD

Reduction of water losses in Transmission Mains: Treated filtered water is pumped and transmitted with pressure from Water Treatment Plants to the Primary Reservoirs. Water loss is through joints of the Pre-stressed / C.I. pipes or through the body of the pipe. Water loss is round the clock and seepage into ground or sometimes may damage the adjacent structures. All the transmission mains of prestressed cement pipes and C.I. Materials have been replaced with Mild Steel lines and coated pipes to ensure water tightness of joints. Delhi Jal Board has saved around 10% filtered water after replacing old pipes.

Water Loss in Distribution main & House Connections (NRW): Since, Delhi's population is increasing manifold and there is no hope of addition of raw water in near future, Delhi Jal Board planned to manage the water supply in an efficient way. Delhi Jal Board took initiative to conduct Water Audit up to Micro Level through various studies as under:

The consultants M/S Halcrow and PWC-DHV-TCE worked out the NRW varying from 45% to 55% depending on the area and pattern of consumption.

JICA has conducted the study of NRW while preparing the Water Master Plan and assessed NRW varying from 45 to 65%.

While conducting the baseline study in Nangloi Water treatment command area, NRW was assessed maximum up to 68% by M/S ILFS-STUPS-JV.

From the above studies, it came out that reduction of NRW is inevitable. Hence, it took initiative to form District Meter Areas (DMAs) with key performance indicators as reduction in NRW, Reduction in electricity consumption, ensure water quality, extension of water connectivity and increase in duration of water supply through outsourcing agencies on PPP Model. These agencies are of international repute and have expertise in efficient management of water supply in Europe and Asian

Countries i.e. SUEZ, VEOLIA (Both are French companies with Indian Partners) and one Israel company. The areas were selected as the command area of Nangloi Water Treatment Plant, Malviya Nagar Underground Reservoir, Vasan Vihar and Meharoli. The remaining areas are also under consideration for awarding water asset management work.

Leak Detection Management: To reduce the real losses, Delhi Jal Board set up the Leak Detection Investigating Cell and adopted following Best Management Practices to curb the leakage s:

Hardware: Visual Inspection, Sounding Rods to sense the noise during night hours, Co-Relaters and Helium Gas sensors.

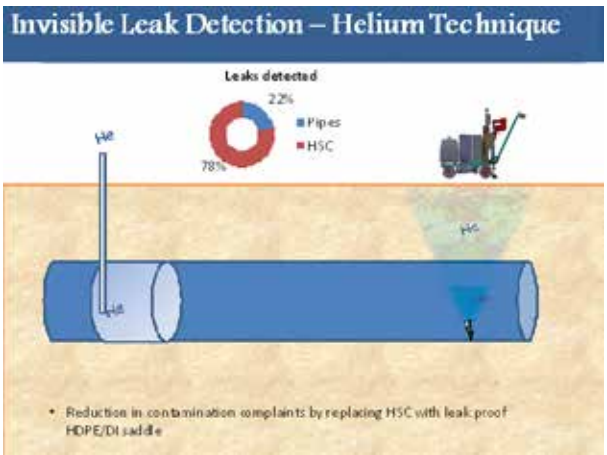
Software: GIS application and Pressure drop analysis

Recycle & Reuse of water: To supplement drinking water demand, Delhi Jal Board supplies around 89 MGD treated effluent for no drinking purposes i.e. irrigation, Horticulture, cooling of Power Plants and Industrial use etc.

Customer Oriented services:

REVENUE MANAGEMENT SYSTEM: With the introduction of 24x7 online services by DJB, consumers can avail facilities such as bill payment, download forms, and apply for new connections among other services. Consumers can also update their mobile numbers to get SMS alerts for different services. In the interests of the consumer, DJB has also waived off the transaction charges on the payment made online which is now borne by DJB itself.

Computerized Complaint Management System & Call Centre: To increase efficiency and performance, across the system, a centralized 24x7 Call Centre was set up, with a Computerized Complaint Management System, to provide quick and speedy redressal to the public grievances. Consumers can call at the call centre toll-free number 1916, provided by DJB, and lodge all types of complaints related to water & sewer issues .



Mobile Application for the convenience of its consumers. The application comes with a provision to upload suggestions/ complaints along with photographs related to Dirty water, Leakage of water, Sewer overflow, Missing manhole covers on DJB's website. Bill can be downloaded and paid.

Schedule of Tankers: Uploaded schedule of timings of all tankers on websites so that the beneficiaries can oversee the schedule and do not waste their time in waiting for the tankers.

Government Policies for enhancing water efficiencies:

Free water supply: The Domestic consumers of Delhi Jal Board consuming water upto 20 KL per month will be exempted from payment of water bill w.e.f. 01.01.2014 for functional meters. Domestic consumers consuming more than 20 KL per month will be billed as per applicable tariff for their full water consumption. This gives a sense of water conservation to the consumers to keep their consumption within 20KL/Month to avail free water.

Water & Sewer Development Charges: Water & sewer development charges have been reduced from Rs 500/- to Rs 100/- per sq. m. of plot areas so that more and more consumers are registered.

Penalty for unauthorized connections: Penalty for regularization of water connection has been reduced from Rs 33000/ to Rs 1800/- only to encourage illegal consumers to legalize their water connections

Various facilities: Facility of self meter reading, generation of bill and payment online by the consumer through Mobile App: M-seva

Incentives for RWH & Recycling plants: To encourage installation of Rainwater harvesting system and using recycled water Delhi Jal Board gives 10% incentive on water bills for using Rain Water Harvesting System and additional 15% for consumers having their own Recycling Plant to use treated effluent for non drinking purposes.

Telescoping Water Tariff: Delhi Jal Board has designed a telescopic water tariff by which if any consumer consumes more water, he has to pay more. Higher consumption water goes to the higher slabs of water tariff. Hence, it discourages consumers to use less water.

