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SIGNIFICANCE OF WATER PROFUNDITIES IN THE DEARTH OF CONSERVED WATER HARVESTING STRUCTURES

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ABSTRACT

Worldwide urbanization and environmental change need the making of more proficient and reasonable metropolitan water frameworks all over the planet. Due to expansions in metropolitan populace and pay, worldwide metropolitan water request is supposed to develop by 80% by 2050. Furthermore, environmental change will make more devastating events like floods and dry spells all through the world, putting additional strain on existing water and non-water foundation. While most of examination on maintainable metropolitan water frameworks is centered around low-and center pay countries, urban communities in big league salary nations face tantamount, if unmistakable, issues.

Water management has been practiced in India since ancient times. This was an essential facet and tradition, which was practiced by various Indian cultures. Rivers, lakes, step wells, and baolis were major sources of water for all civilizations that in turn evolved to flood management. Due to rate of urbanization, traditional water and flood management practices have become obsolete. It is critical to recognize the importance of being water positive, recharging groundwater reservoirs for long-term water consumption in the climate crisis era, by preserving the cultural heritage of Indian cities

Systems caught between relying on occupation on the one hand and being supported on the other by massive climatic variations and contradictory rainstorms. Hyderabad has a unique combination of a tropical wet and dry climate that borders on a hot semi-arid climate.

A ghost of the rural past appears to haunt India's emerging urbanization, according to Karl Marx as all the powers of politics, economics, and technology appear to have formed a sacred alliance underneath the code name "nature". In the current context, it is critical to recognize the importance of structural and material investigation in the preservation of rich fabricated legacy (step wells, baolis, vav, and so on) as directing them into major tourist attractions and social interaction hubs such as parks, melas, and Haat marketplaces.

The Deccan baolis were created to provide comfort and relief to citizens travelling on hot sunny days, systems designed by the then Qutb Shahi and Kakatiya leaders of Hyderabad. To determine the importance of rainy season event sampling on agrarian terrain, the beautiful Deccan Aquifers are being studied using adaptive interpretative research methodology and a cross-sectional case study of Bapughat Well and KW Bagh Well, Telangana.

Keywords: *Water positive, Step Wells, SDG 2030,Urban Floods, RWH,Resilience*

INTRODUCTION

In the western Pedi plain, the drainage pattern is generally dendritic, with wide valleys. The Eastern Ghats's drainage is coarse and dendritic, with steep and narrow valleys. Most the smaller streams feed numerous tanks and lakes.

In the case of Telangana state, it is drained by two major rivers, the Godavari and Krishna, as well as their tributaries, which flow into the state of Andhra Pradesh and then into the Bay of Bengal. The state is divided into two major basins and thirteen sub-basins.

We understand that the Godavari basin is divided into eight sub-basins: lower Godavari, Maneru, Manjira, middle Godavari, Penganga, Pranhita, Sabari, and Wardha, and the Krishna basin is divided into five sub-basins: lower Bhima, lower Krishna, Munneru, Musi, and Paleru.

Krishna basin Godavari basin.

Some higher altitude locations are scattered throughout, giving rise to the appearance of several small hillocks but mostly the Hyderabad city's predominant topography is sloping rocky terrain of grey and pink granites. Hyderabad is situated at an altitude of about 1,778 feet (542m) above mean sea level (MSL), with the highest point in the city being Banjara Hills at 2,206 feet (672 m). The city has several lakes and large water tanks. The city's lakes are often referred to as Sagar, which means "sea."

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CLIMATE

Hyderabad has a distinct tropical wet and dry climate that borders on a hot semi-arid climate (Köppen climate classification BSh).

Geology:

Geological formations in Telangana state range from Archaean crystalline formations to recent alluvium. Crystalline rocks, also known as "hard" rocks, are two types of ancient rocks: plutonic rocks such as granites and metamorphic rocks such as gneiss, schist, mica schist.

