Water Culture Connection: A Conservation-Led, Integrated Development Strategy for Water to meet SDG 6: Clean Water and Sanitation

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Abstract

The increasingly frequent natural disasters in the last decade, are not only symptomatic of climate change, but indicate the critical importance of a holistically overhauling our lifestyles and sympathetically engaging with our built and natural environment. There is an urgent need to actively engage with and analyse the pre-industrial era traditional settlements, as they constitute a three-dimensional record of past wisdom embodying a holistic way of life that reflects a synergetic relationship with nature. The essay explores connect of water and settlements in Indian subcontinent from the Indus Valley civilization to mediaeval times to the colonial and then Independent India. Traditionally in India, land, rivers, fields, groundwater, and forests were all valuable resources and not commodities. Each of the states of India and their traditional settlements are a repository of such knowledge systems for respective climate. By combining 21st Century mapping technologies and regional traditional knowledge systems of water harvesting and management, it is possible to effectively synergise the top-down and ground-up planning policies. Citing examples and experiential learning's, the essay espouses for conservation led development as preferred planning policy to achieve an equitable, stable, self-sustaining, compassionate, and humane future, as continuum of three thousand years of nature-culture journey.

Introduction

Water constitutes sixty percent of a human body and covers approximately seventy-one percent of the earth's surface, of which, about ninety-six percent is saline. India has just four percent of the world's freshwater for sixteen percent of the global population (ide-india, 2020). Murthy and Kumar (2020) note that almost seventy percent of India's surface water resources, including eighteen major rivers and a growing percentage of its groundwater reserves, are contaminated by biological, toxic, organic, and inorganic pollutants. Fortunately, water is a renewable resource and becomes polluted only when polluting loads exceed the natural regenerative capacity of the water resource. Thus, we have a role to play in ensuring water security.

The evolution of life on earth is a transformative story of water in continuum. Water is central to all aspects of human civilization, from its role in agriculture and industrial development to the embedded social, cultural and religious values with which it is imbued. The sentiments of cultural connection are recognised as the lynchpin for developing water security solutions. This approach was formally adopted at the 3rd World Water Forum through the following statement:

> Due to its fundamental role in society's life, water has a strong cultural dimension. Without understanding and considering the cultural aspects of our water problems, no sustainable solution can be found. (WHO, 2005-2015)

Fig. 1: Upper and Lower Sagar site at Amber. Source: Ashish Srivastav, (first published in The Art of Conserving Indian Cities, My Liveable City, Oct-Dec 2019.)

In 2001, while working as a Conservation Architect Consultant[3] at the 12th century CE settlement of Amber, the cultural concept of planning and designing with nature became tangible to me. Essentially, the Upper Sagar site, located in the northern outskirts of Amber village, is a reservoir created by a dam-wall spanning the two adjacent hills of Aravalli range at the closest point. Designed as a blind wall, the dam holds water on the catchment side. There is a three-level terraced building on the other end, with rooms at the lower levels for services. A pavilion is situated on the top and thus serves as a short stay royal lodge. The site has another check dam wall on the lower

[3] I was working as a consultant for the INTACH Jaipur chapter for building-conservation projects under Asian Development Bank funded Rajasthan Urban Infrastructure Development Project, Jaipur, India. Phase- I, 2000-2005),

end of the valley, with a walkway and a yard which created another reservoir called the Lower Sagar. The resultant two reservoirs, along with the Panna Miya ka Kund- a stepwell, in the valley at the village center, are design interventions from an era of experiential understanding of

Fig. 2: Restored Panna Miya Ka Kund at Amber. Picture Credit: Poonam Verma Mascarenhas.

topography and water connection. While conserving these sites, the reservoirs were de-silted, and the dam walls were repaired using traditional materials. The stepwell was emptied of all the solid waste that had collected in it over decades, and the built fabric was restored. The sight of water trickling from the north-rock-face, at a depth of 35 feet, right at the bottom of the square kund is a cherished memory and an experiential learning of water tables and underground water channels.

Two seasons of failed monsoons had reduced the number of wells with water to twenty-six in Amber village. Following the completion of conservation projects, coupled with a year of a good monsoon, the project teams were delighted to find that all the seventy-five wells in the valley had been revitalized. Thus, conservation of historic built elements and surroundings of the two reservoirs had recharged the water table which serendipitously revived the ancient water distribution and management system. Thus, ensued a personal engagement by observation and enquiry into the pre-colonial settlements vis-a-vis planning and water management systems (Mascarenhas, 2020).