Conclusion:

To enhance further water efficiencies, Delhi Jal Board is switching from manual to mechanical means and outsourcing various activities to ensure quick disposal of water related complaints. Zonal services have been further connected with higher officers to address the complaints and their quick disposal. In future, Delhi Jal Board may become the state of art water utility department by adopting best management practices.

*View expressed by- **Er. R.S. Tyagi**, Former Member (WS), Delhi Jal Board*

Source: *Delhi Jal Board*

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Towards Net Water Positive Towns

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» ISHITA JALAN
Hydrologist, CSEI-ATREE

India currently has less than 1000 m3 of renewable freshwater per person annually, making it one of the most water-stressed countries in the world. With India's economy accelerating to become the world's third largest by 2030, there is increasing pressure on the country's natural resources, groundwater in particular. Even as demand for water by cities, agriculture and industry has grown, the amount of freshwater resources available has stayed the same.

We need solutions that address this challenge while meeting our commitments to the SDG 6.4 target to "substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity"'.

Groundwater depletion poses a threat to drinking water security in towns

India has a high dependence on its groundwater resources as it caters to 85% of the rural drinking water supply, and 50% of the urban drinking water supply. Extraction of groundwater has exceeded its recharge in several parts of the country, with a quarter of the blocks declared overexploited or critical.

There is an urgent need to improve the groundwater situation in urban areas, particularly small towns. Groundwater depletion poses a real threat to both drinking water security and urban growth. In smaller towns, depletion may be driven by irrigation in surrounding agricultural areas. While the towns may not have any control over agricultural pumping, they nonetheless have to bear the cost in terms of urban drinking water security and municipal revenues as they have to "chase the water table". Not only do municipalities in water-stressed regions have to repeatedly invest capital in replacing defunct borewells, but just a single line item - the cost of electricity to pump drinking water - often uses up most of the budget for water and sanitation, making it difficult to sustain O&M of piped water schemes.

We need to bring aquifers back into balance, both by boosting recharge and by reducing groundwater abstraction.

This is a monumental task. India's economy is still growing rapidly, which means demand for groundwater is increasing, not decreasing. Further, in many water-stressed parts of India, every drop of water is already being used. Simply harvesting more rain often just means less water flows downstream.

So, what is to be done? One of the biggest challenges is that urban groundwater is nobody's responsibility. There are no real revenue streams associated with regulating or managing groundwater and this needs to change.

We need to develop a "groundwater economy" that aligns data, technology and economic incentives.

The first challenge is that we don't have enough data on groundwater use. If we don't even know how much we are abstracting, how can we manage aquifers? Self-supply by households and industries often goes under-reported. Programmes involving voluntary metering and reporting of borewell water use have not really succeeded.

We need to incentivise borewell owners to report. One approach that has worked in the piped supply context, is to bill users for groundwater at a high flat rate. This would create an incentive for them to install meters to demonstrate a lower level of consumption and thus reduce their bill. Another approach would be to

introduce incentives for net metering of groundwater (similar to solar), where large apartment complexes and commercial establishments would be required to meter groundwater pumping, but offset their bill through rainwater harvesting.

Incentivise corporations to adopt technologies to reduce water use

The second challenge is scaling existing efforts to reduce groundwater use. Many corporations are already addressing water-stress, through 'within the fence' and 'outside the fence' efforts. Within-the fence measures typically involve improving water-use efficiency and recycling within industrial premises. Outside-the-fence programmes typically involve watershed management projects in the immediate vicinity of the facility. These practices are already being adopted by large multinational corporations that have made global commitments, e.g., to the United Nations Global Impact CEO Water Mandate. But there is an opportunity to promote learning and scaling of these ideas through industry associations.

Invest in public infrastructure projects that promote recharge

The third challenge is figuring out where to get water to recharge aquifers in towns. Beyond rooftop rainwater harvesting in public buildings, water to boost recharge can only come from two sources -- flood water and wastewater. Municipalities could invest in Flood Managed Aquifer Recharge or Flood MAR, because urban floods generate large volumes of water in very short time periods. In contrast, groundwater recharge, particularly into deeper borewells, tends to occur slowly. Therefore, the key to harvesting floodwater is designing a space to temporarily store flood water allowing the water to percolate to deeper layers over the period of a few weeks. The land itself can serve a dual purpose (e.g. public playgrounds) in the dry months, but it must be designated as a bio retention basin to treat and store urban storm runoff.

Additionally, towns can make investments in wastewater treatment plants to treat sewage for reuse locally or within the watershed. If treated to high enough standards, the water could be released into local water bodies or directly injected to recharge groundwater.

