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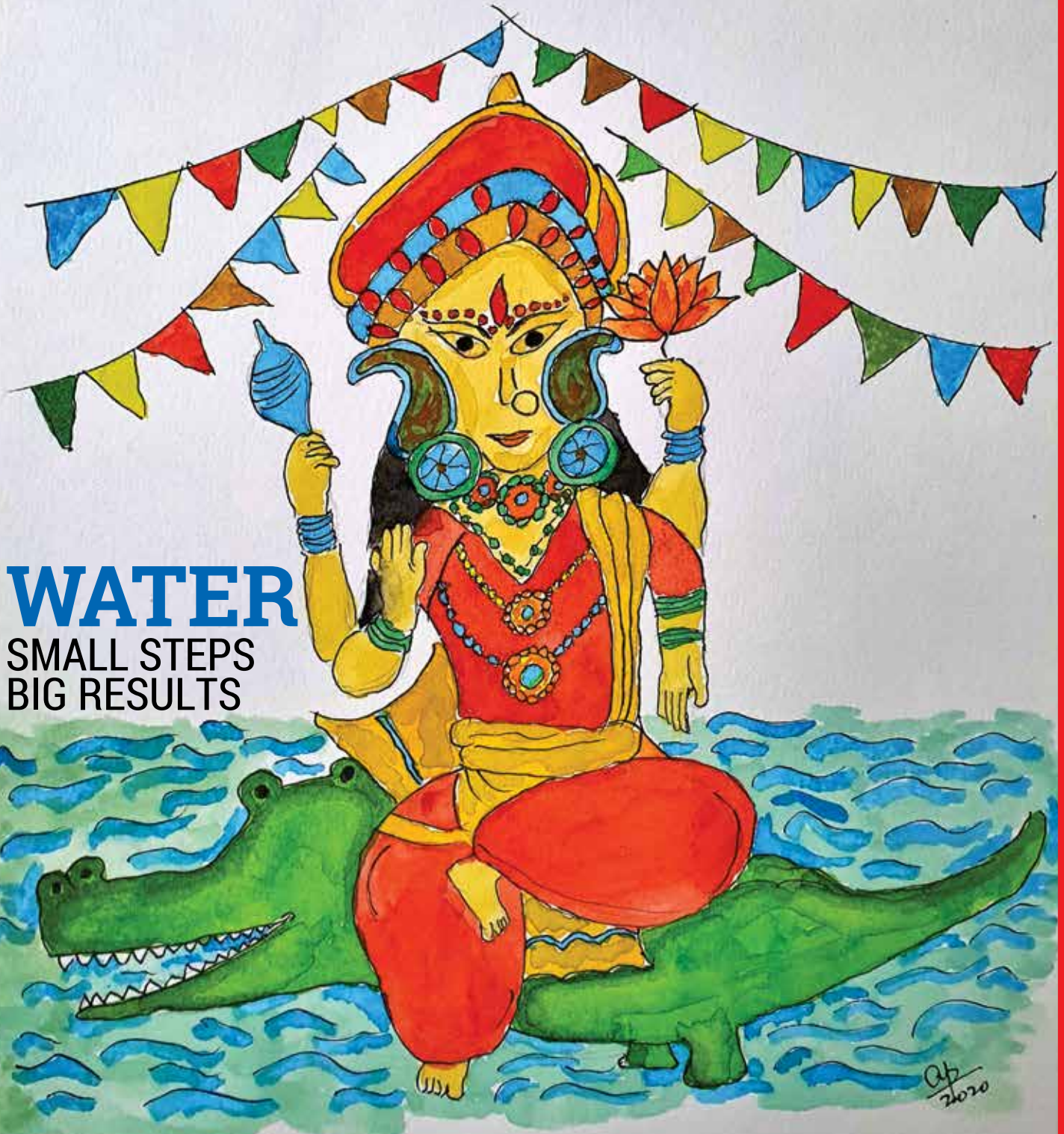
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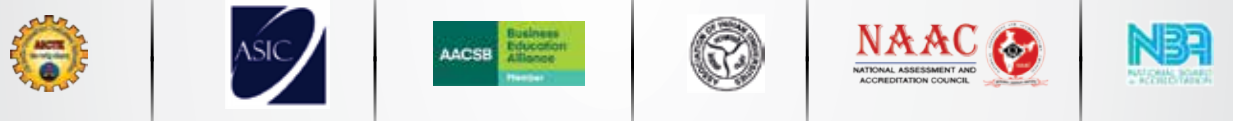
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SAVE WATER BEFORE IT IS TOO LATE

The switch box of humans, it appears, has been severely tampered with and as a result no one seems to understand things when put in a simple straight-forward language. Try calling terrorism bad and chances are you might end up being trolled for being an Islamophobe. Comment on why banning Chinese apps is a part of a bigger strategy and you might get trampled under a massive pile of angry emoticons. A rough guess is that the social media has actually massacred the art of logical discussions sans rancor because it is far easier to rush in with loud cries and swing your baton of ill-conceived arguments hurriedly tempered with uncouth words and phrases. In short, we live in an abusive online world today.

This epidemic is so wide-spread and is so evident that I am now sure that if I make a simple statement asking people to follow the ideas of PM Mr Modi and that, each of us in our own way, must save water or read about and appreciate small efforts to conserve water, I just might end up being hauled up for being a *bhakt*. All because the PM said: *'We should together resolve the water crisis by saving every drop of water. Let's start an awareness campaign to save water.'* They wouldn't even bother to find out that this quote is from the past year.

What then is a better way to convince people that conserving water is the need of the hour? Satire. Well, yes, this is the language that the social-media bitten generation understands well.

One alternative to quoting statistics, research papers, and the way conservation is going on in other countries, is to say things like:

Why bathe or shower? Just dunk yourself in

a heavy dose of a deodorant of your choice and you're ready to attend office... or even a party in the evening. And the world saves water! The added benefit is not having to buy and store towels anymore.

Why wash clothes? Just hop from one new set of clothes to another and gift the soiled one to some needy fellow. Don't forget to click a selfie and share it on Instagram as you give your old clothes away. You'll shop more and save water! Don't worry about the added expenses... just add more hours to your work-day.

Why do the dishes after eating? Use disposable cutlery, plates and whatever else you need. Order food online. You'll be a water saviour! Don't worry about the garbage piles of non-biodegradable things... you have your favourite cricketer Gambhir taking care of it.

Why drink water? Go ahead and guzzle those bottled fizzy ones that tell you: *darr ke aage jeet hai!* Save water! We know you may need to be hospitalized sooner but then even doctors have to make a living, right?

If these new-age ideas of saving water make you uneasy, pause and start thinking about saving water in earnest. Think about water-saving techniques in the bathroom and kitchen, train your house-help to clean the house with minimum water used, pour water in your glass that you will finish drinking, tell yourself that throwing garbage bags in the river aren't helping the cause, and think of every other way you can, as an individual, help in saving water.

Stop waiting for the government to do something. Frankly, it is time that each of us got serious about conserving water.

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Divya Jindal

POROSITY IN PUBLIC SPACES

People . Water . Cities

Role and impact of water in urban spaces

Public spaces can no longer be conceived as architectonic entities standing apart from its landscape and people, but a phenomenon constantly evolving from the inter-relationship of social, cultural, political and economic aspects. While globally it is understood that urbanisation is an imperative force, shaping not only the way we live in cities but also what we understand of them. Creating and fostering thriving urban places, within this paradigm shift has brought both an opportunity and challenge to construct new ideas while giving an architectonic dimension to them.

Humans are attracted to water. Historically, public and open spaces were symbolic of power, authoritarianism and influence. Water and water bodies have played a major role in defining this character in cities, even more so within public spaces and open spaces. Mughal gardens had their extensive and elaborate water drainage systems, to accented water fountains in Roman and French public realm, in Spanish plazas and gardens and reverence and reverence of ghats and baolis in Indian culture. Over centuries, water has played diverse roles in our urban lives, being a medium and reference of understanding and associating with our cultural, social and traditional roots.

However, in these intensively urbanized and unpredictable times, open public spaces and community spaces are fast transforming into aspiring, thriving places, creating the much required porosity and soft moments within the otherwise intense urban lives. It is now time that they are better associated as a medium to pause and savour those transient moments, while being a major aspect of our urban life itself. Moreover, at times this also acts as a rather humbling reminder of vast expanses of nature that we are all part of and take constant cognisance of and thus water bodies help us build a better relationship between people and cities.

‘Water Square’ Benthemplein, a little north of the Rotterdam Central Station and Rotterdam square in one such transformation of community space through water. The water square acts as not just an interactive community space for young citizens around the academic zone, it also acts an innovative way to prevent urban flooding. Designed in multiple levels with a detailed water system collecting rain water from the surrounding pavements and the rooftops of buildings around, the area retains water during the peak rainfall season, creating a series of water ponds which are otherwise open spaces with steps and additionally helps ease the stress on the city’s sewage system.

In a small yet innovative way the square has become an influential example



Image 1: Benthemplein square, during summer when the square is dry and people can use it as a sport arena and public space

of tactical urbanism for taking the load of city managements while ensuring safety, accessibility and interactive spaces for all. The square has also managed to transform a rather unsafe, mundane neighbourhood into an interactive, inclusive and sustainable space.

The square has also been recognised by the C-40 consortia & UN good practices as a good example and the Rotterdam city and other city governments across Netherlands plan to learn from the intervention and find ways to scale such interventions in the near future.

The Cheonggyecheon project in Seoul, Korea, is another remarkable example for its dramatic transformation from a seedy industrial eyesore to a nature-filled public space. Since



Image 2: Benthemplein square, during monsoon when the square has water collected through the rain water collection from the buildings around and the space transforms into a water body along the steps.



Image 3: Bentemplein square, with its multiple layers helping form different cozy spaces to socialise while helping create a cascade of water channels for different seasons

the 1940s, the Cheonggyecheon deteriorated into an open sewer and was thus paved over with concrete for sanitation reasons. Leading to the sewer being turned into an elevated freeway built overtop the channelized river, further removing it from the public over the next decades. However, similar to what likely happens to most underpasses, the area beneath and around the freeway gave way to criminal activity and illegal dumping.

At the turn of the millennium however, then mayor and future president of Korea Lee Myung-Bak successfully campaigned to remove the freeway and restore the Cheonggyecheon. From 2002 to 2005, the government ripped out the road and replaced it with a 3.6-mile restored and planted



Image 4: Cheonggyecheon project, transformed into a thriving public place with restored natural drainage system and green reserve along the drainage system

stream with parallel roadways. The mayor won support for the project by framing the project as a major flood relief channel and marketing the restoration as a highly visible, sustainable development that would boost Korea’s image around the world. To alleviate fears of traffic congestion, the government also invested heavily in public transportation, such as a dedicated bus lane.

The project is a great illustration of how vision and commitment from the leadership can help transform public spaces and make them into interventions that can help change the way not the way citizens but also how the rest of world perceives the city from outside. The way the restoration of the drain has been made into an open public space with water as a key element of the project, also helps people become more aware of the city’s history.

As in recent times, we see more and more natural water bodies, drainage systems and ecological concerns take a backseat in our political, urban and social discourses, the case of Cheonggyecheon project serves as a great reminder of how if we open and include our natural and ecological morphology into mainstream urban interventions, it can not only help bring forth delightful public spaces, but also transition towards a more sensitive, sustainable and equitable environment.

These interventions also highlight a vital concern about landscape urbanism, one which needs to be addressed from both ends of the spectrum - one where it is to engage in a discourse for an inspiring metropolitan region and on the other to think of how to create a self-sufficient urban system which makes room for its vivid ecological reserve. In the words of the famous Dutch landscape Urbanist Frits Palmboom, in his book ‘Drawing the ground -landscape urbanism today’: “to find ways to integrate all the aspects of the urban landscape into an understandable, flexible and livable whole- what the Dutch famously call “the makeable landscape””.