BGC: The Banded Gneissic Complex, the only gneissic basement in India considered to underlie an early Precambrian sedimentary suite unconformably, comprises composite gneisses formed by extensive migmatization of metasedimentary rocks of diverse composition.

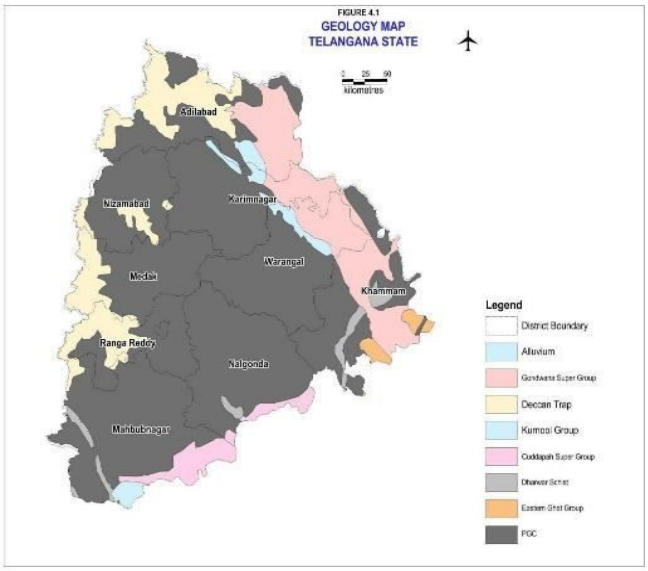


Fig. 1: Map showing Geology of Telangana

Fig. 2: Map showing Telangana state drainage and river sub-basin

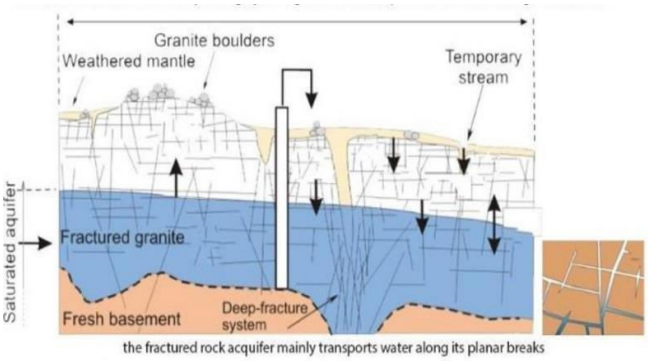


Fig. 3: Figure showing fractured rock aquifer

Impact of Monsoon on Rainfall:

In August 2020, Telangana received an excess of rainfall (1055 mm, 40% above normal) due to back-to-back low-pressure systems that formed over the North Bay of Bengal.

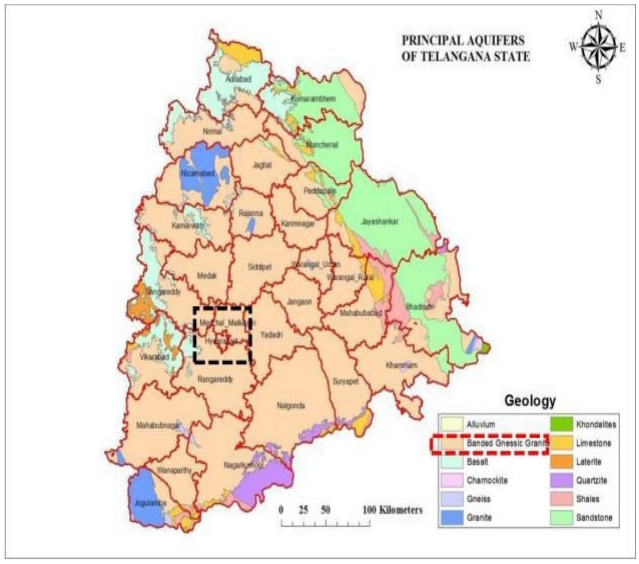


Fig. 4: Map for Principle Aquifers of Telangana state.