Dholavira

The ancient civilization of the Indus Valley, comprising Harappa and Mohenjo-Daro and dating to 3000 BCE, remains an enigma as the script of that era is still not deciphered. The archaeological sites of Mohenjo-Daro and Harappa in present day Pakistan have been extensively documented and many insights into that era are astounding with respect to planning and resource management along with trade and agricultural practices. The archaeological site Dholavira is the fifth-largest of the eight major Harappan sites. It is located in present-day Rann of Kutch, in the northern part of Gujarat state in India. Discovered in 1967-1968, the site has been under excavation since 1990 by the Archaeological Survey of India. The findings and analysis assert that the site was occupied from c.2650 BCE, declining slowly after about c.2100 BCE, being briefly abandoned, but then reoccupied until c.1450 BCE. Understanding the site as a whole has continued with scholars coming together at the Indian Institute of Technology, Gandhinagar, Gujarat, under the umbrella of the Archaeological Sciences Centre. Some of the findings were showcased at a lecture series by Michel Danino (2014), which I summarize here:

Dholavira was an important city for trade, primarily to control the movement of goods from Gujarat to Sindh, Punjab and Western Asia. In ancient times, it was an island. Managing water for humans was as much of a challenge then as it is now. A rivulet, on the southeast of the site was dammed, using wooden palisades to force the water to flow into the city. Twelve hectares of the forty-eight hectares of the city area was identified for the management of water as storage. No grand dwellings were un-earthed, nor were any specifically religious. All habitation appeared to be similar, and it was only by location on-site that some social hierarchy was perhaps observed. The top of the hill has been identified as a citadel by archaeologists and another rectangular building footprint with thick walls as a granary. The most important of all the discoveries are the stormwater and wastewater drains of varying depths. Stormwater drains of up to human height, hint at a spate of torrential rain experienced by the region, and for which it was planned. Two spectacular reservoirs that form the south-east boundary to the city are interconnected with steps hewn on the sides to access the lowermost parts. It also has systems for drawing water out, and the drains empty into these reservoirs at several points.

Fig. 3: Dholavira – water reservoir. Picture Credit: Poonam Verma Mascarenhas.

The city is said to have sustained life for 600-700 years. This is significant, as even today there are no such habitations in the region largely due to the lack of palatable

water; the water table too is saline which also leads to poor agriculture in the region.

Fig. 4: Stepwell, Modhera Surya Kund, Gujrat. Picture Credit: Poonam Verma Mascarenhas.

Today, the inhabitants of the Indus valley are believed to be the first climate-change-migrants of the subcontinent. Historian Thapar (2002, p.xiii) records the Vedic period (c.1500 - c.500 BCE) of Indian culture as the period of history between the end of the urban Indus Valley Civilization and the second urbanization in the central Gangetic Plain post-migration. It is the later Vedic period (c.1100 – c. 500 BCE), that is credited with the development of the Sanskrit language, script, and several treatises for planning, social governing systems, spiritual and physical health along with ritualistic Hinduism. Many of the treatises were a part of the oral tradition prior to the writing of the Vedas. The Rigveda is considered to be the oldest of the four Vedas, and many scholars and historians have traced the development and records of mathematics, astrology, astronomy and building/planning guidelines, known as the Vastu Shilpa Shastra, to this period through the many treatises.

Vastu-Shastra, literally, the science of dwelling, is an ancient manual of architecture in Sanskrit. These contain Vastu-Vidya, meaning knowledge of dwelling (Dutt,1925). Several Vastu-Shastras exist; the Sutradhara Mandana's Prasadamandana is a manual discovered in Rajasthan for planning and building a temple which includes chapters on town building; the Manasara Shilpa and Mayamatam are guidebooks on South Indian Vastu design and construction which are estimated to be in circulation by 5th to 7th century CE; the Isanasivagurudeva Paddhati is yet another Sanskrit text from the 9th century AD, describing the art of building in central India; finally, the Brihat Samhita by Varāhamihira is a widely cited ancient Sanskrit manual from 6th century CE, describing the design and construction of Nagara style of Hindu temples. These ancient Vastu Shastras often contain descriptions and discussions of the principles of a Hindu temple as a holistic part of its community. They illustrate various principles for being in harmony with nature and provide a diverse range of alternate designs for house, village, and city layouts, along with temples, gardens, and water bodies (Silverman, 2007).

