

Owner Replenishes: Enabling Youth Participation for Ground Water Conservation in Peri Urban Nashik

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Abstract: UN World Water Development Report 2022 'Groundwater: making invisible visible' - has pointed out that the major source of freshwater is groundwater. Groundwater conservation and replenishment have taken the forefront in view of the water crisis faced by the world. Groundwater management is action-oriented, focusing on practical implementation activities and day-to-day operations. It occurs more often at the micro- and meso-level. The urban area has the privileges of an established public water supply system, the suburbs and periurban areas are almost entirely groundwater dependent. The surface water runoff is mostly wasted and drained into the nalla/ river in these areas.

Peri Urban zone of Nashik includes 177 institutional campuses (schools and colleges). These campuses can be developed as role models and act as leaders for water conservation methods and groundwater recharge for the neighbouring rural zone.

This research is based on a methodology that involves three-pronged approaches, which consist of a) Identifying the potential of educational campuses in the peri-urban zone, b) educating the school students about the water and its conservation techniques as primary stakeholders of the future and c) creating platform at the school level to interact with the villagers in the vicinity to create the actual impact of the replenishment. This approach ensures active participation of the stakeholders (campus management, admin, student community) in periurban areas for groundwater recharge. Thus sensitising the student community as the primary stakeholder ensures the bottom up approach for sustainable urban development.

This transdisciplinary approach of engaging the students with the community drives two fold benefits - one, of committed habit formation in them & second, of becoming a leader & a resource person for future green development of the area. The discussions on groundwater conservation in this paper point out to the need to coin principle of "Owner Replenishes"- for water conservation on the lines of "Polluter Pays".

Key words: Groundwater recharge, urban sustainability, youth participation, peri urban campus.

Introduction

Recognizing the growing challenge, the UN General Assembly launched the "Water Action Decade" - to mobilize action to transform how water is managed. Meeting drinking water, sanitation and hygiene targets by 2030 requires a 4 × increase in the pace of progress.

UN World Water Development Report 2022 'Ground water: making invisible visible' - has pointed out that the major source of freshwater is groundwater. Groundwater conservation and replenishment have taken the forefront in view of the water crisis faced by the world. The UN Summary Progress Update 2021 on SDG 6 raises the issue of the lack of groundwater data

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and groundwater monitoring initiatives, emphasising that groundwater monitoring is a 'neglected area'. This paper discusses the importance of owners in periurban areas (who have the right to groundwater in their land) in the replenishment of groundwater. The means of achieving it is by including the youth (who are the future owners) in the process.

Groundwater Scenario

The groundwater dependence of innumerable cities appears to be intensifying, such that nearly 50% of the global urban population today is estimated to be supplied from groundwater sources.

India accounts for 25% of the world's extracted groundwater. 85-90% of rural India depends on groundwater resources for its drinking water supplies (DDWS, 2009; World Bank, 2010).

Figure 1 illustrates the evolution of groundwater withdrawal during the period 1950–2020 for selected countries (countries for which sufficient data are available). It shows clearly the difference in the timing of maximum growth between the USA and Asian countries like India, China, Pakistan and Iran. Its share in total freshwater withdrawal has risen from 12% in 1950 to 25% in 2017. Accounting for approximately 99% of all liquid freshwater on Earth, groundwater has the potential to provide societies with tremendous social, economic and environmental benefits and opportunities. Groundwater already provides half of the volume of water withdrawn for domestic use by the global

population, including the drinking water for the vast majority of the rural population who do not get their water delivered to them via public or private supply systems, and around 25% of all water withdrawn for irrigation. However, this natural resource is often poorly understood, and consequently undervalued, mismanaged and even abused. (The United Nations World Water Development Report 2022)

Urbanisation and Groundwater

Rapid urbanization has triggered the growth of cities beyond the boundaries. The haphazard development in periurban areas has created a threat to the ecological balance of the area. The ecological factors that are affected are- biodiversity, green cover, and pollution of groundwater.