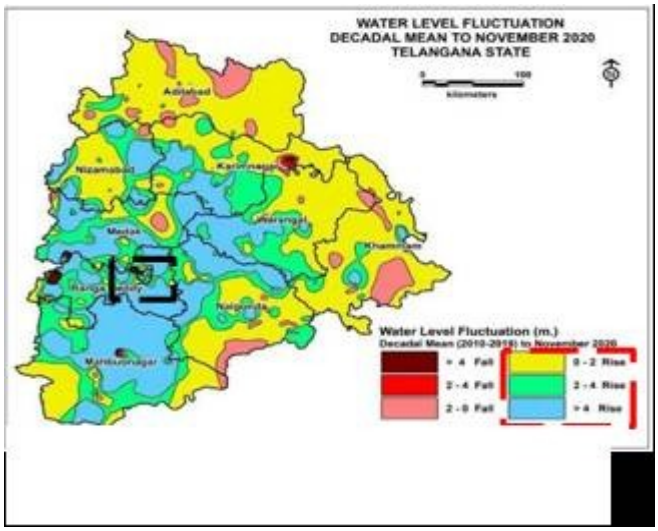


Fig. 5: Water Level Fluctuation from Decadal Mean to November-2020

RESULTS AND DISCUSSION

- During the northeast monsoon, Hyderabad, Khammam, and Nizamabad districts received 211%, 114%, and 102% more rainfall than normal, respectively.
- By drawing lines of equal precipitation, the Isohyetal method is used to estimate the mean precipitation across an area.

CONCLUSION

The anisotropic and non-homogeneous nature of the aquifers results in different hydrogeological conditions within shorter distances depending on the degree and intensity of fracture and recharge conditions. The weathered zone thickness ranges from 5 to 25 m and and the yield ranges from negligible to 5 lps.

Ground water levels measured over time provide valuable information about the behavior of the ground water regime,

which is constantly changing due to recharge and discharge phenomena.

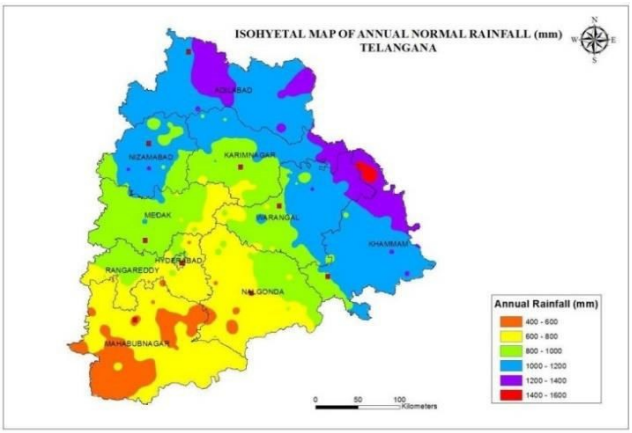
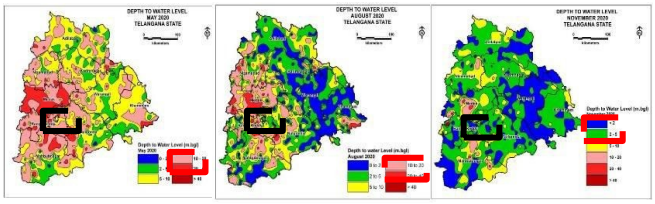


Fig 7 : Isohytel map of Telangana state (Normal annual rainfall in mm).



- The balance of recharge and discharge results in a decrease or increase in ground water storage. When the recharge exceeds the discharge, the groundwater storage rises, and vice versa.
- A decrease in water level could be caused by an increase in draught (for various purposes) or a decrease in precipitation (less recharge to ground water). A rise in water level, on the other hand, could be the result of increased rainfall and/or changes in irrigation practices.
- The predominant gneiss rock in Hyderabad really contributes to keeping the level of the ground water stable. However, other factors, such as rainfall, which affects a city's recharge the most, change for a variety of causes as described.
- The ground water department's report on the 84% rise in level above normal.
- The net increase in ground water level in wells is 2.64 mts on account of the district's overall rise in ground water level.
- Over the course of a decade, it indicates an increase, and in 2021, it indicates a large increase in level where it is anticipated that the level of recharge will be high and be able to alleviate the water deficit.