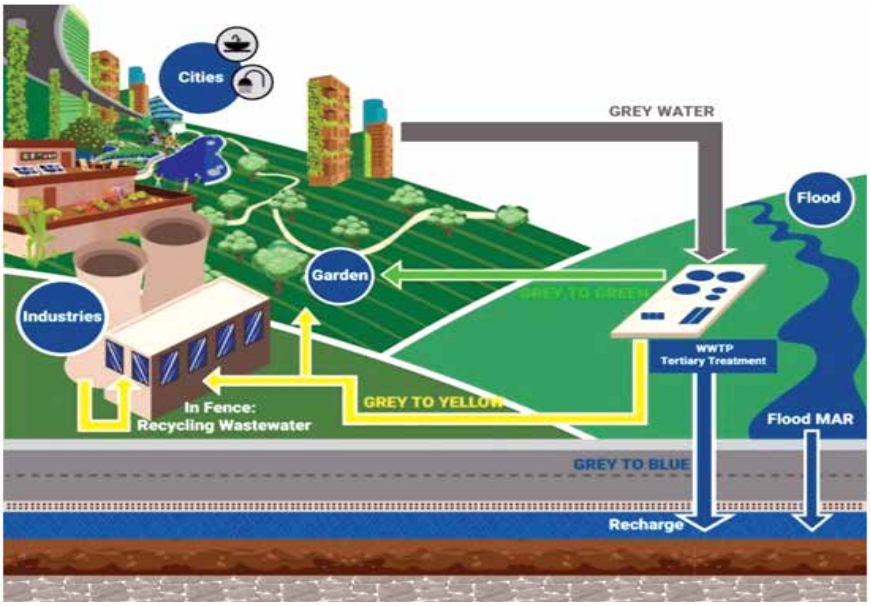

Illustration by SarayuNeelakantan and Aparna Nambiar, CSEI-ATREE, Bangalore

Create mechanisms for collective investment

While efforts by individual households and commercial/industrial establishments are much needed, they can only go so far. Ultimately, we need good public infrastructure for stormwater and wastewater treatment because there are inherent economies of scale in centralised infrastructure. The biggest bottleneck many small towns in water-stressed regions face is that they are stuck in a "low-level equilibrium". The surface water bodies are contaminated with raw sewage. As a result, ULBs must chase the water table spending ever more on pumping from deep aquifers, leaving them even lesser funds for operations and maintenance

But public infrastructure projects like sewage treatment plants and bioretention basins, are expensive. One possible solution to this gridlock would be through creating mechanisms for collective investment. i.e., allowing firms to claim water credits (similar to carbon credits) to offset their groundwater pumping by directing CSR funds towards capital-intensive public projects. This would create a mechanism to unlock financing for wastewater reclamation and Flood MAR. Companies in turn, could claim net water positivity by purchasing or selling water credits. With proper enforcement, this could address the twin problems of urban water body pollution and groundwater stress.

In summary, solving India's urban groundwater crisis through improving water-use efficiency to address SDG 6.4 is possible. But we need to create a groundwater economy. To achieve this, we need better data. We also need to innovate technology solutions that work in private and public contexts. Finally, we need and mechanism to unlock financing to ensure scale.

Views expressed by **Dr. Veena Srinivasan** and **Ishita Jalan**. Dr. Veena Srinivasan (veena.srinivasan@atree.org) is a Senior Fellow at Ashoka Trust for Research in Ecology and the Environment (ATREE), where she is the Director of the Centre for Social and Environmental Innovation (CSEI). Ishita Jalan (ishita.jalan@atree.org) is a Hydrologist at CSEI-ATREE.

Making Power Utilities Smarter

Elets Technomedia, in association with SAS and e-Gov magazine as its knowledge partner, organised a webinar on "Power Utilities Conclave 2022" with an aim to make our utilities future ready.

The discussions in the webinar revolved around digital transformation shaping utilities and the need to do more on leveraging technological innovation and tools like data analytics, AI/ML or drones etc to make our utilities and energy smarter and futuristic. The virtual dialogue underscored the importance of renewable energy integration into the grid and the steps to bring down AT&C losses as contemporary times demand.

The virtual gathering witnessed enthusiastic participation from senior utilities administrators and leaders from various states of India as well as the industry experts from SAS who deliberated on the topics at length and shared their unmatched insights on new-age innovations, challenges, and opportunities to ensure future-ready and smart utilities taking shape.

Curbing AT&C losses: key to reach last mile energy connectivity

The Maharashtra government has decided to procure 50 per cent of its power from renewable energy generators located within Maharashtra. There are lots of facilitation provisions provided in the amended renewable energy policy. Drones and its thermal imaging features are being used to monitor energy assets and to do away with the manual patrolling of transmission towers. Highlighting this **Dinesh Waghmare**, CMD, Maharashtra State Electricity Transmission Co. Ltd., Government of Maharashtra, share his thoughts at Power Utilities Conclave 2022, organised by Elets technomedia.

Despite various challenges arising due to covid 19, Maharashtra secured number 1 ranking in terms of power generation in the country, said **Dinesh Waghmare**, CMD, Maharashtra State Electricity Transmission Co. Ltd., Government of Maharashtra.

"Notwithstanding the disruption in coal supply chain, Maharashtra managed to generate 9000 Megawatt of electricity and provided 24*7 power supply to the state. In the last financial year, 28000 Megawatts of power were transmitted in Maharashtra which is a record in itself," highlighted Waghmare adding that state's biggest distribution company – Maharashtra state electricity distribution company had, till then, transmitted 24000 MW of power.

In the renewable energy sector, he said that they brought some complementary policies like non-agricultural tax exemption for solar and wind generators and also the single window system for renewable energy developers. They also exempted electricity duty for all captive renewable energy generators.

"The Maharashtra government has decided to procure 50 per cent of its power from renewable energy generators located within Maharashtra. There are lots of facilitation provisions provided in the amended renewable energy policy." he further emphasised.

» DINESH WAGHMARE
CMD, Maharashtra State Electricity Transmission Co. Ltd., Government of Maharashtra

Speaking on technological intervention taking place in Maharashtra, he said, drones and its thermal imaging features are being used to monitor energy assets and to do away with the manual patrolling of transmission towers. They also have put in place 22 substations for remote monitoring and control. They have also envisaged VSAT system for improving visibility of our substation and transmission lines.

Terming the aggregate technical and commercial losses (AT&C Losses) as the biggest challenge, he said substantial steps were being taken to overcome that. "In the distribution sector, lots of recovery is pending and also the financial status of these distribution companies is not very healthy" he added.

He added that renewable energy is basically going to be a thrust area for them. They have set a target of 17000 MW of energy to be generated in the next 4-5 years, out of which 12500 MW is going to be from solar energy. According to him, renewable energy integration is also one of the challenges they are facing.