Medieval India saw subsequent centuries of demolition and material reuse for new construction. Additionally, the pattern of assimilation, appropriation, adaptation, adoption, and fusion has continued to shape the built environment through the subsequent Mughal and Colonial periods (Mascarenhas, 2019 a).

This linearity of time study into the evolution of architecture and planning in the subcontinent reveals how in pre-colonial India the political boundaries were partial and far more permeable to both trade and knowledge systems. The adherence to Vastu Shastra principles in design and construction of temples, as witnessed at Himachal Pradesh, Rajasthan, Kerala and from Tamil Nadu to Bengal, establishes the rigor of the treatises; one that encouraged regional thought and material prowess, which had its genesis in the symbiotic relationship between the built and the unbuilt. The diversity in styling the template is credited to the ingenuity of the respective indigenous communities.

Fig. 6: Traditional water mill for irrigation near Kumbhalgarh, Rajasthan. Picture Credit: Poonam Verma Mascarenhas.

The study of the only medieval living fort at Jaisalmer, c.1156 AD, Rajasthan, reveals it to be an example of 'traditional passive cooling' characterized by the use of thermal mass, controlled openings in the building, sun shading of building's surfaces and fenestrations, flexible building envelopes, controlled ventilation, and the use of night radiation cooling and flexibility of spaces (Gupta, 1990). While ASHRAE measures temperature and humidity; historic cities work on radiant temperatures felt by the body. Water systems (involving collection, storage, and maintenance) were a necessity in the arid areas of Rajasthan and Gujarat. Houses in the fort city collected water and stored it in an underground tank in the courtyard.

Other systems included man-made catchments lined with temples and other structures, rendering them sacred and thereby conveying that the space be treated with reverence, and kept free of defecation and garbage.

Fig. 6:. Rain harvesting and accessing systems, Mandu Fort, M.P. Picture Credit: Poonam Verma Mascarenhas.

Engineering and artistry were combined in the walls of the dam which lined the catchment. Animal figurines at different heights were not placed randomly but formed definitive markings for the measurement of collected rainwater each season. This subsequently informed water usage for both domestic use and husbandry by the polity. It was thus part of the residents' shared experiential knowledge system which had been developed and maintained in a continuum for centuries. Additionally, the old society had designated families as important community members who maintained the waterworks. The design incorporated sacred themes, pillars, pavilions, etc. to remind the users to be mindful and reverential of the watershed area. This sacred value ascribed to water was practiced throughout the subcontinent with rivers being given the stature of goddesses. Temples adorned with water tanks were an essential design feature in settlements which survive today.

So how did this consciousness change so drastically in the last 100 years? Today, all rivers, lakes, and ponds in India are being discussed for all the wrong reasons. The water table in most towns and cities is alarmingly depleted and our coastal belt is extremely vulnerable to saltwater ingress due to bore-wells.

Imperialism and Independent India

One point of departure is perhaps the advent of the colonial management of social disruption. All community-based systems were systematically dismantled to be replaced by colonial administration. The Public Works Department (PWD) was constituted in 1854 to undertake civic infrastructure works such as roads to carry goods to the port for shipping to England and for the movement of imperial armies; irrigation canals to increase the production of cotton and grains to be shipped abroad; and barracks and defense stations to house the soldiers of the imperial armies and other residential establishments for ruling the colony. In 1911, with the decision to shift the capital from Calcutta, a department was set up exclusively for building the new capital - New Delhi. Transformed into the Central Public Works Department (CPWD) in 1930, it then primarily oversaw the vast office and residential campus of the Central Secretariat and allied offices.

Independent India had no choice but to continue with the established systems: regional PWDs grew state-wide as the primary institutions for Nation building. In the early 1970's, the departments were segregated based on types of infrastructure, namely, for highways, bridges, buildings, irrigation, sewerage, electricity, industrial sites etc., while town-planning departments took up land-use policy and planning. However, the hoped-for efficiencies used to justify the reforms came at the cost of coherence.