Case Study of Bansalipet Well

The Bansalipetneighborhood was planned as a model village under the Secunderabad CantonmentTown Improvement Scheme, which was launched in 1993. The village was built thanks to a donation from Raja Bahadur Bansilal and is thus named after him. P. R. Venkata Swami, a prominent Dalit leader and advocate of the Dalit Movement in Hyderabad, wrote in his book Our Struggle for Emancipation: The Dalit Movement in Hyderabad State, that NaganahGarden is part of a gardenenclave. Several anecdotal evidences suggest that the Bansilapet Stepwell was constructed during theAsaf-Jahi period (1724-1948). Scenic well with its strategic location along the Kings way, a route connecting Hyderabad with the British residency in Bolaram- anecdotal story, that can be linked withthe horse motifs found at the main gallery, is that the well was used by caretaker of the horsesbelonging to British Cavalry and Royalty. The story of Naganah's Garden Holistic restoration of the baoli, which included the removal of plastic and other waste from cascaded wells. Also, well dewatering and desalination, Cleaning of stones and removal of plant material and vegetation from structure- Structuralreinforcement of retaining walls, restoration of damaged/damaged wells, lime plaster finishing, andfinally quality improvement of areas surrounding wells via landscape paver, furniture, and signagedesign Community stewardship effort to create information and educational seminars for residents inthe Wells area. Attention to the Cultural and Ecology of Historic Buildings ensures academic importance.

Damage Survey:

- Used as a landfill (7 years old construction debris noticed along with garbage and plastics)
- Was planned by the locals to be used as a parking area (basti encroachments were observed onto the well premises)
- Structural damage over the years of poor maintenance to build structure.
- Studied history of the well associated to secunderabad bansilalpet basti

- Its importance and connection to the ecological an social wellbeing with religious harmony
- Creating a biological diversification in the local ecosystem.

Careful examination and study of its current situation with respect to its construction strategies and details of the materials and principles to bring its charm back to life, Through collective effort

THE RAIN WATER PROJECT.

The Rainwater Project, a social enterprise working towards water conservation, initiated working towards the restoration of this Well. Initial support from GHMC for clean-up of the well has begun.

Access And Approach

Usually, women were associated with these wells because they were responsible to get water. And majorly they used to pray and offer gifts to the goddess of the well for her blessings-the steep approach of the well through the steps was also accessible to the cavalry and cattle. This led to the building of some significant decorative (like the inverted lotus bud, horse heads, nagabanda and floral IndoSaracenicmotifs) and architectural structures, often associated with dwellings. ensured their survival as this stepwell ensured availability of water during periods of drought for the bansilalpet basti. It had social, cultural, and religious significance with a temple in its periphery

Building System

It is a stepped arch design, built in the year 1888 AD. This step well is a type of storage and irrigation tank that were developed, mainly to cope with seasonal fluctuations in water availability. The galleries and chambers surrounding the well were not carved profusely but elaborate detail like horse heads- nagabanda –lotus buds etc. They became cool, quiet retreats during the hot summers. The stepped well is: -57 feet at the approach x 62 feet longitudinally -it is approximately about 45 to 50 feet deep.

Ashlars' type stone masonry in granite with lime mortar is used for the construction of this step well. Masonry is plastered with lime plaster, which bears following designs/details to enhance the elevations.

Environmental and micro-climate

Stepwells were introduced by the Kakatiyas and Qutb Shahis to provide a place to rest on a sunny day. The temperature in the stepwells is up to 5ºC cooler than outside-surviving stepwells originally served relaxation purpose along with providing water. This was because the base of the well provided respite from high temperature during the day, and relief was amplified if the well was covered as it also served as a place for social get-togethers and holy rituals for the Parsigutta, Bhoigudatemple.