"We are working on revamping the distribution sector scheme. We are leveraging technology like data analytics, drones and AI & ML in this regard. Out of MSEDCL 2.5 crore consumers, we have targeted 1.5 crore for installation of smart prepaid meters which would cost us 11.5 crore rupees. The installation of SCADA systems in major urban areas is also in our focus." he concluded.

Telangana Utility Success story: a case in point

Telangana as a region used to reel under continuous energy deficit. But since its inception as a state, with conducive policies and administrative decisions, it has made a remarkable turnaround in taking out its utility from darkness to brightness. **Gopal Rao**, Chairman and Managing Director, the Northern Power Distribution Company of Telangana Limited, Government of Telangana, highlighted this while speaking at Elets Power Utilities Conclave.

Leveraging emerging technology, we aim to make our utility futuristic and analytics-driven, said **Gopal Rao**, Chairman and Managing Director, the Northern Power Distribution Company of Telangana Limited, Government of Telangana. "Before the inception of our state, Telangana would frequently witness drastic utility failures and power breakages. Even industries used to face 2 days of power holidays. Agriculture too was not provided with a minimum of 6 hours of continuous power which resulted in failure of transformers and drying up of agricultural land." he added.

When Telangana upgraded to take the shape of a state, the government of the day started taking initiatives and policies to turn around the image of power utility. Professionals and people with expertise in the energy field were given administrative charge of the utility and energy department. The government invested a hefty sum of 36000 crore to upgrade and modernise its power infrastructure. As a result, he said, while other states are reeling under the fiscal losses, Telangana is comfortably providing 24*7 free electricity to the people of the state, including agriculture.

Highlighting the transformational role played by the power utility in the state, he said Telangana was easily able to meet the energy demand of 14160 MW. He said the state government was constructing

» GOPAL RAO
Chairman and Managing Director,
Northern Power Distribution Company of Telangana Limited, Government of Telangana

gas-based stations of 220KB, 132KB and 33KB at Hyderabad. He said per unit capacity was 2000 in Telangana as against the central government's 1300. With such a transformation, he believes, the state of Telangana is flourishing and ready to show light to other states.

"The criticality of uninterrupted and affordable power supply can be gauged from the fact that even to purify air and water, the country today needs electricity," he added.

Speaking about the technological advancements of the state in the power sector, he said using modern technology, telangana has made a big turnaround in taking out its utility from darkness to brightness. The state also aims to use technology to achieve high operational efficiency and safety.

"NPDCL has 63.8 Lakh consumers out of which 12.51 Lakh are agricultural consumers. Agriculture consumers dominate the energy consumers list. With conducive policies like giving highly subsidised energy to farmers, we have helped our farmers flourish and enhance their income level. Earlier, paddy farmers would depend on Andhra and Punjab for electricity but today with 24*7 supply of power, the state has become paddy surplus and is exporting it to other states. " added Mr. Rao.

He said despite Telangana's highly subsidised agriculture where 60 per cent of the people enjoy free electricity and where revenue comes from only 40 per cent, the state had managed to bring its distribution loss from 14 per cent to the current rate of 10 per cent.

Highlighting the mission of NPDCL, he said the organisation aims to become one of the best Power Distribution Utilities in the Country, with high customer focus, financial strength and operational efficiency. "We aim to provide safe, reliable, uninterrupted and quality power to all its customers at a competitive cost and a reasonable return to all its stakeholders duly following sound commercial practices and business ethics." he concluded.

Tata Power transforming power utility in Odisha

The Northern Odisha Distribution Limited' business was recently taken over by Tata Power given the energy infrastructure in Northern Odisha had been in very bad condition, said **Bhaskar Sarkar**, Chief Executive Officer, TP Northern Odisha Distribution Limited, Government of Odisha.

"In the northern part of Odisha, The condition of the utility network was poor. We were facing maintenance issues and transmission issues. In order to overcome that, we focus on greater usage of emerging technology like analytics, tools and AI&ML to make a turnaround." added Sarkar.

Speaking on technological integration, he said data analytics, Artificial Intelligence and Machine learning can be leveraged to make accurate demand

predictions or forecasting and in effective renewable energy integration.

"RE integration has a lot to do in doing proper weather forecasting. We have been trying to integrate our system with the IMD database and getting some insights but there are certain issues which we are facing. So, we have also planned to link our airlines database for weather forecasting." he added.

Speaking on meter reading, he said in due course of time there will be smart meters installed in Odisha. Meter reading is the fundamental for correct billing and correct revenue, but as of now there are some issues in the meter systems which could affect the revenue and other aspects. He also talked about the issues faced, such as suppressed meter reading, issues of table-top meter reading, meter reading not reaching the sight.

He concluded by highlighting the importance of AI in the sector of power and how it can be very useful. He also added about the integration of SCADA, GIS, ADMS system and the CRM which is a great form of AI and could be of great help to a distribution company.

"Banking of energy between states can address power crisis"

In the power sector, things are changing rapidly in terms of power generation from thermal and fossil fuels to renewable energy sources, and the weight is being given to making our energy smarter. **Anil Kolap**, Director (Operations), Maharashtra State Electricity Transmission Co. Limited, Government of Maharashtra, highlighted this in the Elets organised power utilities conclave 2022.

According to him, the challenge of integration of renewable energy into the grid is paramount and technological innovation should be explored to make the process efficient.

He said in Maharashtra, the wind usually is very strong in the monsoon season when the demand is not that high, but given the demand outpacing the supply of energy in the state, it is important to efficiently integrate those renewable energy into the grid. He then suggested that MSETCL could also look into the integration of trapped wind energy.

Exploring the importance of energy swapping or efficient distribution and transmission of energy between states, he suggested that banking of the power could be a good option. He said, because in the atmospheric condition of Northern India, the demand is higher, whereas Maharashtra has low demand, so power can be shared between states. This approach can be significant from a grid management point of view.