The fragmented and over-arching mismanagement that resulted is well analysed by Baig (2017) who presents the 12th century Jaisalmer fort as one of her case studies. Being a border outpost after independence, this World Heritage Site became relevant once again, both for the tourist industry and for the nation; leading the Central Government of India to invest in bringing the Indira Gandhi Canal close to town to sustain the growth. The fort, with its existing inbuilt water storage systems, was also furbished with underground water tanks placed in the bastions, and a supply of piped water to households was seen as a sign of development. Unfortunately, it was not accompanied by a wastewater management plan for drainage, and by the time the need became obvious the historic fort was in distress! Not only had seepage led to the collapse of a couple of bastions, but some of the historic buildings within the fort as well! Users who were mindful of not wasting water also became complacent, and soon the fort was put on the World Monument Fund's endangered heritage list in order to provide expert advice and investment. Although many private organisations continue to engage in canvassing, re-building, and restoration of the heritage fabric, multiple Government agencies, including the Archaeological Survey of India, the Public Works Department, the Electrical, and Public Health departments, etc., also continue to work unilaterally. Participation by residents is negligible, and not surprisingly, it all has led to multiple detrimental effects on India's only living fort and its surrounding ecology.

The scenario is similar in every city, town, and village, almost all of which are on the continuum as living cultures in India, existing at various stages of decline vis-a-vis livability due to callous planning. Moreover, water - the primary source of life - is being appropriated and commodified increasingly every day by the privileged.

Neo-Liberalism and its impacts

Economic liberalization in India has increased urbanization which often correlates to higher national incomes (GDP) as availability and consumption go together. The expansion of urban areas is also socially significant as cities provide anonymity for those seeking to earn a living within a caste-ridden Indian society. Accordingly, unplanned development and severe environmental degradation are a feature in all our cities. Studies have shown that 19% of air pollution in Mumbai is caused by the open burning of landfill waste: producing carbon-monoxide, hydrocarbons, and other particulate matter. They are also the source of the leaching of heavy

metals into the water table, resulting in serious health concerns for the those residing in the area - both directly through water consumption and indirectly through the contamination of food grown in the area. These are irreversible impacts as water table contamination is almost untreatable within the living time frame of a generation or more.

To make matters worse, increasingly frequent natural disasters in the last decade, including floods, droughts, hurricanes, and flash floods, are not only symptomatic of climate change, but indicate the critical importance of a holistically overhauling our lifestyles and sympathetically engaging with our built and natural environment. There is an urgent need to actively engage with and analyse the traditionally constructed buildings and settlements which have survived for centuries. They constitute a three-dimensional record of past wisdom embodying a holistic way of life that reflects a synergetic relationship with nature.

New imaginings and approaches

Let us now imagine that each government department worked in collaboration and followed the historic layout as a guiding principle wherein each lake, pond, tank, watershed area, etc., was regarded as a life-giving source, to not only be protected and cared for as a priority, but to be used for ascertaining the carrying-capacity of regional developments. This could then become the foundation of a holistic approach for managing agricultural needs and ensuring the water-feed to the water table. Based on the participation of an inspired resident-community, a long-term symbiotic relationship could be created; instead of the endless firefighting scenario in which we currently appear to be caught.

Such was the approach taken to address the worst water crisis in Chennai in 2019 by Shri A. Vikranth Raja - the then District Collector and present Secretary to the Chief Minister, Puducherry. The following excerpt from an article by Rajesh B. Nair (March 2020, pp.) sums it up:

"It all started with a query raised at the meeting. When someone asked if Karaikal had the capacity to store 7 tmcft of river water allotted by the Cauvery Water Disputes Tribunal the response from officials was an emphatic 'no'," says M. Selvaganesh, Assistant District Collector of Karaikal. This was when the then District Collector and present Secretary to the Chief Minister, A. Vikranth Raja, stepped in with the idea of digging into revenue records to locate the region's traditional waterbodies.

"To our surprise," says Raja, "we found 549 ponds within a small territory spread over 157 sq. km. However, we found that 40% of these water bodies were in various stages of extinction. Most of them turned out to be dumping yards." The biggest hurdle, the young officer says, was to figure out a way to bring these water bodies back to life. "When people depended on ponds, they took care of them. When wells came up, they forgot about ponds; then when hand pumps arrived, wells were neglected. And, finally, with piped water, hand pumps went into disrepair," says Raja.

The article further informs us of the adopted approach, which identified community awareness and participation as crucibles of the venture that succeeded in rejuvenating 178 ponds in just four short months! Not only has the winter monsoon filled the desilted and cleaned ponds, but it has also been made into a veritable habitat for flora and fauna through a planting drive undertaken by the community living in the vicinity; an initiative of the Collector who provided saplings of the local trees. The participation of the community has cultivated ownership and thus, long term caretaking. Moreover, now the remaining ponds and tanks are being similarly revived.