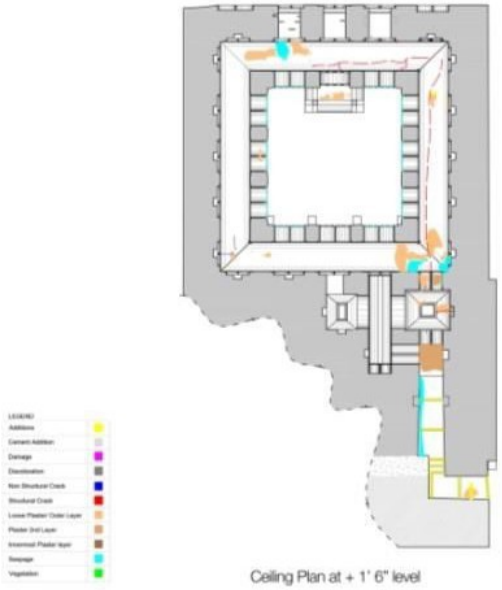
Building Materials

Walls were covered with layers of paints followed by a layer of traces of plaster, especially observed on internal walls of the step well gallery the plaster is chipped, exposing the Ashlar granite stone masonry from about more than 200 years old.

Case Study of Bapughat Well

The step-well is a three-tiered building composed of stone masonry and lime plaster, with architectural characteristics influenced by the Kakatiya and Nizam periods. During the Asif Jahi period, the step-well is thought to have been the source of the "Bagh" (pleasure garden).

Case Study of KW Well



Ceiling Plan at + 1' 6" level

Section A - A'

Architectural Details and Construction Techniques:

It is a stepped arch design, built in the year 1888 AD. It is a type of storage and irrigation tank built specifically to overcome the seasonal water resource variations. The galleries and chambers that encircle the bridge were extensively ornamented and during the warm summers became cool and peaceful. The stepped well is: -30'X35' baoli size. It was about 40 to 45 feet deep.

Construction of this step well (used for irrigation purpose) was done in following four steps,

1. Excavation as well as the construction of retaining walls at first level (below ground) over 35 ft X 30 ft X 40 ft volume being excavated by the hands of workers/mazdoors]. Construction and/or detailing of arcuate retaining wall all around, which is opposite to the semi open arcade i.e., on the other side, which we are not able to see in the photographs].
2. Digging up of the main well as well as the construction of the retaining walls simultaneously with all the required steps and landings for descending up to the water table/level (in three steps)
3. Construction of the semi open arcade (with cusped arch) as well as projecting jack arch slab structure and Installation of techniques used for drawing water from the well. Having 3 Moot (3 sets of bulls used to lift the water with the help of long ropes, water drums hinged on the heavy pulleys).

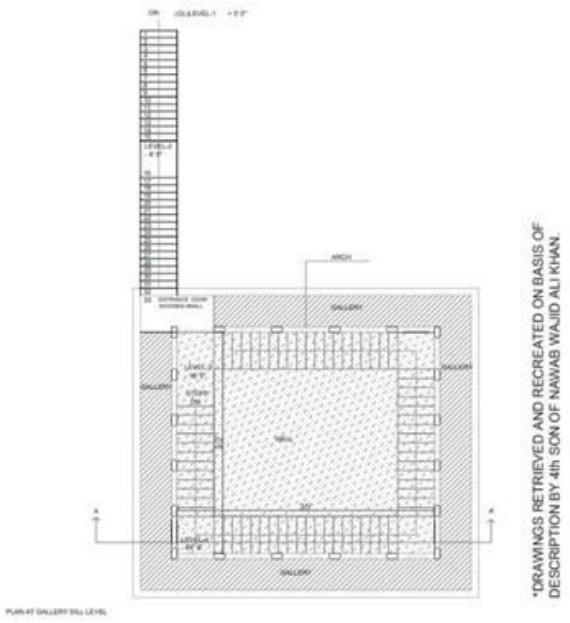


Fig. 8: Plan of baoli

4. Construction of the network of channels for irrigation purpose. Construction style of the complex, of which this step well is the part of, is Indo Saracenic architecture. Because the temperature of this semi open arcade is always found to be 5 degrees Celsius lower than the average ground temperature above, hence this place was used as resting place by nobles.