Talking about storage of renewable energy for its efficient use, he said when the demand soars in Mumbai, this stored renewable energy can be utilised in meeting the demand. For this, effective battery storage, grid management and

grid manoeuvring must be taken care of. He said we can leverage emerging technologies like analytics or AI/ML in that regard.

"We are planning to collaborate with SAS for various data management and analytics to use the SCADA's data and inputs to properly forecast the energy demand, so that we can have effective load management and load forecasting," he concluded.

SAS making Utilities smarter

Highlighting the significant investments made by the government on technological aspects in the power sector and to bring noticeable return of investment on the same, **P Praveen Rao**, industry expert - SAS India, shared that SAS as an organisation has been facilitating the transformative change taking place in the utility sector in Telangana and is ready to do more on this aspect.

Detailing out various measures as to how the Indian government is tackling various challenges in the energy sector post-covid, he shared three important points which need to be taken care of. "First point is, to address the needs of a citizen, a decision support system has to

be piped up and I think that is the most critical component which needs to be improved. Secondly, on the revenue assurance, there should be certain technologies taking care of that aspect as well. The revenue should be going up and the decision support system should be supportive in terms of revenue and DISCOMs companies should be fetching those revenues. The third is the asset performance. There is a huge investment in the assets, there is a huge setup of assets so certain rules are required to manage those assets," he added.

Speaking on the role of emerging technologies like Data Analytics, he said instead of interrupting the existing operations of an organisation, it empowers them to take the decisions. "SAS has more than 560 power companies across the world and they are doing remarkable work in areas such as forecasting, managing of assets, managing compliance, customer analytics, portfolio, meter etc." he concluded.

Haryana undergoing energy transformation

Explaining the fundamental work of 'Uttar Haryana Bijli Vitran Limited', **Dr Saket Kumar**, Managing Director, Uttar Haryana Bijli Vitran Limited, Government of Haryana said his department had been doing phenomenal work to ensure reliable and quality power at reasonable and competitive tariffs to its consumers in order to boost agricultural, industrial and overall economic development of the state and thus become the best distribution utility of India.

"We supply power to the 10 northern districts of Haryana and have a total connected load of 14,344 MW. With a consumer base of 35 Lakh consumers, the revenue generation is 13,738 crore rupees," said Dr Saket adding that over the past three-four years, Haryana has done well in loss reduction.

Under the "Mhara Gaon Jagmag Gaon scheme", he said that they took a large-scale replacement of conductors with cables and took out the old metres and also other initiatives, due to which their losses came to a reasonable level and they were also recognised by the Government of India. They were also ranked second in the 9th Annual Integrated Rating.

Speaking on the technological intervention, especially in terms of electro-mechanical in power utility, he said, they have engaged project management consultants to fully implement the SCADA project of GOI in the state. He said there were few areas working on which the loss reduction could be further brought down. "Through the RDSS scheme, we will be adopting AI and Machine Learning technology that can be used in accurate and reliable demand

forecasting especially in order to fully exploit solar energy, alerts on theft detection and preventive maintenance and also in business support and customer services." he concluded.

MSEDCL transforming Maharashtra's utility

Maharashtra has long back recognised the importance of technology in making its utilities smarter and been marching ahead in greater leveraging of scientific innovation. **Prasad Reshme**, Director (projects), Maharashtra State Electricity Distribution Co. Limited, Government of Maharashtra, highlighted this in Elets organised power utilities conclave 2022.

"With 2.85 crore consumers, Maharashtra State Electricity Transmission Co. Limited (MSEDCL) is the biggest electricity distribution utility in Maharashtra. Except some parts in Mumbai the entire responsibility of distribution of electricity is on MSEDCL." he added.

"For the purpose of smooth running of the distribution system and good

consumer services, correct billing, correct reading, reduction in AT&C losses, load forecasting, all you require is the technological advancements or technological updation in the distribution utility." he added.

Speaking about the technological route taken by MSEDCL in transforming the utility, he said MSEDCL has developed a centralised IT system, which has eventually helped the utility in reducing the billing complaints and the bills are generated with almost 100 percent accuracy.

They have developed a mobile application for the consumers rendering them enjoy different services under one room. Steps for improvement of collection efficiency by developing an online collection system have been taken. The in house developed system known as OCCS (Online Cash Collection System), gives the consumer the flexibility of paying bills from sitting anywhere.

He concluded by saying "Artificial Intelligence is the future of distribution utilities." egov

KSEBL aims to transform power utilities in Kerala

Kerala State Electricity Board Limited - KSEBL is one of the best power utilities in India and the driving force behind development of Kerala. **Dr S.R Anand**, Director (Transmission System Operations, Planning and safety), Kerala State Electricity Board Limited, Government of Kerala, highlighted this in Elets organised Power Utilities Conclave 2022.

Speaking about leveraging emerging technologies, he said, in Kerala, there had been limited use of such technologies except few areas such as weather forecasting and soil forecasting, but with rapid adoption of such technologies elsewhere, the state also aims to leverage those technologies in making their utilities smarter and efficient.

Referring to the energy roadmap ahead for Kerala, he gave major thrust on installation of smart meters. The KSEB hopes to have a little over 1.33 crore smart prepayment meters in place by December 2025. He said the grid required control over the consumer. "Consumers are not direct consumers now, they have become passive now. So, we need to have a bit of control over them as has been the case in Europe and USA for effective distribution." said Dr Anand adding that some key areas like supply side management, pricing of pontracts, metres analytics and reduction of operation and maintenance (O&M) cost, need greater focus should to bring real transformation in the energy sector of India.