It is to develop a self-sustainable system through design which is equipped to manage

and evolve in this ever-changing urban and ecological background. The idea is embedded in a comprehensive understanding of the landscape morphology and designing the ground for the city as an ecological construct, whose sustainability is addressed through its design and complementing urban structure on an extensive range of scales.

Diana memorial at the Hyde Park, London is another rich reference of symbolism in architecture and creating public space and narrative. The beautiful water sculpture is designed on the concept of ‘Reaching out – letting in’, taken from the qualities of the Princess of Wales that were most loved and admired by people; in addition to her inclusiveness and accessibility. The fountain’s sculptural form is integrated into the natural slope of land in London’s Hyde Park and is designed to radiate energy as well as draw people inwards. The fountain is beautifully crafted with water running from the highest point cascading through different textures, creating patterns with water across the fountain.

The memorial fountain is an elegant illustration of integrating cultural and modern history and memory into public space, through the medium of water, careful craftsmanship and a deep sense of understanding of building public spaces that have lasting impact in our memories.

In most of these interventions the approach is not new, rather laid in history, where water acts as an active medium to communicate with the space and its people in urban public spaces. However, in distinction, Makoko floating school, in Lagos, Nigeria touches upon on a different kind of life altogether. One where life is all about floating on water, and how that transforms the way people interact with community space and water. It is a fine reference for learning to live and work with limited natural resources and adapting urban and architectural design to make room for and within that ecosystem.

The school together with community space was designed with local available



Image 5: People in the city enjoying the transformed urban space within the intense city fabric and life

materials on stilts to support the local children and women to have a designated space to socialise and study. The school has received multiple global accolades and recognition for its social impact and innovation. But then again the project has achieved above and beyond the naïve understanding of community space and its impact, and expanded our horizon and made us perceive, participate and interact with the ecological system and narrative we are all a part of, in a completely transformative way.

The lesson that these interventions in recent history are teaching is the realisation that water, landscape, and ecology in public spaces are not only a decorative element. They perform an important and critical function and



Image 6: The landscape in the polder (a low-lying tract of land enclosed by embankments) in the Netherlands.



Image 7: The memorial water sculpture as a medium for city people to interact with it while they enjoy being at the park.

has benefits that go way beyond the social aspects.

Indian mythology and religious history has helped us learn, how ghats along Varanasi, are symbolic of an entire life cycle of human life, and Indian temples closely knit the narratives of symbolism, space and sense of



Image 8: Children of Makoko enjoying the prototype for their school and community space building

association in places of worship while also serving as an important place to socialise and to some extent self-introspect.

As we are moving towards defining a paradigm shift in how we experience and transform our urban spaces in the times of climate change and global pandemics, there is a need to unlearn and re-learn our existing urban and ecological landscape through an architectonic dimension, rather than just an appearance of its physical buildings. As Italian urbanist Bernardo Secchi called it “il progetto del suolo”, the design of the ground, as the spatial articulation of the site; moving away from treating landscape as a mood map of urban interventions rather a more fundamental concern about the environment as a whole.

The principles of the approach are not new, rather laid in history, from the Dutch reclaiming and shaping land for centuries and making it an inherent part of their lifestyle, to Canadian cities like Toronto, Ottawa, and devising green infrastructure as a phenomenon of the same act. Perhaps also in Indian cities helping form our association with the rich cultural heritage, religious narrative and ecological landscape. It is now rather critical to choose from this significant standpoint, a sustainable and a more resilient urban form which can be enriched and further layered through technology, modern history and evolving perspectives of making social space.

These interventions are lessons helping us open up to opportunities to develop a new urban language, where a more meaningful discourse can be held between people, ecology and urban form... one where an extensive, fluid, and distinct urban fabric is built and layered over time, arising out of a discordant interplay of nature and culture. While, opening-up an entirely new exchange of ideas and the possibility to develop fresh ways of interacting with nature. It is in this urban dialogue where




Image 9: People in Makoko cherishing the locally crafted floating school and community space

its people will adapt and develop ingenious ways to shape unexpected places and make their cities their own. In essence, these are some of the complex urban



Image 10: Ghats of Varanasi, with children enjoying playing in the water as the day breaks

questions we need to engage in, or else will might just plague our ideas of city making by re-inventing the sameness of a banal landscape. 

The author is an Urbanist and Architect by training and currently part of the National Institute of Urban Affairs Delhi as a Research Associate. With her experience in inclusive development and her Masters in urbanism in sustainable urban management, she is currently exploring ways to develop research in the area.

References and credits

Image 1

Source: <http://www.urbanisten.nl/wp/?portfolio=waterplein-benthemplein>

Image 2

Source: <http://www.urbanisten.nl/wp/?portfolio=waterplein-benthemplein>

Image 3

https://www.c40.org/case_studies/benthemplein-water-square-an-innovative-way-to-prevent-urban-flooding-in-rotterdam

Image 4

<https://upload.wikimedia.org/wikipedia/commons/d/d0/Korea-Seoul-Cheonggyecheon-2008-01.jpg>

Image 5

<https://inhabitat.com/how-the-cheonggyecheon-river-urban-design-restored-the-green-heart-of-seoul/>

Image 6

<http://www.sfchronicle.com/travel/article/Exploring-Holland-s-charming-Polder-Country-5613997.php?cmpid=twitter-premium&t=2d9682538a0a4808f6#photo-6559430>

Getty Images, Photo Credits: Frans Lemmens

Image 7

[https://images.adsttc.com/media/images/587d/3394/e58e/ce73/5f00/003f/large_jpg/%C2%A9_Peter_Guenzel_\(2\).jpg?1484600205](https://images.adsttc.com/media/images/587d/3394/e58e/ce73/5f00/003f/large_jpg/%C2%A9_Peter_Guenzel_(2).jpg?1484600205)

Image 8

<http://www.nleworks.com/case/makoko-floating-school/>

Image 9

<http://www.nleworks.com/case/makoko-floating-school/>

Image 10

<https://unsplash.com/photos/OPWM488DfeQ>

Photographer: Shiv Prasad

THE WAY A PHOTOGRAPHER SEES WATER



Aman Chotani

H

appiness is a lot like clicking water... take the right steps and every moment becomes a representation of ecstasy. Clicking water is all about removing every little obstacle that is in the way of a good image. A good landscape photo needs an interesting foreground, mid-ground and a background. Reflective photographs come up with their additional challenges. Reflections are all about balance and symmetry in the frame. However, there are a few



guidelines that will make sure that one captures better reflections. A few steps that will go a long way to making every shot of water a lasting memory are mentioned below. I am sure these guidelines will help the budding photographer within each of us besides helping us capture water bodies and reflections on water beautifully.

Finding Still Water

The first requirement in photographing reflections is still water. Most of us think we need large water bodies to get those lovely reflections. But even a small puddle is, in many instances, good enough. What is more important is that it should be still. Even a slight breeze can cause air-induced ripples and this can make clear reflections difficult. It is believed that smaller and shallower water bodies give better reflections most of the time. The lesser the wind/ breeze, the better will be the reflections.

Someone once remarked that it is difficult to see your own reflection in boiling water... obviously implying that truth cannot be seen when the mind is ruffled and full of ripples of worldly worries. Both still water and a calm mind are essential in the world of photography so far as capturing reflections on water are concerned.

Equipment

1. Tripod

When it comes to photographing reflections, a good tripod is a must. A tripod that allows you to get as low would be most preferable. Stability and performance go together in photography and this device leads to sharper and clearer output particularly when shooting in low light or where there is motion of any type that will need to be stilled without any blur. A blur, as we all know, is what is the

main culprit in a bad photo.

2. Lens

Next comes selecting the lens. A wide or an ultra-wide angle lens is desirable in most cases. What works best for me is a focal range between 15mm to 30mm (on full frame). So far as a lens is concerned, a wide-angle is often used in clicking a landscape because of the increased perception of what the human eye sees. While clicking a reflection a photographer correctly captures the entire scene and not just a part... and if it is a part needed later, there is always the tool of cropping a picture. In photography, it is better to have a wider perspective and then crop than have a narrowed down one where the possibility of adding details is simply not there.

Camera Settings

Below are a few recommended settings for a good reflection shot:

1. As with most landscape photographs, sticking to your base ISO or somewhere close to it is the way to go. Most of us already know that the widest dynamic range, as well as the lowest amount of noise in images is achieved

at base ISO. A good photographer will know instinctively when an increase in ISO is going to be essential.

- Generally a smaller aperture works well. As a standard practice, I try to use the aperture in which the lens yields maximum sharpness. For most fast lenses, the best aperture is generally at the f/8. My general aperture recommendation would be f/8 or smaller (depending on the subject distance).

Another reason for smaller aperture in size and higher in number is to achieve the maximum depth-of-field.

- There are two possible shutter speeds that can be used depending upon one's preference. A shutter speed of at least 1/250 is desirable if



you want the reflections to be sharp. On the other hand, a smooth reflection will call for an extremely slow shutter speed which results in a sharp subject and a soft, blurred out water body around the subject, making it stand out.

Composition

1. Get as close and to a low angle as possible. Sometimes you might end up with your feet and your tripod legs in the water to get to an angle where the bottom tip of your lens is barely a few inches above the surface.

2. Mind the leading lines. They are rather important in any landscape photograph. They are even more important when you are photographing reflections, as one of the primary objectives is to attain a sense of symmetry.




The author is a professional travel and lifestyle photographer based in New Delhi, India and has explored the world documenting travel, culture and life. He works on freelance projects with travel agencies like Cox & Kings and travel magazines like National Geographic, Outlook Traveler, Travel Biz, India Today, TLF Magazine, Reative Gaga etc. These experiences include capturing stunning images of inspiring destinations including Dubai, South Africa, Singapore, Switzerland, Oman, France, Turkey, Israel, Australia, and UK. He is equally involved with wildlife projects for Deccan Odyssey, UK news agency -

Carter News and many more.

Aman has received awards from many prestigious organizations including The Siena International Photo Awards 2015 (Italy), IPA AWARD, Monochrome Photography Awards, Black and White Spider Awards, ND Awards and many more.

His work can be accessed on his website - <http://www.amanchotani.com/>

3. Have some negative space around your subject and its reflection. A very tight composition might have all the technical ingredients of a picture, but most of the time it lacks emotion.
4. Include clouds in your frame. With the subject and its reflection, the mid ground and the foreground is taken care of. But a blank cloudless sky looks boring unless you deliberately seek to make the image abstract.
5. Most of the time we seek to get geometrical mirror images. But do not limit yourself to just that. Get creative – sometimes even distorted reflections of a subject might turn up interesting.

In the ultimate analysis, water is an easy subject but at times it tends to be difficult to capture and interpret. Water and reflections on water captured well are not just aesthetically brilliant but invariably have multiple interpreted messages for almost everyone. 



Ishita Ahuja



FILMS DOCUMENTARIES & WATER

If you think films use water only to dilute whiskey in a glass or to give prominence to the curves and sensuality of a female body, think again. Water is powerful enough to identify conflict and even be there twisting and turning to push in solutions to filmi crisis. By the way, water isn't always roaring or zipping around like a super hero just saving the world, but is also providing adequate contrast to human and animal characteristics. For instance, in the Hollywood blockbuster 'Remember The Titans', it is Denzel Washington as Coach Herman Boone who says: 'A water break? Water is for cowards. Water makes you weak. Water is for washing blood

off that uniform and you don't get no blood on my uniform, boy you must be outside your mind! We are going to do up-downs, until Blue is no longer tired, and thirsty.'