The well is surrounded by semi open arcade (with pointed cusped arch) or verandah at first level (below ground). Jack arch slab structure transfer live & dead load (above) to this arcade thereby transferring the said load on arch piers/abutments, which further transfer the load to the foundation. Well is surrounded by railing having balustrade of following designs/details…

Ashlars' type stone masonry in granite with lime mortar is used for the construction of this step well. Masonry is plastered with lime plaster, which bears following designs/details to enhance the elevations.

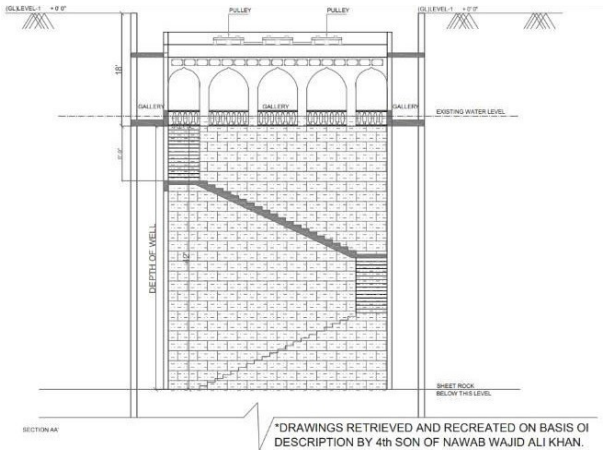


Fig. 9. Section through baoli

THREAT:

The Mindless construction above the baoli wall can cause damage to both the old and new structures.

Fig. 10. Present situation images of baoli

MATERIALS:

Internal lime finish Paint traces:

Walls were covered with lavers of paints followed by a laver of traces of plaster, especially observed on internal walls of the step well gallary the plaster is chipped, exposing the Ashlar stone masonryfrom about more than 200 years old.

System of water retrieval:

The baoli being one storey below ground level with a bullock turning a water wheel to raise the well water to the ground floor. Designed to make it easier for people to reach the groundwater and to maintain and manage the wells for irrigation and daily activities. Having 3 Moot (3 sets of bulls used to lift the water with the help of long ropes, water drums hinged on the heavy pulleys).