He concluded by stating that the integration of solar energy and wind

energy has been a challenge and soon as the renewable energy usage increases, there would be greater need of using AI and ML as human interface would not be able to handle the systems. egov

C-DAC Initiatives in India's Digital Mission

To make India a digitally empowered society, the Digital India programme was introduced in 2015. C-DAC, an autonomous scientific society under the Ministry of Electronics & Information Technology (MeitY), has created a number of national projects to support the online public service delivery system and has been supporting the digital mission. In an exclusive interview **Kapil Kant Kamal**, Joint Director, C-DAC Mumbai, shared the transformative initiatives of C-DAC with **Nisha Samant** of **Elets News Network (ENN)**. Edited excerpts

C-DAC has been instrumental in promoting digital acceptance across major public sectors and Govt. entities. What are the key projects or solutions in EGovernance?

Centre for Development of Advanced Computing (C-DAC) is an Autonomous Scientific Society under the Ministry of Electronics & Information Technology (MeitY), Government of India. C-DAC is involved in developing end-to-end state-of-art products, systems, services and solutions. C-DAC has been at the forefront of the Information Technology (IT) revolution, constantly building capacities in emerging/enabling technologies, innovating & leveraging its expertise, skill sets to develop/deploy IT products and solutions for different sectors of the economy.

Government agencies developing public digital services in a number of industries, including transportation, health, education, agriculture, logistics, mobile computing, etc., have received technical assistance from C-DAC and key initiatives thanks to its work. The standard, smooth interface provided by these initiatives and solutions will make it simpler for people to access services. Modern technology and standards were incorporated into the architecture and development of these platforms to ensure interoperability and encourage data sharing for improved online services.

» **KAPIL KANT KAMAL**
Joint Director, C-DAC Mumbai

To make India a digitally empowered society, the Digital India programme was introduced in 2015. Additionally, C-DAC created a number of national projects to support the service delivery system.

Some major e-governance solutions / services of C-DAC are:

- **e-Pramaan (MeriPehchaan):** A National e-Authentication framework to authenticate users safety and security for accessing services through desktop as well as mobile platforms. E-Pramaan also provides Single Sign On (SSO) to various e-Gov services and is a part of Nation SSO – "MeriPehchaan" which was launched by Hon'ble Prime Minister Shri Narendra Modiji in Digital India Week, on 4th July 2022. e-Pramaan provides multiple factors of authentication such as password (Text, image), OTP (SMS, email, smartapp), Digital signatures (provided by Indian CA) and Biometric (Finger, IRIS, Face) authentication. Biometric authentication is carried out using Aadhaar. The solution not only provides authentication but also ensures the security for which it has

many fraud management techniques implemented. It also has identity verification using Aadhaar, PAN, Driving License etc which helps in mapping the virtual identity to physical identity especially essential for e-Governance services.

- **Aadhaar Data Vault:** IDs like Aadhaar are sensitive data and should be stored securely. Aadhaar data vault stores Aadhaar numbers in an encrypted format and generates a reference number to access it. Hence, the Aadhaar number is locked securely in the vault with its decryption key in Hardware Security Module (HSM). The reference number is different for each service. C-DAC provides Aadhaar Data Vault as a solution as well as a service.
- **C-DAC's Aadhaar Ecosystem:** Aadhaar-related authentication services are accessible only through ASA and AUAs who are trusted partners of UIDAI for providing Aadhaar services. C-DAC is an ASA as well as AUA provides access to various Aadhaar Services such as auth, e-KYC .
- **Mobile Seva:** Government uses SMS services extensively to communicate with their citizen users. Mobile Seva is a Platform to deliver government services to citizens over mobile devices using SMS, USSD, Voice, LBS, and/ or mobile applications. More than 4000 departments are making use of this platform which provides these services on very economical charges. The infrastructure is such that it is handling more than 70 crore transactions per month.
- **mSeva AppStore:** It is India's own indigenously developed very secured and trusted app store providing a great opportunity for mobile app developers to host their apps and trust guarantee. The apps go through rigorous security tests before hosting, thereby providing security assurance to the citizens while downloading the apps from the Appstore. Like all other Appstore, there is a rating system, feedback system, recommender system, and app classification available on mSeva Appstore. It's a great opportunity for Indian mobile app developers to host their applications.
- **eSanjeevani:** A web-based comprehensive telemedicine solution which has served 68,619,839 patients till date. It extends the reach of specialised healthcare services to masses in both rural areas and isolated communities. It is used to provide medical education to interns, people across various Common Service Centres (CSCs), etc.
- **e-Hastakshar:** It is C-DAC's indigenously developed online e-Sign service which facilitates digital signing of electronic documents to citizens in a legally acceptable form. Any individual with a registered mobile number with Aadhaar can sign a document anywhere and anytime based on on-line authentication services of Aadhaar. C-DAC is also an empanelled eSign Service Provider (ESP) and a Certifying Authority (CA).

mSeva AppStore has hosted more than a thousand apps for Citizen & Department trust. The AppStore Framework now has opened for all entities of the society to host their secure apps freely. It's a big initiative of GoI keeping in mind the welfare of the Indian mobile app developers and citizens of India as the indigenously developed Appstore ensures the security and authenticity of the hosted apps.

The governments in India have gone for revamp with rapid digitisation of public service. What is the role of Mobile Governance in the digital-led future?

The aim of the government of India is to promote e-Governance & m-Governance schemes, with the unveiling of the Digital India Programme. The overarching vision of the programme is to transform India into a digitally empowered society and knowledge economy. With 1.38 billion people and two-thirds of them below the age of 35, the world's largest youth population "India" is poised to become one of the world's leading markets in Mobile Apps. This surge can be considered as an opportunity to regulate and organise this industry for promoting an indigenous app hosting platform. Government backs the need for a trusted indigenous platform for mobile apps by keeping the hunt on in between various availability.