Water is almost akin to an unsung hero that ensures that practices, traditions and customs should be fluid; they should be adapted differently with the changing times. Stagnant water, otherwise, poses as an incubator for all sorts of creatures. All of this and many more protean characterizations of water are done, whether it is the quintessential romanticising of the rain, the coquettish holi celebrations or the dancing and prancing around under waterfalls. Water does a lot. Even in films.

Water, by the way, has been used to create so much art. It has been an inspiration and an involved muse for many works of varying genres and amongst them are films. Film, as an art-form, is a way of expression for the creators of it, but for the viewers, it is a medium of escapism; an escape from their version of realities and more importantly, an escape from themselves. What we may not realise is that even though they take us away from our facticity for a time, they bring us closer to ourselves; understanding ourselves.

When tropes of fiction, surrealism and/or fantasy are used to tell a story or to convey a message, it provokes the audience to think, but when elements of reality, especially the ones we encounter in our daily lives, are employed to evoke a reaction or invoke a feeling, it stays with them throughout.

Water is almost akin to an unsung hero that ensures that practices, traditions and customs should be fluid; they should be adapted differently with the changing times. Stagnant water, otherwise, poses as an incubator for all sorts of creatures.

This short piece revolves around films and documentaries engineered to give you a better knowledge about the way water has been treated in the audio-visual medium in the entertainment as well as the information segments. A few films that have made their connect with water obvious are 'Flow: for the love of water' (2008) by Irena Salina, 'Water' (2005) by Deepa Mehta, 'Dunkirk' (2017) by Christopher Nolan, 'Chinatown' (1974) by Roman Polanski, and 'Water Pressures' (2013) by William Natale.

One such element is water. So versatile. Whether it is a location, setting, invigorating emotions, exemplifying figures of speech or just showing its



A still from Deepa Mehta's Water (2005)



A still from Kumbalangi Nights (2019)

beauty in one of its many forms; it is dynamic.

Take for instance Anurag Kashyap's neo-noir classic *No Smoking* (2007). Incidentally, Wikipedia says that the term neo-noir was "popularized in 1955 by French critics Raymond Borde and Étienne Chaumeton. It was applied to crime films of the 1940s and 1950s, mostly produced in the United States, which adopted a 1920s/1930s Art Deco visual environment." The bathtub is used as a channel for K to traverse between his conscience and sub-conscience. Water, here, although used as an accessory to exhibit the transition also indicates the fear, anxiety and the stifling conundrum (courtesy, Baba Bengali) that has essentially robbed him of his free will.

Fear and anxiety, suppression and depression, fluidity and formidability, all can be expressed through water. It is one such element which can act and serve as an inspiration, as both, the foundation of a film and an adjunct to it.

Off the top of my head I can think of *Chinatown* (1974), the film with Jack Nicholson and Faye Dunaway in lead roles. The story is about a cop turned private investigator who discovers that there is an imperilling malfunctioning in the Department of Water and Power of LA, all in direct

relation to the case that he has to solve. It is loosely based on Los Angeles' fight over Owens Valley water supply in the 1910s. Even though it is a noir classic, Polanski and the writers presented the story quite subjectively and the idea was clearly drawn from the public's preoccupation with corruption and feudal bureaucracy that had led people to go to insurmountable lengths to feed their cynic and greed; taking away water.

An even better piece that has revealed the immoral and unscrupulous practice, trend and trade

Fear and anxiety, suppression and depression, fluidity and formidability, all can be expressed through water. It is one such element which can act and serve as an inspiration, as both, the foundation of a film and an adjunct to it.

of commoditization and privatization of water is the award-winning film, *Flow: for the love of water* (2011). It talks about the water crisis that we are experiencing globally, the tragedies that have happened and are happening in its stead, our future if it continues to happen and the truth about who, today, 'owns' water. "Water is a transient gift on earth for life. Moving and flowing. Things that are transient, you don't own it."

As the rain pours down heavily and the camera establishes the opening scene in *Rashomon*, the temple is barely standing tall in the downpour as the commoner comes rushing in. Soon, three characters start narrating and discussing various versions of an instance that took place in the woods. The main aspect that tells us the difference between times is Kurosawa's use of rain. It is raining in the opening scene of the film. It is used throughout the course of the film as an editing transition to bring us back to the present.

"The water is 'blooming' with sea sparkles. Why don't you take her out and show it to her?" Bobby asks Bonny to take Nylah out to show her Kavaru in the Malayalam blockbuster *Kumbalangi Nights* (2019). The shining waters of Kumbalangi are a product of bioluminescence that occurs in brackish waters. The said sea sparkles are a metaphor of the similar sparkling chemistry between Nylah and Bonny.

Likewise, the present state of dal lake in Jammu and Kashmir is a tell-tale sign of the decaying that the state and more so, the people, have had and continue to go through in the docu-drama *Raqs-e-inquilab* (2019). Once idiosyncratic lines by Jahangir

Gar firdaus bar-rue zamin ast, hami asto, hamin asto, hamin ast (translation: If there is a heaven on earth, it's here, it's here, and it's here), do not suit the place anymore. A place once known to be the beauty and pride of an entire nation is reduced to 'the world's most militarised zone'.

It would not be fair to conclude the article without mentioning Deepa Mehta's final film in the trilogy, *Water* (2005). It is a story about the mistreatment and prejudice done with the Hindu widows, set in the holy city of Banaras of the 1930s. The film is shot from a child widow's point of view who doesn't understand the relevance, concept or significance of the tradition that she is being forced to follow. More importantly, the film elucidates the capitalistic mind-set of the people that have stooped so low as to mould religions to their avarice.

Well, water does support the subtle and not-so-subtle romantic interludes in life as well. Just look at the way Ryan Reynolds in *Deadpool 2* expresses his love: 'I loved her. I loved her like an ocean loves water.' Or the way water rises in importance in 'The treasure of the Sierra Madre': 'Water's precious. Sometimes may be more precious than gold.' So yes, water and films do have a bond that goes well beyond being a mere show-piece in an audio-visual treat. 📺

The author has just completed her studies in journalism and loves calling herself the human equivalent of an old fashioned cocktail who straddles the fence between serendipity and zemblanity.



A still from Raqs-e-inquilab (2019)

NIRMALLYA MANDAL
 Director
 Ecociate Consultants Pvt. Ltd

DECODING TECHNOLOGY FOR WATER STRESS REDUCTION IN INDIAN AGRICULTURE

India receives an average of 4,000 billion cubic meters of precipitation every year. However, only 48% of it is used in India's surface and groundwater bodies. The NITI Aayog has released the Composite Water Management Index (CWMI) which signifies that around 54% of the country is water stressed. Agriculture is the biggest user of water, accounting for about 80 percent of the water usage and 80% of farmers using groundwater to irrigate their lands. While various technological interventions are being envisaged for addressing water stress in agriculture, the technology needs

to be packaged along with adequate policies, support services, markets etc. as these are critical factors to be effectively implemented at scale. This article explores the need and appropriate placement such technologies to achieve desired results.

Hidden under the Covid-19 crisis and amidst the generous and erratic rains of 2020 which resulted in floods in many regions, India continues to face a severe water crisis. The NITI Aayog has released the Composite Water Management Index (CWMI) in 2018 which assesses key water resources-related indicators considering various aspects of groundwater, water body restoration, irrigation, farm practices, drinking water, policy, governance, etc. CWMI estimated that around 21 Indian cities and their nearby districts will face water crisis in 2020. 54% of the country is under water stress (Ref Fig 1).

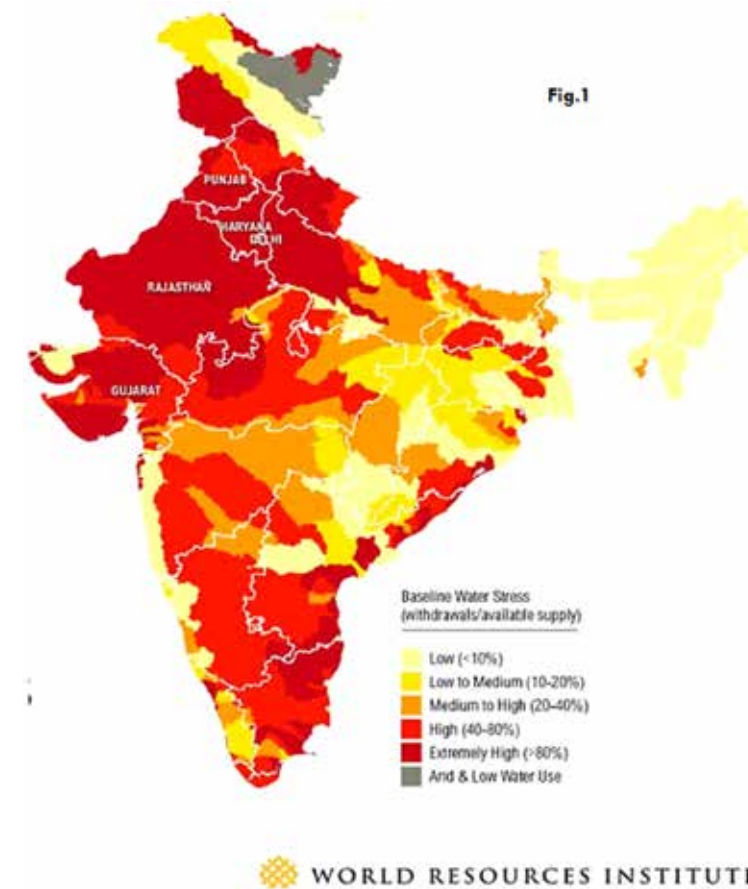
of storage processes, lack of adequate infrastructure, inappropriate water management has created a situation where only 18-20% of the precipitation is used in India, water availability per-capita was over 5000 cubic meters (m3) per annum in 1950, which now stands at around 2000 m3 and is projected to be 1500 m3 by 2025 with deteriorating quality and gross inequalities between basins and geographic regions.

Agriculture accounts for about 80% of the Indian water usage and 80% of irrigated lands uses groundwater as irrigation source. There is pressure for diverting water from agriculture to other sectors but the re-allocation of water out of agriculture can have unforeseen and dramatic impacts on agriculture. It is projected that the availability of water for agricultural use may be reduced by 21% within a couple of years, resulting in reduced yield of irrigated crops, especially rice, in-turn resulting in inflation and food insecurity among poor. India is thus required to produce more from less water resources and thereby use water resources judiciously and optimally.

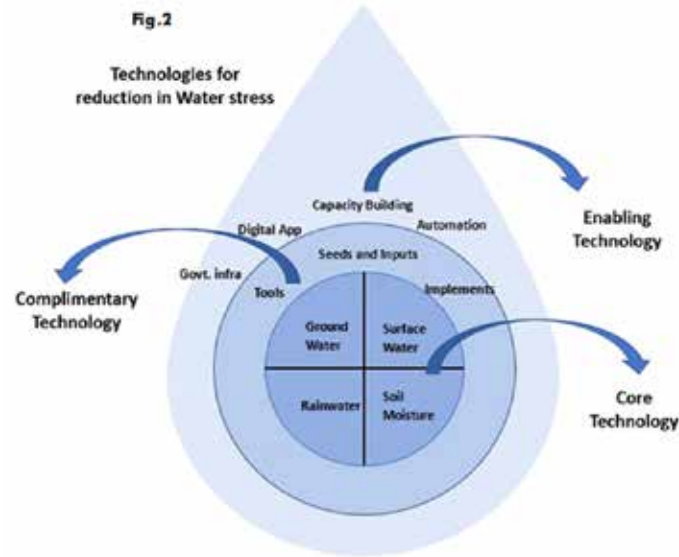
Since irrigated land consumes most of the available water resources, it is necessary to improve the efficiency of the existing irrigation systems to meet the increasing demand. Improved water management by use of effective agricultural practices, suitable cropping pattern in conformity with soil and climatic conditions, prevention of run-offs, water-saving irrigation technologies like drip & sprinklers, control of soil moisture losses by mulching, organic fertilizer usage, etc. are the need of the hour.