Peri Urban areas are zones of transition from rural to urban land uses located between the outer limit of urban and regional centers and the rural environment. The boundaries of periurban areas are porous and transitory as urban development extends into rural and industrial land (*Peri-Urban Landscapes; Water, Food and Environmental Security, University of Western Sydney, July 2014*)

As small towns transition to large cities, there are phases of 'uncertainty' in civic supply. These uncertainties are inevitably filled up by groundwater pumping, either in-situ through private well construction or through tanker-water supply sourced from wells in the rural hinterland. Groundwater management is action-oriented, focusing on practical implementation activities and day-to-day operations. It occurs more often at the micro- and meso-level (*UN World Water Development Report 2022*)

The issue of groundwater requires multilevel addresses wherein the top level is the policies and the bottom level is the students. The authors think that involving students, as the youngest members, in replenishing and protecting groundwater resources is the most ideal approach. Hence the fabric of this issue has multiple threads (stakeholders) making it an interdisciplinary affair.

Initiatives and Policies (National and International)

It is imperative to understand the role adopted by the national and international bodies for groundwater conservation, following the UN World Water Development Report 2022. This part intends to study the various approaches for water conservation, introduced through the policies made at the national

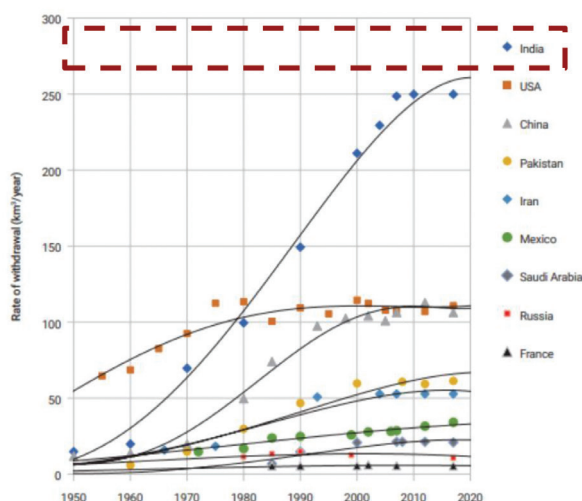


Figure 1: Evolution of total groundwater withdrawal in selected countries, 1950–2020.

Source: Based on Margat and Van der Gun (2013, Figure 5.4, p. 128). Updated by the last author, using reported national data.

and international platforms to achieve the goal of replenishing/reinforcing the groundwater resources.

History of Policies for Water Conservation

National Water Resource Council (NWRC) was set up in 1983 by the Government of India for planning at the national level for utilisation of water resources to be undertaken to achieve the greatest good and optimum benefits from the available water resources. In this context, this council laid down the National Water Policy (NWP) in 1987. This policy was reviewed and updated from time to time.

With the challenges of rapid growth and the global threat of climate change, the Government of India released the National Action Plan on Climate Change (NAPCC, 2008). Under this action plan, a “National water mission” was announced to meet the challenges of water. One of the strategies under the National Water Mission is promoting citizens and state actions for water conservation, augmentation and preservation.

The National Water Policy 2012 defines the broad contours of the strategy for water management in

India. One of the highlights of NWP 2012 is “declining groundwater levels in over exploited areas need to be arrested by introducing improved technologies of water use, incentivising efficient water use and encouraging community-based management of aquifers. In addition, where necessary, artificial recharging projects should be undertaken so that extraction is less than the recharge. This would allow the aquifers to provide base flows to the surface system, and maintain ecology.” Integrated management of water resources at different spatial scales features quite prominently in the policy.

Parallely, the World Bank, in 2012, defined Integrated Urban Water Management (IUWM), as “a holistic mode of strategic planning which takes a landscape view of water challenges by looking at competing water users in an urban area”. IUWM is a holistic and comprehensive perspective on water management adopted by the Indian government. One of the neglected key components of IUWM, which needs to be reinforced is Utilisation of alternative water sources, including rainwater, and reclaimed and treated water. The 3 pillars for urban sustainable development under IUWM are:

Table 1: Global indicator framework for the SDG and targets of the 2030 Agenda for Sustainable Development

<i>SDG 06</i>	
<i>Ensure availability and sustainable management of water and sanitation for all</i>	
<i>Target</i>	<i>Indicator</i>
6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	Amount of water and sanitation-related official development, assistance that is part of a government-coordinated spending plan
6.b Support and strengthen the participation of local communities in improving water and sanitation management	Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management.
<i>SDG 04</i>	
<i>Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all</i>	
4.4 By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	
4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development	Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment.