With the implementation of Mobile Governance platforms, citizens can avail of integrated public services through multiple mobile-based channels in a seamless and timely manner. This will benefit citizens to keep a track of Government-to-Citizen (G2C) communications and transparently receive timely updates.

Mobile Seva' is a countrywide initiative under mobile governance that aims to enable all government departments and agencies to provide services through

various mobile channels such as short message service (SMS), integrated voice response system (IVRS), Geo-fencing, mobile applications, and Appstore. mSeva AppStore has hosted more than a thousand apps for Citizen & Department trust. The AppStore Framework now has opened for all entities of the society to host their secure apps freely. It's a big initiative of GoI keeping in mind the welfare of the Indian mobile app developers and citizens of India as the indigenously developed Appstore ensures the security and authenticity of the hosted apps.

Can you throw some light on this National AppStore (various challenges, features, and some examples, programs, etc.?

mSeva AppStore is the government's mobile application store, set up under the guidance of the Ministry of Electronics and Information Technology under the umbrella of the 'Atma Nirbhar Bharat Mission' scheme. It is the nation's first indigenous AppStore which is a trusted and authentic app ecosystem. It has been created to provide Indian mobile application developers with a hosting platform for their mobile applications.

The mSeva AppStore is available at https://apps.mgov.gov.in. Every App goes through two levels of security check before getting hosted on the Appstore and hence provides the assurance to the citizens of the security and authenticity of the available apps. The security tests are done free of charge for the developers and complete handholding is provided to overcome security concerns of the app. The Appstore has all the features like rating system, feedback, recommendation system, app classification etc which are sought by developers as well as users. Over 3000+ organisational and individual developers are already integrated with the platform and availing services with authenticity. 8.7 cr application download by users from mSeva AppStore for accessing various government/public services anytime from anywhere.

India's smartphone market is predicted to reach a whopping 820+ million by the year 2022. As of today, India is among the largest mobile markets in the world. With such a huge market, there is a requirement for an indigenous platform for hosting Indian Apps with our own policy and guidelines for developers. mSeva AppStore takes this emergent scenario as an opportunity to provide a platform with government trust and security.

C-DAC is the implementing agency and is also maintaining this indigenously developed Appstore. Now it is open for all sectors.

What makes this National Appstore different from the group?

India's smartphone market is predicted to reach a whopping 820+ million by the year 2022. As of today, India is among the largest mobile markets in the world. With such a huge market, there is a requirement for an indigenous platform for hosting Indian Apps with our own policy and guidelines for developers. mSeva AppStore takes this emergent scenario as an opportunity to provide a platform with government trust and security.

In today's scenario, choices are unlimited when it comes to availing and providing digital services. But the best among the group will always stand out regardless of its initial phase challenges. The same goes with this native Appstore, which stands out in the market with its firm policies yet successful in gaining trust of its stakeholders by maintaining the secure App Ecosystem. It is not charging any fees that drives the Mobile App Industry to be financially independent while choosing this AppStore. Again, the intramural testing ensures the integrity and privacy of the App data. The Government, the App industry and the citizens, every stakeholder will be benefitted by this indigenous platform.

According to you, what are the challenges in the digitisation of service?

The real digital transformation is moving from silos approach to system approach and providing smooth end to end services. Earlier data capture systems were isolated from ICT, now data can be captured through mobile, IoT devices, drones, etc which are connected with IT infrastructure. So, the entire paradigm has changed. Now it is a capturing system for delivery of services and all the things dependent on the data centres and because every device is a data point and every person generates data, so at every point you require security. Now we have to increase computing power, network, bandwidth, storage, provide services/ mobile apps in local languages and to build zero trust security in all components.

Future of IT and innovations in the financial ecosystem

The world is changing rapidly. To remain competitive, organisations must be ready to embrace IT transformation in their operations, reinterpret business data, and rethink IT systems management. The future of IT presents unprecedented opportunities for well-prepared organisations.

Whether in supply chains, product development processes, or operations, organisations are just beginning to truly realise the value of AI and automation. Artificial intelligence helps companies predict and improve outcomes by finding patterns in vast amounts of previously untapped data, whether structured or not. These insights help decision-makers identify new markets and products, optimise pricing, improve forecast accuracy, and more. Machine learning is another aspect that plays an integral role in many parts of the financial ecosystem, from loan approval and credit rating to wealth management and risk assessment. But few tech-savvy financial services firms have a clear understanding of what role machine learning can play within their organisations.

Below are some examples of AI and machine learning that are actively used today:

1) Fraud Detection: The combination of more accessible computing power, an increasingly ubiquitous Internet, and the growing amount of valuable corporate data stored online creates a "perfect storm" for data security risks. Whereas previous financial fraud detection systems relied heavily on complex and robust rule sets, modern fraud detection goes beyond simply following a checklist of risk factors to discovering new potential (or actual) security threats. Actively learn and adjust.

2) Customer Service: Chatbots and conversational interfaces are growing rapidly in the areas of risk investing and customer service budgets. These assistants had to be equipped with robust natural language processing engines and countless financial-specific customer interactions. Banks and financial institutions that enable such quick queries and interactions could alienate customers from cumbersome banks that have to log into traditional online banking portals and do their own research. This application is likely to manifest itself as specialized chatbots in a variety of fields and industries.

INNOVATIONS IN FINANCIAL ECOSYSTEM

Access to digital infrastructure has fundamentally changed the Indian financial sector. Tools like Aadhaar, UPI and Account Aggregator (AA) enable fintech and banks to offer many innovative, customised and frictionless products. This led to an interesting conundrum. Most of the New Age financial products are designed for digitally savvy customers, further isolating farmers, small businesses and migrant workers.