Technology for water stress reduction in Indian Agriculture

Technologies are often classified into hardware, software, and orgware. Hard technologies, or hardware, refer to physical tools, infrastructure development etc.; soft technologies, or software, refer to the processes, knowledge and skills required in using the technology; and organisational technologies, or orgware, refer to the ownership and institutional arrangements pertaining to a technology. In the water sector, 'hard' technologies



India receives an average of 4,000 billion cubic meters of precipitation every year but only 48% is retained in surface and groundwater bodies. Dearth



refer to structures such as ponds, wells, reservoirs, and rainwater harvesting equipment, whereas ‘soft’ technologies are those applied to improve water use efficiency, like water recycling techniques. Orgware include institutional mechanisms like water-user associations, water-pricing systems, etc.

Alternately, technologies reducing water stress may also be classified into core technologies, complimentary technologies and enabling technologies, respectively (Refer Fig2). Core technologies constitute of products and services to enhance quality and availability of ground water, surface water, rainwater harvesting and maintenance of soil moisture for agricultural use. A set of products and services also address water stress in agriculture through indirect or complimentary technologies supporting core technologies, like drought resistant seeds, water efficient tools, machines and implements used for non-irrigation related functions in the Agricultural value chains like processing etc. Lastly, enabling technologies find their relevance in servicing core and complementary technologies through functions like development of supportive govt. infrastructure like farm ponds, capacity building of farmers or stakeholders on farming that include water use efficiency etc.

Implementation programs addressing water stress in Indian Agriculture need a combination of all three technology types in a mutually supportive manner

to ensure sustainable and effective results. It is also important to understand that technology for addressing water stress need to be delivered in a package and that any standalone innovative technology is extremely difficult to be effectively scaled up Indian Agricultural context. The critical components which are required for effective implementation of technologies are:

- (i) commensurate support services including financial services, logistics, marketing etc.
- (ii) good governance and organization of farmers in the form of Farmer producer organisations (FPO), water user groups etc. along with enhanced capacities and awareness levels of farmers and
- (iii) supportive government policies in the form of appropriate investments, infrastructure development, energy policies, etc. particularly when technologies are promoted by Business institutions including start-ups.

Technology Positioning

Addressing water stress in Indian Agriculture calls for effective positioning of technologies for large scale impact. Technology, especially from private

Fig.3 Techno-Governance Matrix

Technology	<p>S3- Ordinary governance with Advanced technology</p> <ul style="list-style-type: none"> Individual commercial Agribusiness initiatives Agri-tech Startups Exotic vegetables, Fruits, Floriculture Export oriented Scalability issues 	<p>S4- Advanced governance with advance technology</p> <ul style="list-style-type: none"> Private and Public sector investment Large scale planning High value crops: Horticulture, floricultui Enabling Support services: Market, Logis etc.
	<p>S1- Ordinary governance with Basic technology</p> <ul style="list-style-type: none"> Small and Marginal Farmers Cereals, oilseeds, pulses High volumes and low margins: Low return on investments Low Infrastructure levels Limited market access and support services 	<p>S2- Better governance with Basic technol</p> <ul style="list-style-type: none"> Farmer Producer Organization, water use groups as farmer institutions Potential Linkage with remunerative mar Developing Support service environment New government schemes
	Governance	

developers, in the Indian Agriculture context have a unique relationship with the governance situation as described in the techno-governance matrix(refer Fig 2).Although not watertight, the 4 scenarios of the matrix depict Indian agriculture with respect to the level of governance and enabling policies for technology interventions. The technology positioning strategies for each scenario differ from each other.

Ordinary governance with basic technology

This scenario depicts the picture of small and marginal farmers In India which constitute more than 80% of the Indian farming population. Typically, this segment is characterized by high volumes and low margin crops like cereals, oilseeds, pulses etc. which have relatively low return on investment. Farmers often face issues related to inferior produce quality and limited market access. Water stress is characterized by lack of water saving practices and lack of basic irrigation infrastructure coupled with low levels of awareness and capabilities. The technological needs of this segment are technological interventions which are low cost, scalable and suited for better adoption with small and marginal farmers. More pertinent skill development and awareness generation initiatives are required at this level. Partnerships with various government institutions and convergence with existing schemes will help in scale-up and outreach.

Better governance with basic technology

This depicts the current picture of an evolving Indian agriculture scenario. Farmers are being organized into FPOs and other institutions in a mission mode. Special focus is being given in developing support services for farmers. There are efforts to create market linkages with remunerative markets as well along with Agri-marketing reforms. With new government schemes and programs targeted at this quadrant, technology intervention is catching pace. However existing technologies addressing water stress is still at low levels and opportunities are present to develop appropriate technologies and implement them through capable farmer institutions operating channels like custom hiring centers and enabling services like financial services and marketing.

Ordinary governance with advanced technology

This depicts a picture of high-end technology including automated green houses, automated irrigation systems, soil less cultivation, digital app-based plant care practices etc. that are currently being used

across many parts of the country but at a small scale. Typically, Agri start-ups and Agriculture entrepreneurs are found to engage high end technologies often sourced from countries like the Netherlands or Israel to set up commercial enterprises around floriculture, high value fruits and exotic vegetables. However, the scalability of such initiatives is low since replication of such initiatives without large amounts of private or public investments is extremely difficult.To attract such investments, the respective business model for such technological interventions need to be equipped with adequate market linkage and support services.

Better governance with advanced technology

This area is yet to pick-up steam in India, but large-scale advanced technology-based interventions are catching up fast. Drip irrigation systems across 60000 acres of land in Ramthal, Karnataka is one such example. However, for large scale techno enabled initiatives, the government may provide initial investment for setup but private sector partnership and investment particularly to ensure marketing and establishment of business models are inevitable for ensuring long term sustainability. [E]

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WATER

THE DEMI-GOD OF SOLUTIONS TODAY

Sarika Baheti

What has been the most bewildering lesson of the year 2020?

If you believe that Nature is annoyed with us and purging human race, you're absolutely right! The answer to the question above is to listen to the evident signals and align our connection with the elements of nature deeper. We do not have any argument left to explain why the raging crises are

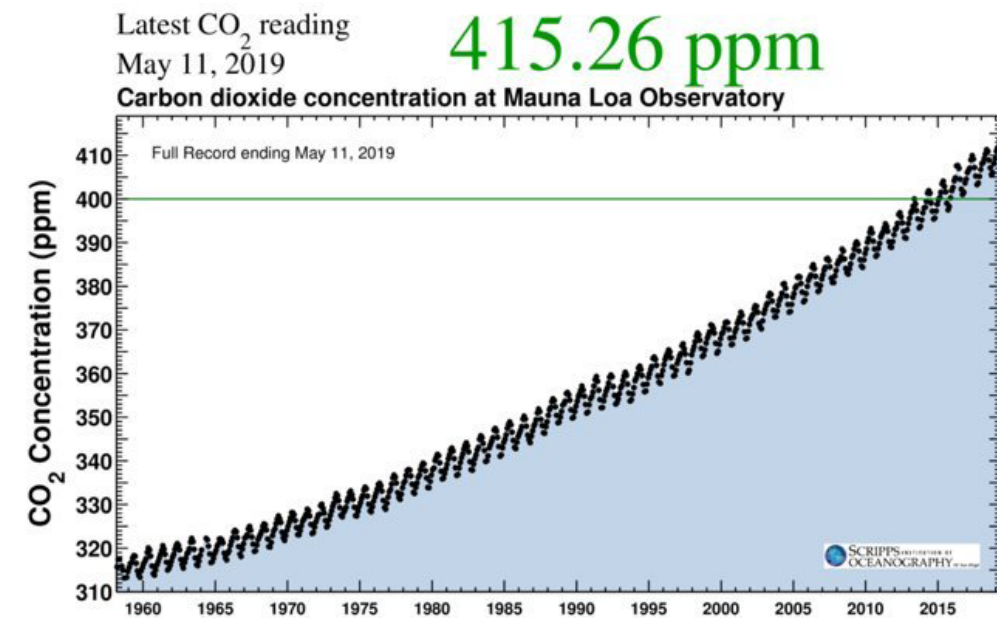
happening. Humans have behaved inhumanly, like predators on Earth. A pandemic like COVID-19 was bound to happen. We need a realignment with the nature, our source of nurturance, remembering everything that we need and use comes from Mother Earth.

Going back eons, the Universe, made of matter and energy, is assumed to be 13.5 billion years old. That was the beginning of physics, as we know it. The atoms and molecules that appeared, started chemistry at the cosmic level. Eventually, life on earth began with the five basic elements of nature - Space, Air, Fire, Water and Earth. Water is indeed one of the most precious natural products on earth. We all know that water is so essential that life will cease to exist without it. More than 70% of the earth's surface is covered with water – just like the body composition of several species on earth. Water, the ethereal fluid, flows like blood in our body, circulating in the arteries and veins of humans,

inventions and innovations. From here, the pace of development started growing at an exponential rate. Consequently, that gave rise to the concept of extensive consumerism as well. Without realising the need for sustainable growth, the so-called development became an incessant menace for the environment. The trio of Air, Water and Land pollution started taking a toll in multiple ways. With carbon dioxide in the Earth's atmosphere at nearly 415 ppm, the United Nations has already warned global leaders for the urgency to act now. It is expected that CO2 shall cross 427 ppm within five years.

Let us now geek around how 'Water' is involved here. Scientists discovered the conditions prevailing in a million-year-old atmosphere. As the snow compresses into ice, it traps bubbles of the atmosphere at that time. These bubbles act as samples that can be used to study the past million years. Besides this, several indirect measures like

studying the density of stomata of plants and examining the ocean sediments are used to further our understanding. These are unprecedented times where we have such high levels of pollution. We have already reached around 1 degree rise in the average global temperatures since pre-industrial levels. As per the warning of WMO (World Meteorological Organization), there is a 70% probability that at least one of the next five years shall see a 1.5 degree rise in

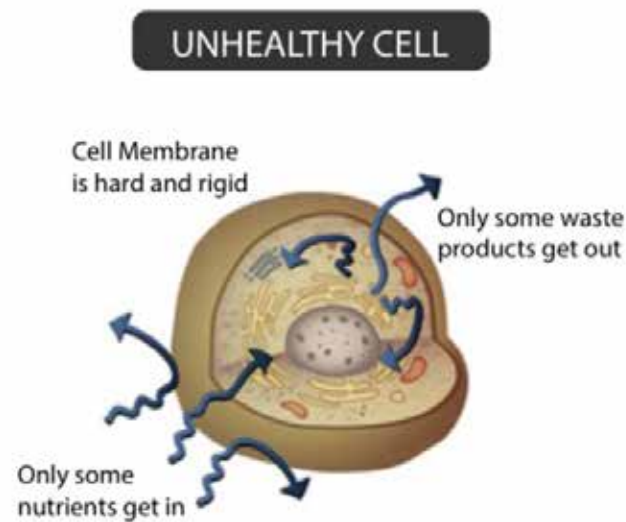


carrying oxygen and carbon dioxide, to and from the tissues of the body to the heart.