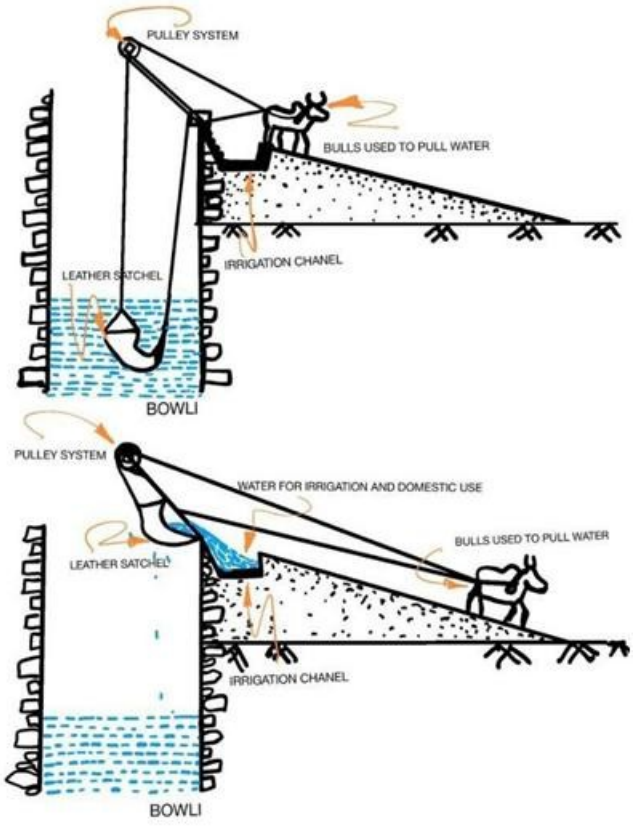


Fig. 11: System of water retrieval

The harvested water from the bodies was collected by a leather satchel, dropped from 3 moot pulley system.The cattle were used to operate the same,as indicated in the adjacent sketch .Irrigation channels that directed this water were called "Kattas" and were made of earth, also temporary kattas were used in the bagh too that would direct the water to rows and columns of home gardens that would includefruits like Chikoo, guava, mango, Tamarind, Mulberry, grape vines, also many vegetables, curry leaf tall shrubs, papaya, Neem, Banyan etc.

Realization of the relationship between the elements of natural heritage and manmade heritage:

These sacred aspects are interrelated and interdependent in such a manner that any positive or negative impact on any one will have a consequent effect on the other. The prioritization for conservation can therefore be focused and implemented by identifying the heritage fabric of that settlement, the market lanes of old city, the Dewdis, the Bagh's, the gardens, the baolis and even the daily lives of the businessmen of the heritage city are an intrinsic part of the heritage fabric of Hyderabad which needs to be conserved. Once the heritage fabric is determined it is necessary, to understand the primary causes of decay and destruction of our heritage to determine the policies of conservation it will help to evolve strategies methodologies and processes and the action plans for conservation.

The elements of natural heritage trends traditional decision- making tend to always have been balanced between the availability of the resources and their consumption and the evolution of the local architecture. Which always seem to have in its basics a conscious attempt to balance between continuity and change so that the change was always congruent to the context.

We also notice that heritage structures and most traditional buildings are very respectful of the land and the surroundings with exceptional understanding of the traditional materials and construction techniques that are much more durable and ecofriendly than the contemporary materials.

Common sense appears to be the common denominator in the traditional process of decision-making traditional designs and decision making offered opportunities for creative inputs on all various levels of its implementation and was never restricted to the design studios of the architect's office only.

Need for Conservation and not Preservation:

Hyderabad has seen significant development over the past several years, including increased industrial and economic activity. Telangana Pollution Control Board has accomplished things in the containment, transport, treatment and safe disposal of industrial waste as well as the control on air, noise and water pollution (TPCB). [6][7]

With over 1000 ppm hardness count, ground water of Hyderabad is more than three times harder than desirable drinking water hardness standard.[8] Rapidly increasing population of the city, thereby increased use of ground water has resulted in fall of ground water table. [9][10] Water level in river and lakes have also declined enormously. Inadequately treated effluent from effluent treatment plants of industrial areas is discharged in natural water sources which is further aggravating the already grim situation.[11] Scores of settlements in India which had its own character call to be conserved in its totality, Charminar of Hyderabad city is one such pocket which has character of its own cultural background that's uniquely appropriate to its scale and positivity of its people with their pride of being a Hyderabadis.

We can use it as Rainwater Harvesting system, by purifying the collected water and channelize the water through pipelines to eradicate the water scarcity of the particular area.

Energy markets offer enormous possibilities for increasing efficiency. Going forward, GIS-based mapping of energy assets will benefit all stakeholders and aid to accelerate the policy-making process. Fragmented data has been compiled; this will be an excellent research tool.

Geospatial systems are crucial not just for supporting daily operations, but also for India's economic growth.

To Engage and educate industry experts, other levels of government, non-profit organizations, and academics on how and why the city is transforming its approach to

rainwater management through an integrated water approach and climate resiliency as part of the transition to a water sensitive city is necessary. We could then use these interactions to exchange knowledge and create capacity in business, government, and academia to promote the deployment of integrated water management systems, including green rainwater infrastructure, throughout the city. We could also engage practitioners and the general public to promote knowledge of rainwater management, climate change, and green rainwater infrastructure, empowering people to act in their community.

There is a need for IHR to design a "Data Centric Architecture" to solve data gaps, data quality control, data management, and end-user data access for sustainable development planning and decision making.

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