1. Enabling environment
2. Institutional arrangement
3. Management instruments

Water and SDG

The way water is managed in the cities will determine the success in achieving the Sustainable Development Goals (SDG) targets, given that water cuts across most of the SDGs (UNGA, 2015). This research focuses on SDG 6 as the primary goal and SDG 4. The following Table 1 highlights the SDG and target and indicators for achieving the goal.

Implementation of SDG at National Level-Niti Aayog

The Union government of India announced NITI Aayog in 2015. Figure 2a shows the Indian scenario of SDG achievements as in 2022.

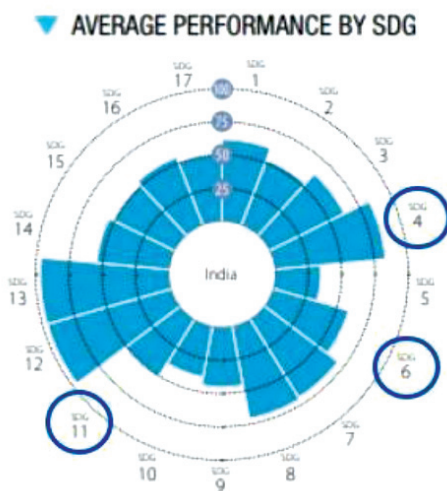


Figure 2a: Indian scenario of SDG achievements as in 2022.

Source: 2022: UN Sustainable Development Report.

Action taken for the implementation of SDGs at the local level has been formatted by NITI Aayog. NITI Aayog endeavours to acknowledge all unique and ingenious efforts that could combat water scarcity and boost water management successfully.

It formulates policy directions and advisories to harness the potential of advanced and ready-to-use technologies and promotes research and development to achieve excellence in water and land resources management (Figure 2b). Ensuring long-term sustainability of finite groundwater resources and the Operation and maintenance of water infrastructure with the active participation of stakeholders are 2 key objectives under Niti Aayog.

Niti Aayog has combined various water ministries under its flagship - Jalshakti Mantralaya. Various schemes such as Swachh Bharat, Jal Jeevan Mission, Har Ghar Jal, Jal Shakti Abhiyan : catch the rain are proposed for the fulfillment of 2030 global agendas.

Jal Shakti mission is a transdisciplinary action taken. Jalshakti campus has a multifold agenda of turning into a water-efficient campus and extending the model to the surrounding rural area.

Jal Shakti Campus - A Water Conservation Action and Implementation Plan

The Ministry of Jal Shakti, India, has launched the Jal Shakti Abhiyan-I in 2019. The mission promotes water conservation and water resource management by focussing on 5 targeted interventions

1. Water conservation and rainwater harvesting
2. Renovation of traditional and other water bodies
3. Reuse of water and recharging of structure
4. Watershed development
5. Intensive afforestation.



Figure 2b: Timeline of various policies and initiatives.

Jal Shakti Abhiyan identified the potential for water conservation in educational institutions. A water conservation plan published by MGNCRE (Mahatma Gandhi National Council for Rural Education) named 'Jal Shakti Campus and Jal Shakti Gram'

Jal Shakti Campus is a guide on water management measures including conservation measures like water budgeting, water metering, water audit, water demand study, reduction of water losses and management

Parameters for assessing water conservation under the Jal Shakti campus plan are:

- Water conservation - to ensure water adequacy, efficient use of water in toilets, mending and repairing leaks in taps and pipes.
- Rainwater Harvesting- installation and implementation of rainwater harvesting inside the campus. Educating faculty and students on campus through workshops and seminars.
- Renovation of traditional and other water bodies- through groundwater recharge, maintenance and reuse, management of water and land and development of watershed.
- Technological interventions - to develop planning, preparing and reporting mechanisms, publicity and sharing knowledge.