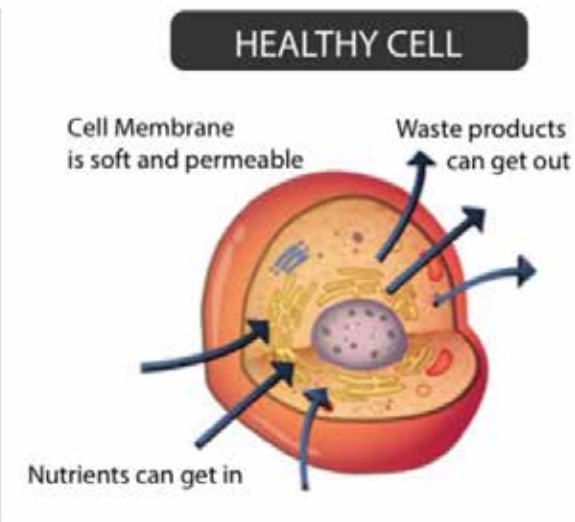
As the Theory of Evolution goes, the evolution of Homo sapiens to modern-day humans happened, and as the human population grew, so did the detrimental changes in the composition of nature. Our discoveries and inventions led to the industrial revolution, which further led to newer

temperatures. The rise in atmospheric temperature is directly related to the speedy melting of glaciers, thereby increasing the sea level at many places and the subsequent submerging of lower islands. The direct and strong link of pollution of the natural elements and its detrimental effects on our health are quite notably obvious.

Oh, the vicious cycle - that what pollutes land, also pollutes the water bodies, air and us! Health begins with a cell



the cell. An adequate amount of potable water keeps the cell healthy and functioning properly. When a cell is unhealthy, only a limited amount of nutrients are able to penetrate the cell and just partial waste (toxins) are able to exit, thus leaving the cell lacking in the essential nutrients, withholding excess toxins. If the cell membrane is not functioning optimally,



the cell will not function correctly, resulting in insufficient nutrients entering through the cell walls and insufficient waste (toxins) exiting the cell. This leaves us with toxic and unhealthy cells, tissues and organs that lower our immunity and can bring about the onset of disease or prevent the cell from effectively dealing with disease. Water helps normalize the cell membrane to be soft and permeable. Therefore, the antidote for any illness or disease is building our immune system by eating plant-based diet, natural medicines, drinking more water, living a healthy lifestyle with a positive mental approach. You can feel the difference by relax-fully sitting in a natural environment, soaking up sunshine.

The need to improve the quality of the outer and inner environment

Instead of playing the blame game, we need to focus on the remedial actions. The majorly accused reasons for the rise in pollution are the reckless disposal of industrial and domestic wastes,

To be healthy, our approach should not be pertaining only to the discomfort, illness or disease from the outside, but we also need to peel a few layers and look deep inside our bodies to locate and address its root causes. We need to understand the human body inside out. Illness is never simply one individual factor. It is a bundle; a patient's whole life, ranging from genetics to diet, to the environment. These influences are often complexly layered, creating the thing we call 'disease'. Fortunately, the body knows how to fix itself — as long as we provide it with the proper nutrition it needs, remove the toxins or poisons that may have become lodged within the cells, and support it with substances that facilitate these functions.

Start at the foundation... the cellular level and water

In a healthy cell, all necessary nutrients penetrate the cell, and the waste/toxins leave the cell. A cell membrane's job is to protect the cell from its surroundings. The cell membrane is selectively permeable and able to regulate what enters and exits

construction activities, stubble burning, burning of fuel by automobiles (whether on Land, Water or Air), high consumption of electricity, fire crackers and the non-recycled/non-biodegradable materials.

Essential pointers for a healthy environment

Controlling population will certainly help reduce the burden on earth and its resources. A lesser population can flourish more in the abundance of natural resources. Lesser number of people can bring in more peace and prosperity. Need based living will obviously reduce the ill-effects of materialistic greed.

Improving infrastructures and effective implementation of pro-environment, sustainable technologies are the need of the hour, for a healthier future. India should tap its abundant natural resources like solar, wind and hydro power to harness energy.

Reducing the concept of consumerism is equally vital. Curbing the ceaseless desire to buy more would reduce the load to produce and subsequently be dumped as non-biodegradable waste.

Reusing and re-inventing things out of the existing can also help reduce the waste, which ultimately ends up as trash on land and in water bodies. Not to forget, the sea creatures are equally an important part of our vulnerable eco-system.

Recycling materials need innovations to be dynamic and connected in contemporary sensibilities. The world needs to reduce the cost of recycling of water and other materials. This will contribute in saving time, money, energy and man-made and natural resources.

Promoting the usage of indigenous and eco-friendly products, packaged with minimal material, will help make the whole system sustainable without compromising on health issues.


A healthy lifestyle with a blend of old-age wisdom and new-era knowledge will lead to healthier minds and fitter bodies, and thus, happier individuals. The domino effect of this very happy individual will create a prosperous society and a progressive nation. After all, the future lies in the hands of the fittest.

Keeping our environment clean is as essential as keeping our homes clean. We must ensure that adjoining areas to our homes are clean and that garbage is disposed responsibly in ways that will segregate its contents to expedite the recycling process, instead of being piled up as stinking landfills and choked-up water bodies.

The PPE comprising of the plastic protection gear like gloves, masks and the body suits - so critical in this 'war' against COVID-19, will also contribute to the mountains of trash in our cities - if it is not incinerated in properly controlled and managed medical waste disposal facilities. The fumes further end up further polluting the land, air & water.

The series of lockdowns all over the nation have taught us new ways of living and working. The lower AQI and PM in the air have given us a fresh whiff of ideas. Yes, we can adapt to what's important and indeed better.

There are innumerable more ways in which we can contribute towards a healthier environment. Understanding the need for a clean environment, we also know that the solution requires unprecedented efforts and willpower. Hope the leaders embrace the challenge to act now. Simultaneously, we should individually/collectively work responsibly towards it. So, let's thank our Mother Earth for having given us the gift of life. Be Humble. Slow down. Observe and Listen.

The best cure is always found in nature and, undoubtedly, in water. Always. 

Sarika Baheti started Neeranjali, a Non Profit Organisation for Environment Conservation, in 2011. The enthusiasm and support of volunteers from all across the globe, have made its endeavours more fruitful. The NGO has conducted innumerable campaigns for environmental awareness, fund raisers for donations & provided relief material for the flood & drought afflicted, plantation drives that have promoted an environment-friendly lifestyle and holistic living through naturopathy & yoga. This NGO, is the Corporate Social Responsibility wing for the parent company Vectus Industries Limited.



Suman Khanna Aggarwal

GANDHI

THE ENVIRONMENTALIST

"The earth, the air, the land and the water are not an inheritance from our fore fathers but on loan from our children. So we have to handover to them at least as it was handed over to us." 1

Mahatma Gandhi

Gandhi is well known for being a revolutionary leader of a unique kind of peaceful protest – satyagraha, which harbours no ill will for the ‘wrong-doer’ but is based on love and self-suffering, so that the latter eventually comes to see his ‘wrong- doing’, resulting in a win-win situation for all parties. His legacy – especially of nonviolent conflict resolution - is a gift to posterity. Tagore, therefore, christened him with the title of Mahatma – Great Soul.

“But very few people know that Gandhi was an environmentalist too. This is primarily because the environmental problems have surfaced largely in the post-Gandhian era and as such, the concern for environment has assumed importance only in recent years.”² Gandhi’s austere and simple life-style, his embrace of voluntary

poverty / reduction of wants, his ashrams (community living), his views on development, technology, self-sufficiency, village swaraj, sarvodaya (welfare of all), trusteeship (includes stewardship of the Earth), conservation of resources, etc. reveal his care for the environment. Prof. Shreekrishna Jha, Director of the Gandhian Institute of Studies, Rajghat, Varanasi observes:

“Gandhi is propounder of a kind of life, culture and society which will never lead to environmental problems. ... Gandhi tried to carry his message to the masses through the life he himself led. This is what made him an environmentalist with a difference.”³

T N Khoshoo calls Gandhi, “An apostle of applied human ecology.”⁴ Indian environmentalists such as Vandana Shiva, Anil Agarwal, Madhav Gadgil and Ramachandra Guha have acknowledged their debt to Gandhi’s ideas. Guha calls him, “an early Environmentalist and the single most important influence on the environmental movement.”⁵ Gandhi’s economist, J C Kumarappa, developed his ecological views. His book, Economy of Permanence, has often been cited “as an example of green thought and sustainable development couched in a Gandhian framework.”⁶ Gandhi made the following observation in his Foreword to Kumarappa’s book:

“He (Kumarappa) tackles the question - shall the body triumph over and stifle the soul or shall the latter triumph over and express itself through a perishable body which, with its few wants healthily satisfied, will be free to subserve the end of the imperishable soul? This is ‘Plain living and High thinking’”.⁷

Gandhi’s famous much-quoted insight, is a telling statement on the plunder of our natural resources and mother Earth, for acquisition of wealth at all cost:

“Nature has enough to satisfy every one’s needs, but not to satisfy anybody’s greed” 8

In his perceptive article, Gandhi And Deep Ecology, ⁹ Thomas Weber, analyses the Mahatma’s contribution to the intellectual development of Arne Naess, who coined the term, deep ecology, and who readily admits his debt to Gandhi.¹⁰ Weber argues that those who want to make an informed study of deep ecology, should go back to Gandhi for a fuller picture, because,

“The new environmentalism in the form of deep ecology, very closely mirrors Gandhi’s philosophy.”¹¹

In a prayer meeting in Delhi in 1947, Gandhi suggested water harvesting for irrigation purposes to protect against famines and food shortages.¹² Prime Minister Modi in his first edition of ‘Mann Ki Baat’ radio programme after assuming office, while

urging citizens to unite for conserving water and share their efforts on social media using the hashtag ‘JanShakti4JalShakti, told his listeners:

“If anybody gets a chance to visit Porbandar, the birthplace of Mahatma Gandhi, behind his house there is a 200-year-old water tanker and still, there is water in it. There is a system to preserve rainfall water.”¹³

The Gandhian approach, including his life-style is Holistic. This is in line with human ecology which visualizes human beings and their environment as constituting an integrated whole. All life – human, animal, plant, the elements - are inter-connected. Gandhi was well aware of the inter relatedness of the different aspects of our lives. He maintains:

“I do not divide different activities - political, social, religious, economical - into water-tight compartments. I look upon them all as one indivisible whole each running into the rest and affected by the rest.”¹⁴

“I believe in advaita (non-duality), I believe in the essential unity of man and, for that matter, of all that lives.”¹⁵

As stated above, environmental issues were not significant during Gandhi’s lifetime. But Gandhi was prophetic, as John S Moolakkattu points out, in anticipating most of the environmental problems facing us today:

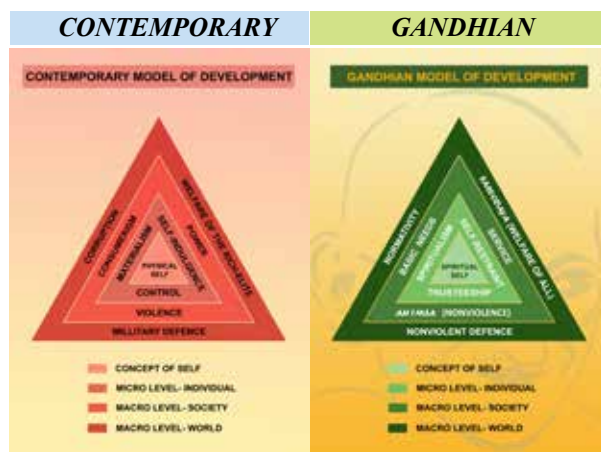
“Gandhi’s description of the modern (industrial) civilization as a ‘seven-day wonder’ contains a prognosis and a warning. He envisaged an ecological or basic needs model centred on limitation of wants in contrast to modern civilization that promoted material welfare and profit motive.”¹⁶

Conservation was a part of Gandhi’s day-to-day life. He would use water most sparingly. It could be said of money and other personal resources also. He wrote history-making decisions on the back of used envelopes. He is known to have used a pencil right up to its stub! There is an interesting story of how his pumice stone (he was very particular about clean feet!) got left behind while moving camp; is insistence on retrieving it – totally against buying a new one! No wonder then Sarojini Naidu quipped about him:

“It takes a great deal of money to keep Bapu living in poverty!”¹⁷

The mad rush for exploitation of our natural resources has resulted in global warming. Gandhi refused to get on a motorcycle, during the Dandi March, brought to him by one of his followers, asking when you can walk, why use the motorcycle? His opposition to urbanization has implications for the environment.