Most of the population benefiting from this digital public goods infrastructure is digitally savvy and financially well off. Nearly 65% of India's population lives in rural areas, and mass market customers tend to be low-income. The economic flow of this segment of the population is poorly understood, creating an information gap between solution providers and target users. Extending the benefits of digital infrastructure to India's 1.4 billion people will require financial innovation to put his 65% of the rural population at the center of its design. This can be achieved by accurately mapping a customer's journey to gain greater insight into specific interactions between the customer and the financial services provider. It also helps identify and resolve gaps and points of friction in the customer experience. Mapping customer economic flows to understand customer requirements is beneficial. Most loan products today do not offer flexible repayment terms. The economic flow of a greengrocer who earns money every day is very different from that of a salaried worker. These aspects should form the backbone of any financial product design.

CONCLUSION

India's financial ecosystem needs to focus on conscious innovation. Designed to equally benefit all segments of the Indian population. Efforts should be made to better understand each customer. Only then can financial products and innovations be aligned for mass adoption. And only when our economy is fundamentally strong will we soar high.

Views expressed by **Anil Sinha**, Chief Technology Officer, Fibe

Parking and traffic need smart solutions

By- **Abhineet Kumar**, ENN

Traffic congestion, a problem that Indian cities are grappling with, has turned catastrophic. The situation is getting worse in major metro cities of India. Lack of parking space is another challenge. In India, the vehicles have increased, and it continues to be, while the parking spaces have remained the same. Vehicles continue to outnumber existing parking spaces, thus clogging roads. Incidences of violence over occupancy, deformed cars due to a space crunch, and overcharging for parking are some resultant problems.

"A city can be friendly to people or it can be friendly to cars, but it can't be both." - Enrique Penalosa

The above quotes stand true in the case of India. The cities of India cover only 3 per cent of land but contribute about 98 per cent to the country's GDP. So, we need to make our cities best in class and liveability. Our solution should be such that it must not become a problem in itself. It must be sustainable and digitally enabled. As the Indian economy is continuously growing and has recently become the 5th largest in the world, purchasing a car is no big deal. In cities and towns, a single family owns 3 to 4 cars on average. Cars being a symbol of status is what derives the continuous growth in its booming sales. As a result, cities and towns witness massive congestion on traffic and reduce space for parking. The severity of the problem is such that people in cities, generally, are forced to park their car on roads.

Being affordable, public transport, if made smarter and its infrastructure developed on the international line, has huge embedded potential in tackling problems like traffic congestion and carbon emissions.

Fighting Spirit

Policy formulation, planning and their implementation cannot alone solve the issue of lack of parking space. A world class parking infrastructure which is futuristic in outlook is the need of the hour. The authorities have to, and must, develop new ways and methods to make most of the limited parking spaces available in cities, so that Indian cities can truly be called smart cities. In this regard, construction of multi-level parking spaces which might be conventional or automated can be a good option. Given the Indian condition, the conventional method dotted with modern technology will be suitable for Indian cities as it is cost effective and can be easily managed.

If we really want to solve the issue of

parking space crunch, we have to have fewer cars on roads. So, it is quite imperative for the government and the administration as well as for us to reduce the number of cars and vehicles. An efficient and flawless public transport system will play a key role in reducing the number of vehicles on the roads. If the public

transport of a city is convenient in availing and comfortable in travelling, people may consequently stop using private vehicles and shift to the public mode. Being affordable, public transport, if made smarter and its infrastructure developed on the international line, has huge embedded potential in tackling problems like traffic congestion and carbon emissions.

Carpooling

The lack of parking space in major Indian cities is caused due to an increase in the number of cars. The sharing of rides for commuting to offices can help in tackling this problem. Carpooling not only can help in quick and efficient commuting but also in effectively checking congestion and unnecessary traffic on roads. It is a very simple concept, but the impact it offers could be significant when it comes to lessening the number of cars on the roads. If we become logical in our approach and look for necessities rather than desire, we can substantially reduce the number of cars on the road. Carpooling which is frequently used in European and western nations can offer effective results in addressing this problem if used in a planned way.

The cities of India cover only 3 per cent of land but contribute about 98 per cent to the country's GDP. So, we need to make our cities best in class and liveability. Our solution should be such that it must not become a problem in itself. It must be sustainable and digitally enabled.

Solar Panel Parking

One of the ways to benefit from excess heat generated from the parking spaces is the use of Solar panels. Solar panel canopy for parking will not only generate renewable energy but also help in addressing the parking challenge. Countries like South Korea, Japan are effectively using solar panel parking.

Solar-powered parking lots can reduce the substantial increase in the energy demand during the peak hours. Therefore, Solar parking panels can be really handy in reducing these demands.

Smart Parking Solution

Leveraging technology, many companies worldwide today offer smart parking. Their Iot-based Smart Parking Platform provides a world class unique set of technologies and data capabilities to solve parking management and congestion in our cities. Technologies like Artificial Intelligence, Data Analytics, Drones and Robotics offer endless possibilities in solving the parking or traffic problems in the country. Smart cities like Indore are using such technologies in dealing with such problems.

Way forward

The demand for parking spaces is rising sky high and it is very important to realise that our resources are limited and we have our own limitations in meeting the demand of our population. We must leverage emerging technologies in developing global-standard parking solutions. Countries like Australia, Ireland, Dubai etc. have invested both time and resources in order to reform parking strategies. They have devised efficient technological solutions like mobile applications and parking metres which makes finding parking space in such countries easy and convenient. In order to effectively do away with these problems, India needs to emulate and strategically implement best practices and global standards.

With ever increasing population and their inclination to buy their own cars as a status symbol, the parking and traffic problem has become more pronounced. If they are not effectively and strategically dealt with, they could turn cataclysmic. In light of this, Gustavo Petro's quotes- "A developed country is not a place where the poor have cars. It's where the rich use public transportation" must be the guiding principle for individuals as well as government officials in the country.

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