A depleting water table woe, recurring urban flooding and the temporary solution for the release of more water from river Cauvery - to meet the demand of the Chennai city -, serendipitously led to revival of an ancient system of capturing and recharging of water table: a set of tanks which had in the past (and traditionally) served the city as water banks. This system exposed the inadequacy of the planning department who continue to work on paper in cahoots with politicians and builders in short-term monetized landgrabs and with a total disregard for the terrain. Indeed, it is high time we move beyond our apathy towards the ancient treatise in our practice and in our education system. As Doxiadis (1970) argued:

> The static plan. Another myth which still prevails is that we can solve the problems of our cities through the conception, and official recognition, of a physical plan expressed by a two- or three-dimensional drawing. But our cities are growing organisms. They need a development policy leading to a development program which is expressed, in space, by physical development plans, but they also need economic, social, political, administrative, technological, and aesthetic programs. (1970, p.13)

The Indian sub-continent has an enormous repertoire of traditional water harvesting, holding, and tapping systems, such as: stepwells, temple tanks, Kattas - the temporary check dams built across streams and rivulets which were a common sight in the districts of Kerala and Karnataka till two decades ago, Madakas – the traditional water harvesting system in an area of natural slopes that comprised a check dam built at minimum width in the slope that would then help to impound crores of liters of rainwater into the ground below which would otherwise go into the sea and cause erosion of top soil too, along with lakes, ponds, village water mills, monsoon fed rivulets that had low height check dams to help retain water and to check the soil erosion.

Unique to Goa, the Khazan system comprising sluice gates and low-lying lands that are flooded periodically with brackish water is an even more complex system from yesteryear that not only supported Pisciculture, but also enabled a unique variety of rice-growing. In practice for centuries, the Khazan systems of food production are now threatened by disrepair, ignorance, derelict Government policies and unscrupulous land mafia. To achieve equitable livability in current Anthropocene induced climate crisis era, alternative strategies must be developed: The relationship between caretaking of natural resources and their commodification should be explicitly balanced, and our past cultural practices need to be acknowledged

and studied as a repertoire of techniques for recovering such a mindset.

Land, rivers, fields, groundwater, and forests are all valuable resources and not commodities. For all life to survive, sustainability is fundamental and not just an 'alternative' lifestyle. Each of the states of India and their settlements are a repository of knowledge systems for respective climate and resources to support life and the living. Human sustenance needs to align with the natural laws of cyclic and closed loop evolution. It is time for Planning to become collaborative and for the developmental agencies to recognize and unlock this potential for sustained progression.

Conclusion

We in India urgently need to revise our development model and adopt a 'Conservation-led Integrated Development' strategy (Mascarenhas, 2019b), consisting of the following approaches:

Development oriented conservation: The study of built character should dictate the formulation of building by-laws in respective areas. Conservation and re-use of buildings should be incentivised. New buildings should be spatially appropriate to the existing structures/area.

Ecologically appropriate development. Traditional settlements characteristically featured ecological equilibrium, its destruction by insensitive contemporary interventions must be prevented.

Development using locally sourced materials, skills, and technology: The distinctiveness of historic towns is mainly due to the creative use of the local materials. The revival of traditional building methods with locally available materials is both necessary and beneficial for the planet.

The time for working in silos is over: The government needs to revamp its administrative structure to creatively harness the potential of all its employees, to curtail all duplication and bridge any remaining gaps. The Constitutional 73rd Amendment Act (1992) came into force on April 24, 1993. It provides constitutional sanction to establish "democracy at the grassroots level as it is at the state level or national level". Amongst other key objectives, the legislation aims to promote bottom-up-planning. To do so, the District Planning Committee (DPC) in every district has been accorded constitutional status with a clear mandate for inclusive, integrated, and participatory planning for both resource management and spatial development. The 74th amendment made similar provisions related to Urban Local Governance - the Nagarpalikas.

These amendments to the Constitution of India have paved the way for activating the potential of community participation at both the rural (village) and urban (town) levels. Community-based initiatives in responsible planning and mindful caretaking should then inform the States' regional planning policies. The resistance to this move by respective politicians all over India, except Kerala, is detrimental to developing resilience in the face of a climate crisis.

By combining 21st Century mapping technologies and regional traditional knowledge systems of water harvesting and management, it is possible to effectively synergise the top-down and ground-up planning policies. Adopting this holistic approach is now urgently needed. Not only will it enable our sub-continent to achieve an equitable, stable, self-sustaining, compassionate, and humane future, it will protect and prolong the continuum whose legacy is reflected in our three thousand years of nature-culture journey.

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