To conclude, I share with you 2 Models of Development:



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Naess himself admits in a brief third-person account of his philosophy that, "his work on the philosophy

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The author is an associate Professor of Philosophy, Delhi University, India, from 1979 to 2013, Suman Khanna Aggarwal obtained her doctoral degree on Gandhian thought in 1978 and has since translated her theoretical knowledge into practical action by founding the Gandhian NGO – Shanti Sahyog that works in 17 South Delhi slums (Kalkaji/ Govindpuri are) and Tughlakabad Village, New Delhi. She has also extended her understanding of Gandhi 's ideology to her work as a Peace Researcher and Activist. To promote Gandhi's legacy of Nonviolent Conflict Resolution and vision of a World beyond War, she has set up Shanti Sahyog Centre for Peace & Conflict Resolution. She has authored three books and published several papers/ articles in reputed journals/books on Gandhian principles.

As a Gandhian scholar, she has lectured extensively and taught courses on Gandhi in North America, Europe, Middle East and Asia, for instance, John Hopkins University - USA, McMaster University - Canada, Bradford University - UK, Scandinavian/ Nordic Universities, and Al Quds University - Palestine/Israel, amongst others.



Manoj Nainani
Executive Director, Egis India

LOW COST REVERSE OSMOSIS WATER TREATMENT IN RURAL INDIA



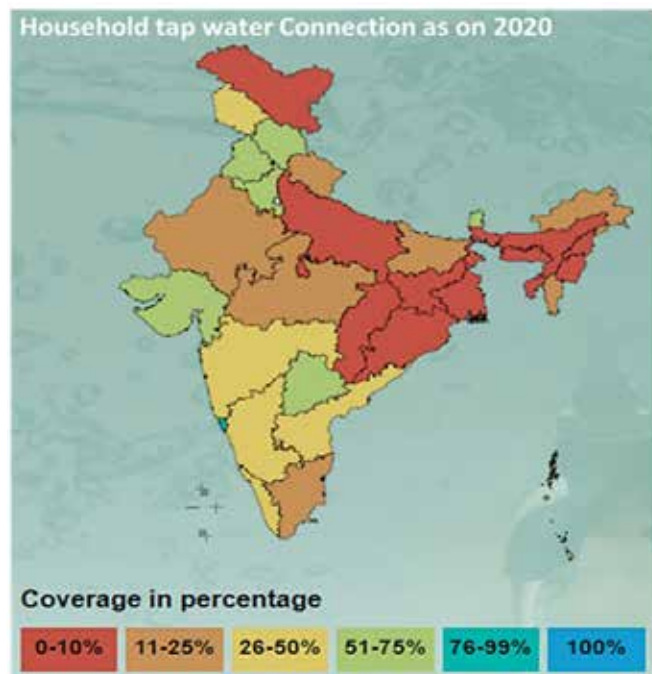
Water Challenge

India has made improvements over the past decades to both the availability and quality of municipal drinking water systems, but our rural areas are left out.

Traditionally, people in rural areas have obtained water from ponds, wells and sometimes streams and rivers. These water sources are frequented daily drinking, cooking water, washing clothes, bathing, livestock washing, etc.

Presently the situation of potable water availability is quite grim in villages as indiscriminate use of chemicals in agriculture has had very serious repercussions on ground and surface water quality. This is coupled with on one hand with polluted River water coming loaded with sewage flow from nearby Cities and Industrial areas. And on the other hand, Groundwater as well is contaminated thanks to heavy use of fertilizers finding its way into ground water causing many diseases like diarrhoea, hepatitis, arthritis, and even cancer due to presence of heavy metals etc.

Certain water purification concepts in rural area based on traditional knowledge are in practice like boiling of water for drinking, using herbs for cleansing of water, protection of drinking water wells from surface pollution. But certainly, these methods are high cost & come with scalability issues. The fig below indicates the status of water supply in Rural India.



Source: Ministry of Jal Shakti



Solution A

A good solution to this problem is Reverse Osmosis water filtration technology, in villages, and expanding rapidly with near uniform coverage all across the country. RO tech is capable of removing heavy metals like Lead, mercury & Uranium. Six districts of Punjab have already benefitted from this technology.

This is a membrane-technology filtration method that removes pollution by applying pressure to the chamber on the top so that the impurities are retained on the pressurised side of the membrane, Water flows through the filter medium and the treated water drains through the bottom part.

A typical RO system consists of pre-treatment, high-pressure feed pump(s), an inline membrane housed in pressure vessels, and a network of piping and valves to supply treated water to the household nearby. (See 3D)

This device can purify the domestic water with respect to microorganism, colour, odour, suspended solids and organics. It is not only much less expensive but superior to existing devices in many ways and has following features

Very effective as it removes bacteria completely and Removes complete turbidity and produces crystal clear water.

One challenge of the RO plants in most of the villages is frequent power cuts but this can be eliminated by tapping solar energy to drive its process. Solar power slowly emerging as the cheapest & abundant energy source, solar power can run a RO plant anywhere, at any time.

Almost maintenance free except occasional cleaning of suspended solids which deposits on membrane surface and this does not take more than 3-4 minutes time.

Solution B

Government should as well focus to create awareness and disseminate information regarding the benefits available under RO installation and maintenance and to guide the consumers on how to access them. The objective shall be to encourage build-up of health seeking behaviour among the masses

- **Awareness**—The community needs to be made aware about the need to switch to Clean water source & its impact.
- **Responsibility**—People shall be made aware & community should take over the responsibility of managing and providing safe drinking water to all on a sustainable basis.
- **Behavior**—Local Government shall endeavor changes in the behavior ensuring personal Hygiene and safe handling of water sources.

in keeping with the focus on promoting and preventive health.

Government/ NGO/private players need to deploy appropriate communication approach and methodology to Increase people’s participation in development & motivate and train rural populations in

- ◆ Use of Safe & Clean Drinking water
- ◆ Judicious usage of Drinking water and avoid wastage.
- ◆ Rainwater harvesting & recharge of Ground water
- ◆ Protection of Drinking water sources
- ◆ Operation & Maintenance of water system

Conclusion

Reverse Osmosis has been touted as an effective drinking water purification method for the specific areas where ground water is adversely effected & We are aware that Reverse Osmosis System show reduction in uranium concentration. RO can also be installed where there is non availability of assured surface water.

Government under Jal Jeevan mission (JJM) will soon embark on a RO based rural water treatment program across the country and install RO plants in villages through a variety of management options. The Jal Jeevan Mission (JJM) is a flagship scheme of the Government of India which seeks to not only provides functional household tap connections for all, but seeks to promote the holistic management of local water resources.

Private vendor can invest on the RO plant (90%) and operate and charge for the RO water. Also, the village itself to invest on the plant and take charge of distribution themselves.

With Government initiative can install rural community led RO plants being managed by an elected body or local committees or cooperatives on decision making on capacity of plant treatment, expenses incurred, storage capacity, running expenses, selling price of water, number of hours of operation etc. [E]

The author has been with Egis since October 2015 and holds the position of Executive Director - Infrastructure (Water, Ports, Urban, Energy & Specialized projects and he is also IOSIS partner and holding position in Management team of Egis India. He is in charge of Pradhan Mantri Awaas Yojana (PMAY), AMRUT (Water Project) which are largest projects of Egis in India



Arvind Passey

WATER

SMALL STEPS, BIG RESULTS

Franksly, one doesn't need to be a management consultant or some celebrity journalist writing a column in a national daily or having a show during prime time on a leading TV channel or even be a bureaucrat or a politician tweaking legislations to be a water warrior. Small steps matter.

SSM or Small Steps Matter

Look at Aabid Surti from Drop Dead Foundation, a one-man NGO who simply goes around taking care of leakages in plumbing that lead to massive water wastage. According to the Better India website, this 80 year old man helped save 4.14 lakh litres of water by fixing 414 leaking taps in 1666 houses in 2007 alone. This man doesn't charge any money for this service.

Then there is the super idea of Rajendra Singh, who began assisting villagers in Rajasthan to build mud dams called johads which is a traditional technique of collecting rainwater. He began in 1959 and in around 20 years has built 8,600 johads across a thousand villages in Rajasthan.

There is another instance of Shirish Apte, an engineer with the irrigation department of Bhandara district in Maharashtra, who identified and helped restore more than 21 of a thousand water tanks that were being maintained by the Malguzaars or zamindaars that were now lying unattended and useless.

It is vital to note that every small step adds to the efforts directed towards making the water situation less severe. Yes, legislations help and so do massive and resource-intensive schemes to create new sources for water supply, but it must be remembered that water scarcity even centuries back was as intense and there were people concerned about the situation.

Water conservation in the past

A news item from July the 13th had said that a water-body from the heart of Delhi had gone missing as it was buried under illegal constructions. There were 20 shops, 2 schools, and even a temple constructed illegally over a water-body in Rajouri Garden. This water-body existed as a 'johad' according to the revenue records of 1951-1952' and led the DPCC or the Delhi Pollution Control Committee to approach the NGT 'which ordered demolition of all illegal structures'. A johad, by the way, is a rain-water storage tank mainly used for drinking.

The way we have been treating our water-bodies is cause for serious concern... but this also points to fact that in the past, almost every part of India had people who had a vision about water storage. Vikramjit Singh Roprai and other historians have pointed out that Delhi and its surrounding areas had a network of functional aquifers that ensured drinking water even when the monsoons betrayed us. Take a peep into the past and you'll know that besides johads being used for groundwater conservation and recharge, India had madakas or earthen check dams in Karnataka, and pemgharas in Odisha. People in Waynad used wooden cylinders made of natural palm stems to store water. We had catchment areas called kunds scattered all over western Rajasthan and Gujarat and these were also covered with lime and ash to act as disinfectants.



Water is vital. Holier than even the holiness linked to religious beliefs. Thus small steps are those steps that we learn from our ancients, mythology, and maybe even traditional religious rituals... and the big steps are contemporary, steeped in science and technology and yet respectful of the ancient methods. The artwork is a tribute to the sensibility of being new-age without forgetting the old. The artwork is a representation of the way Gond artists revere water. Therefore, they paint the river goddess Ganga often.

Then there are numerous examples of baolis or bawaris with their photogenic arches and carved motifs that were used for water storage and distribution. Travel to any of the states in the country and there will be one or the other form for water conservation that people there will mention... some of these may now be dysfunctional because of the apathy of local administration and politicians but then we had plenty of talabs, talais, bandhis, sagars, or samands spread all over. For those who aren't aware, even south Bihar has ahar-pynes for floodwater harvesting.

There are other systems of conserving and preserving water for drinking and a good example is from Kerala where the locals still boil and then add cumin seeds or siragam to it to make it last longer. In Mewar they have spill-ways and silt-traps to counter sand sediments. I have also read about jhalaras that were used to form 'a supply channel to distribute water for religious rites, royal ceremonies, and community use'.

Water in religion and mythology

Now that we are talking about how water was conserved in the past, it is relevant to understand a bit of religion and mythology surrounding it. Water has been in our thoughts even in ancient times and almost every religion and mythological mention has tales where the source can be traced to it. The Hindus have river goddesses like the Ganga, and the Puranas mention Varuna, the god of oceans and one who prefers Makara or a crocodile, as his vehicle. Neptune is the Lord of the Seas for Romans, the Greek celebrate Poseidon, the sea-god, and even the Aborigine tribes have links with water spirits. Water is 'a symbol of purity and rebirth' for Christians. The site where Ismael, son of Abraham satisfied his thirst, is now a holy place, and Muslims regard water as a blessing from Allah that gives and sustains all life in this world. Furthermore, the word 'water' appears sixty-three times in the holy book of Muslims, Al-Quran. In almost every religion it is water that represents the Holy Spirit and if one goes deeper one may find that

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Half of Delhi's 1,000 water bodies vanished due to garbage dumping, encroachments

Delhi relies heavily on the polluted Yamuna, neighbouring Haryana for its water supply. The groundwater table is also fast depleting. Natural and artificial water bodies in the city are being targeted by land sharks as well as local residents who have turned them into garbage dumps.

DELHI Updated: Jun 18, 2017 07:27 IST

Jydeep Thakur
Hindustan Times, New Delhi



purification by immersion in water isn't unique to just one religion. Thus water is a symbol of purity, prosperity, fertility, protection, and even spiritual regeneration.

Water, as we all know, is indispensable for not just keeping the self and the surroundings clean but is crucial for agriculture as well as industry. Manu says: 'A man who gives water obtains complete satisfaction in life.' Satapata Brahmana says, 'Waters are indeed sacred' (Medhya va Apah S.B.1-1-1-1) and 'Water is in fact nectar' (Amrtahyapah SB 3-9-4-16). The Nadi sukta (River Hymn RV 10-75) from the Rig Veda considers rivers as the heavenly gift for nurturing and preserving life and we still have the example of river aartis to worship river water in Varanasi and Haridwar. Banks of the rivers are regarded suitable sites for performing sacrifices (Gopatha Brahmana 1-2-14). A few other examples are the offerings made to the rivers in sacrifices (RV 1-23-18; 7-47-3) where River Sarasvati is praised in scores of places. Then we have Vedic seers who regularly invoked the rivers for their protection (avantu ma sindhavah pinvamanh RV 6-52-4), the water is the very breaths of people (apo vai pranah SB 3-8-2-4), and thus there are slokas that talk about the sources of plenitude (te sindhavo varivo dhatana RV 7-47-4). According to the Vedas, 'it was not the act of taking a bath itself, but the coming into contact with the sacredness of water, and the attainment of such knowledge

and proximity that made one sinless and guided the individual to the Eternal Self. Water was considered sacred but it was clarified that man does not pray to water, the physical entity, but to the source of life and spirituality within water. 'Water is the purified as well as the purifier, the real and spiritually conceived source of life' (Baartmans 1990)'. We have the latest instance of temple consecration happening in Ayodhya where water from 108 rivers is being brought for the ceremony. Water is indeed indispensable... from puja rituals to idol abhishek and from cleansing the body to nurturing life. Festivals like Aadi Perukku (Adi means a Tamil month, Perukku means swelling), that are celebrated in mid-July when the river is in full flow have traditional wisdom that was effectively translated into the construction of the Mettur dam built over the river and used to store water to be released when the time is right.

These references from the past clearly tell us that water and its conservation is a prime condition for survival. The ancients had their own eco-friendly methods of conserving water, storage, and even purification and these are techniques that must also be revived in these times to add to the technologically sound ideas that have emerged. The way I look at religion and mythology is to promote the idea of a few additions to the small steps needed to conserve water in a big way. After all, every droplet adds to the statistics that goad us on to take more steps before it gets too late.

Water-related statistics and action plans

It is only action that is placed with all perspectives set right that can save the world from a catastrophe that is waiting to happen. The seriousness of the water situation will be clear when one understands that nearly 21 Indian cities, and this includes a few of our metro-towns, are on the verge of running out of groundwater now. This is going to affect more than 100 million people. One source goes on to state that 40 percent of India's population may have no access to drinking water by 2030. This is the case for a country that has 4 percent of the world's fresh water because we have with us over 16 percent of the world's population. Look around carefully and you'll discover hidden in various reports and statistics that we are a country where women spend 150 million work-days every year just

carrying water from a source to their homes.

Statistics for India go way beyond this alarming figure. We already have 76 million who are without access to safe drinking water. A doctor friend revealed to me that 21 percent of the diseases prevalent in India are water-related and over 329,000 children under five still die due to diarrhoea.

More alarming than the statistics mentioned above is the fact that despite all the fabulous traditions of water conservation methods we still have just 3.9 million hectares of land out of a potential 42.2 million hectares where the drip-and-sprinkler method of micro irrigation is in force. Thus 90.8 percent of our land is waiting for attention. This is just one side of the entire picture. There are reports that talk about a massive production of waste-water (38,000 million

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Photo: Mint (Mint)

NGT panel suggests unique ID numbers for water bodies to prevent encroachments in Delhi

litres per day) in urban areas where the population is above 50,000 and the sad part is that our waste water treatment efforts are effective for a mere 29 percent of this. A conservative estimate is that waste-water production is only going to grow exponentially and may cross 1,00,000 mld by 2050. As if this were not enough, we also have our rural population now adding to waste-water production.

It isn't as if all authorities aren't aware of this situation because we already have in place the 'catch the rain' campaign by the National Water Mission

ENGLISH தமிழ் বাংলা கவயം हिंदी मराठी

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COVID19 Third straight day of Maximum cases: Lucknow biggest hotspot with highest number of active cases

Home / Delhi / Delhi: Encroachments on water bodies under sealing scanner

Delhi: Encroachments on water bodies under sealing scanner

Environmentalist Diwan Singh said he had done a survey a few years ago, in which he found that around 70% of encroachment on the water bodies was by government agencies to build housing colonies, schools or other projects to ease the flow of traffic.

Try Now

where they plan 'to create RWHS or rain-water harvesting structures before the onset of monsoon. Dams, water harvesting pits, rooftop RWHS, removal of encroachments and de-silting of tanks to increase storage, removal of obstructions in channels that bring in water from catchment areas, repairs of step-wells, using defunct bore-wells to put water back into aquifers' are all already in various stages of action or legislation.

Some of the actions that are already a part of policy or management include free/ subsidized power, improved irrigation practices, crop diversification, revival of traditional water structures, artificial ground-water recharge, community participation, rain-water harvesting, improved demand management measures, rejuvenation of tanks, technology for aquifer identification, crop intensification, solar energy usage, afforestation, soil studies, mangroves in coastal areas, recycling, construction of storages with flood cushion, flood plain zoning legislations, integrated reservoir operation for flood management, extensive flood forecasting and warning systems, investment for piped supply of water, water saving technology, water pricing, water efficient farm management, precision irrigation, less water consuming crops, water audits and budgets, transparency in enforcement, drainage policy, limiting use of fertilizers, sub-surface water harvesting structures and bio-drainage, and regulation of effluents.

Quite obviously, the above measures vary a lot in

their scope and are applied in different proportions in the areas or zones that need attention. For a country like India, there cannot possibly be a single most effective solution. It always has to be a group of multiple action-plans. Besides the action-plans what matters most is the way people will willingly participate and add to the bouquet of solutions. Without public participation most of these plans may risk remaining mere plans with big intentions.

People participation is essential

The government alone can give directions and pitch in wherever necessary, but, as I have mentioned before, small actions by individuals are far more important. Besides the three examples that I gave at the start of this post, there are others who also deserve a mention.

Sekhar Raghavan and Indukanth Ragade have been visiting houses in Basant Bagar and Valmiki Nagar in Chennai to 'raise awareness about rainwater harvesting in the city' and they even spread information about the construction of simple percolation pits and recharge wells wherever applicable. They set-up Akash Ganga Trust in 2002 and they pick up rain-water harvesting projects and have effectively promoted the benefits of using open wells as this replenishes the shallow water table.

Navin Chandra from the Sea Line Co-operative

Society in Mumbai did their bit by spreading awareness about water and energy conservation in a different way. They got the support of 70 residents in Bandra who needed 6000 kilolitres of water per year and were already paying Rs 20,000 per month for just 5000 kl and installed devices that led to water security. So now this block has rain harvesting in place and has ROs to convert ground water in potable water. Their system has 'managed to recharge their groundwater to such an extent that water is now seen at a depth of just 4 feet'.

There is immense learning in what Soban Singh from Chopdiyal in Garhwal has accomplished. He did not have the privilege of canals, tube-wells, or springs to help him and so 'he has identified spots on his farm where the seepage is visible, excavated a shallow basin, and painstakingly led the water into his fields'. Now he has massive tanks in place and his fields are happy... and so are more than a hundred other farmers in the region who got inspired.

Other examples include one from Ufrenkhal in Pauri Garhwal where villagers 'transformed a dry ravine into a river' and one from Gauna village in Almora where farmers harvested rain-water successfully. What Sacchidanand Bharti, a teacher from Ufrenkhal, did was to inspire villagers to dig small percolation pits on slopes and then planted grass immediately downhill. These pits or chal-khals helped retain water infiltrate into the soil, replenished groundwater, and finally created a river. The report mentions that nearly 40 villages have adopted this method. The people from Gauna village in Almora harvested rooftop rainwater and surface run-off in closed tanks and now they have nearly 155 of such rainwater harvesting tanks for water used in irrigation.

Most of these examples go on to prove that community participation is vital in any activity conceived to conserve water. It is such participations that aren't just adding value to efforts by the government and the researchers, but are probably doing the job until other better alternatives are in place.

Yes, we also know that...

Water is not just a chemical combination of two molecules of hydrogen interacting with one of oxygen but is something that interacts with the

Waterbody goes missing, illegal structures crop up

Jasjeev.Gandhiok @timesgroup.com

RAZE THEM: NGT


New Delhi: The search of a 'missing' waterbody in Rajouri Garden, which existed as a 'Johad' according to the revenue records of 1951-1952 has led the Delhi Pollution Control Committee (DPCC) and the Rajouri Garden SDM to many illegal structures. A Johad is a rainwater storage tank mainly used for drinking.

The findings were submitted to the National Green Tribunal (NGT), which ordered demolition of all 'illegal' structures, including 20 shops, two schools and a temple, and also demarcation of the waterbody. In its July 10, 2020, order, the NGT said both the Rajouri Gar-

- > Illegal structures, including 20 shops, 2 schools and a temple, to be razed
- > Area of missing waterbody to be demarcated
- > Decision taken on basis of reports filed by the Rajouri Garden SDM and DPCC
- > Delhi Wetland Authority also asked to look into it

den SDM and DPCC have submitted reports regarding the allegations that a waterbody at Khasra No 30/1 in Titarpur village, and the waterbody was found to be non-existent, despite its existence on paper.

► Continued on P 4

beginning of creation as we know of it. Water has science, philosophy, and the arts meandering through it. Water inspires poets, writers, photographers, philosophers, scientists, architects, film-makers, rulers, militaries, governments, NGOs, and even activists. Water flows on holding the secrets of conflicts, borders, existence, and evolution in its heart. Even Hermann Hesse wrote in his book 'Siddhartha': 'Have you also learned that secret from the river; that there is no such thing as time? That the river is everywhere at the same time, at the source and at the mouth, at the waterfall, at the ferry, at the current, in the ocean and in the mountains, everywhere and that the present only exists for it, not the shadow of the past nor the shadow of the future.' 

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Dr Arvind Kumar

DO WE NEED A SILVER BULLET FOR WATER SECURITY?

India is not immune to the adverse impacts of global-warming, as pointed in the IPCC's report on global warming 2019 and inadequate measures in addressing global-warming can push India among the worst hit countries that may face the wrath of natural calamities like floods and heat-waves. Moreover, climate change, rapid population growth, and urbanization, and a rising demand for food and energy are impacting water quantity and water quality. The outlook is stark and we are left short of time and immediate action is required.

The twin sides of COVID-19

COVID-19 has truly created an unprecedented situation affecting every sector and post-pandemic world, and it is likely that water use for personal hygiene will rise significantly and the only available option is to ensure water availability during these times. But if we look through a positive prism, the lockdown periods have had a beneficial impact on nature, for instance, less pollutants were released into water bodies and water withdrawal for industrial activity almost came to an end. Some news reports mention that Ganga water in Uttarakhand is now fit for drinking, proving a valid point that nature has immense self-cleansing and rejuvenation capacity, if left undisturbed. 2020 is the super year for nature and we will have many opportunities to set-up pathways to reversing the degradation of water ecosystems and build a mutually supportive relationship with earth.

Threats to water security

Climate change is causing adverse changes to the Riparian eco-tones of 'Water Tower of Asia' where already dry season flows are struggling to meet demands of population explosion, urbanization and overuse on major rivers and especially trans-boundary rivers like the Ganges and Brahmaputra make water-related challenges more pronounced. Water conflicts are rising in water stressed areas among/between countries because sharing a very limited and essential resource is extremely difficult., 'WATER is considered the new OIL' with changing geo-political situation among countries and predicting that third World War shall be fought on water. India has diverse geographical topography and biogeography zones facing the calamity of floods and drought both at the same time, and recurrently faces unsustainable patterns of erratic rainfall. Around 600 million Indians already face



“high to extreme water stress”, adding that 21 cities including Delhi, Bengaluru, Chennai, and Hyderabad will run out of groundwater by 2020 quotes NITI Aayog, in a 2019 report.

With the population of 1.27 billion plus, and growing, the total precipitation is 4000 BCM and water availability is 1869 BCM, are we ready to anticipate future water-stress episodes?

Mixed-bag of ‘missed’ opportunities

The lack of integrated approach in water sector has led to the failure of realizing various water conservation measures. Policies like National Water Policy and campaigns such as Namami Ganga, Jal Shakti Abhiyan, reviving the springs and traditional wisdom have been implemented but the absence of ‘holistic and integrated policy’ have un-resolved our water problems even today. It is also argued that legal frameworks still encompass generic principle of water planning at macro-level but decentralized approach with location specific purpose at Panchayat level is yet to be implemented. Also, we hardly follow the principles of sustainable consumption. For instance, it can take about

10,000 litres of water to produce one kg of cotton fabric. Putting in the words of Inger Andersen, Executive Director of UN Environment Inger Andersen, Executive Director, UN Environment Programme (UNEP), “there is a need to understand the hydrological cycle, the value of ecosystems, and how much water is embodied in our consumption patterns”.

Moreover, within rural settings, lack of community ownership and lack of incentives for households to invest in sanitation are some examples of why water and sanitation targets are not reached. Raising awareness on the risks to health posed by open defecation and investing in behavior change related to hygienic practices have proven to be relaxed.

A paradigm shift towards integrated water possibilities

Nursing the conviction that no policy or programme can be efficiently and effectively implemented sans capacity building of the people who always remain at the receiving end and having no say in policy-making process, India Water Foundation since inception in 2008 has focused on ‘Putting People First’ and



Become Jal Mitra:

To turn Water Conservation into Public Movement

“Tackling water-related problems requires collective efforts and these problems affect all of us and it is through our collective efforts that we can resolve these problems, Growing scarcity of fresh drinking water has emerged as a global phenomenon and India is also adversely affected by it. Fast depletion of underground water resources, pollution of surface water resources, and faster pace of melting glaciers in Himalayas are going to add to water woes in India.

<http://indiawaterfoundation.org/JalMitra.aspx>

Dr. Arvind Kumar
President
India Water Foundation



strengthening ‘capacity building’ endeavors as knowledge and engagement partners at Pan India level and beyond as it is a sine qua non for adaptation & mitigation of environment related woes. Through our Jal-Mitra campaign, we have been advocating water conservation as a public movement building around 50,000 Jal-Mitras and also fostering Young Green Change Makers to carry sustainable environmental activities. Major activities undertaken by us since inception veered around major themes of water and climate change, which inter alia, included: managing water resources, tackling environment issues, exchange and sharing of views on rejuvenating rivers, focus on SDG 2030 realization and generating awareness among communities on abandoning the use of plastic. Realizing water conservation strategies and SDGs implementation in Meghalaya first through an integrated development model, we

have encouraged tailoring in Sikkim, Aspirational Districts of Uttar Pradesh and Uttarakhand.

From compartmentalized to ‘convergence’ approach

We have traditionally treated water as a crisis, not as an opportunity. We need to realize water as a socio-economic connector to address our water woes. Once resilience to water-induced calamities and environment-induced vagaries is enhanced, attainment of other goals will be easier because both water and climate changes are at the roots of bulk of the calamities. Water conservation is a complex issue that requires a multi-pronged approach and focusing on demand side and supply side options would be necessary. It is appreciative to see that Ministry of Jal Shakti has timely initiated ‘Catch the Rains’ programme. Even our Hon’ble

PM Sh. Narendra Modi during Mann Ki Baat reminds people to focus on saving water. The recently inaugurated 'SDG 6 Global Acceleration Framework' has rightly mobilized a call for UN agencies, governments, civil society, private sector and other stakeholders through five 'accelerators' to drive progress on water and sanitation issues, on the whole. If principles of water management are understood and implemented, not only can an abundance of water become available for all people on earth but our global climate can also be restored.

High prioritization is required towards community pooling of water under the public trust doctrine and communities need to be trained at the level of Panchayats by 'Sensitizing, Incentivizing and Galvanizing' them. As a member of committees such as

'National Wetlands Committee and New India@75, NITI Aayog, I have always mentioned people's participation is the key for any program's success at ground level. The guidelines for implementing Wetlands Rules, 2017 are truly guided by an 'integrated management plan', 'wise-use' of wetlands, enumerating the wetland in land revenue records and an emphasis on sustainable development. Moreover, a well-designed National Water Policy customized as per contemporary needs must encompass an integrated approach incorporating 'transversal' shift interlinking vertical linkages between water- food-energy nexus with horizontal indicators like health, education, agriculture, gender etc. must be weighed against efficiency,



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effectiveness and equity if India has to realize its 24x7 water vision.

Time to invest in nature

The Government of India often claims extensive tree plantation drives, but do we have a number on how many saplings turn into trees at the end? Planting trees is not enough, rather holistic ways for example re-wilding, a form of environmental conservation and ecological restoration can help repair damaged ecosystems and restore degraded landscapes. Similarly, practices like Adaptive Management, Polluter pays principle Carbon Offset often remains on paper. These are organizing principles to understand, deal and respond to contemporary environmental problems under different environmental categories.

Last year, nature-based solutions are featured as priority action portfolio at the UN Climate Action Summit and we are at a turning point where we cannot go back to business-as-usual and instead must use this opportunity to transition towards nature-positive economy. Since agriculture uses close to 80% of freshwater, stepping up efforts towards water-efficient irrigation, rainwater harvesting/conservation, management of village water sources, reuse of wastewater and promotion of water-prudent crops is the need. Nature based solutions like recharge of natural aquifers, indigenous methods of conservation, integrated water shed management, ecosystem-based adaptation, restoring wetlands, water-food-energy nexus should be adopted. Highlighting the case for resource efficiency, it has the potential to support climate change mitigation focusing on scientific concepts and technologies incorporating NEWater, circular approach, green infrastructure holding a high potential to revive the water economy.

In these times of crisis, it becomes increasingly important to consider long-term measures and cost-effective

strategies rather than short-term measures. Like COVID-19, water scarcity is a concern that needs collective action and sustainable solution with knowledge-driven approach. Stressing the need for holistic water conservation, 'a country's prosperity depends on water availability and quality and must begin with a new paradigm of moving towards cooperation, convergence and collaboration efforts and an integrated approach should be a cornerstone of water resources management in India'. [EP](#)

The author is Governor of World Water Council and the founder President of India Water Foundation. He has been instrumental in inter-sectoral convergence in water sector and regional water diplomacy. He is a member of the technical advisory committee for India's third national communication and biennial update reports to UNFCCC and member of the National Wetlands Committee, Ministry of Environment, Forest and Climate Change, Government of India. He is a member of the Meghalaya State Water Resources Council and the State Council for Climate Change and Sustainable Development, Government of Meghalaya. Inputs by Dr Arvind Kumar have enabled the Government of Meghalaya to institutionalize the river basin management (RBM) mechanism, addressing climate and ecosystem related issues through its integrated basin development and livelihood programme (IBDLP) to promote gender equity, alleviate poverty and improve livelihoods of the native people. He has a doctorate in defense studies and has published over 400-plus research articles in reputed journals. He is also the Editor of online e-zine Focus Global Reporter and a lead author of a publication published by SAC in December 2015 (Dhaka, Bangladesh) titled "SAARC Outlook on Water-Energy-Food Nexus in SAARC Region".

MATHEMATICS CHALLENGE

CMT - SERIES PROBLEMS - by GANIT MATH (गणित मठ)

CMT - 2020 / 1.

For $x, y \in R$,

$$\text{if } \frac{x^{16} + y^{16} + 1000x^2y^2 - 500x^4y^4 + 80x^6y^6 - 2x^8y^8}{x^{12} + y^{12} + 150x^2y^2 - 45x^4y^4 + 2x^6y^6} = 5$$

$$\text{then, } \frac{x^{14} + y^{14} + 175\sqrt{5}x^2y^2 - 70\sqrt{5}x^4y^4 + 7\sqrt{5}x^6y^6}{x^8 + y^8 + 20x^2y^2 - 2x^4y^4} = ?$$

- composed by -
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CMT - 2020 / 2.

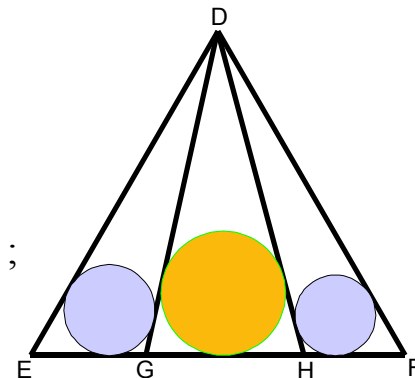
In the adjoining figure, in $\triangle DEF$, the

length of $DE, EG,$ and $,HF$ are $\frac{2}{\sqrt{\pi}}m, \frac{8}{13\sqrt{\pi}}m,$

and $\frac{7}{13\sqrt{\pi}}m$ respectively ; $\angle DEF = \angle DFE = 60^\circ$;

if $A_1, A_2,$ and $, A_3$ denote the area of incircles of $\triangle DEG, \triangle DGH,$ and $,\triangle DFH$ respectively, then

$$\left(11 + 2\sqrt{133} + \sqrt{543}\right)^2 A_2 - \left\{ \left(211 + 17\sqrt{133}\right) A_1 + \left(544 + 22\sqrt{543}\right) A_3 \right\} = ?$$



Answers will be published in the next issue . You can ask any queries and send your solution to
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