Youth Participation: Bottoms up Approach

As stated by Gurudev Rabindranath Tagore "Age considers Youth ventures". The focus of sustenance is inculcating in young minds - the habit and awareness of water conservation.

The water related challenges can no longer be addressed through purely engineering solutions that typically look at problems in isolation. Implementation of the policies cannot be confined to authorities, participation of stakeholders is necessary. The participation of stakeholders is necessary in order to: break 'silos' between different sectors and activities; to reach a common understanding and vision of challenges and activities (François Brikkés, 2015, Urban Water Management in India).

Children and adolescents have a vital understanding of spaces, buildings and neighborhoods. They are experts in their own needs. They will be "framers" and decision-makers in cities of tomorrow. Hence, the participation of children and young people in planning processes receives more and more attention in urban planning (Million & Heinrich, 2014).

The approach demands inducing behavioural change and adopting a new mindset to inculcate water conservation as a habit and a lifestyle. The idea is to make the planning as inclusive and participatory as possible so that there is a sense of ownership among the residents for the interventions carried out. The youngest stakeholder who is the youth/ student should be involved and educated for active participation. This resource when tapped at this impressionable age can carry this habit into adulthood. Adopting Arnstein's ladder for the participation of school children ensures the bottoms up approach wherein the essence of the sustainability models begins at the grassroots level.

NEP 2020 policy facilitates such nonconventional approaches towards sustainability. It encourages

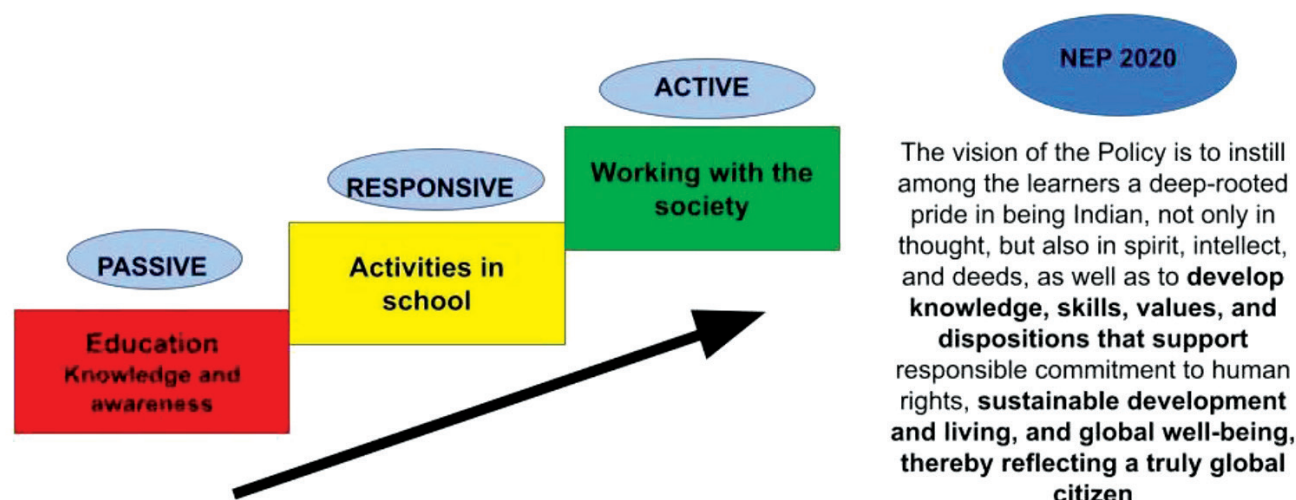


Figure 3: School children participation levels : Bottoms up approach.

Source: Adopted from Arnstein's Ladder of Citizen Participation.

institutes to make students participate and learn skills that will help them develop imperative knowledge for water conservation and green infrastructure (Figure 3).

The policy also facilitates curricular integration of essential subjects, skills and capacities.

- Water and resource conservation
- Current affairs and knowledge of critical issues faced by local communities.
- Environmental education.

Hence Educating, sensitising, empowering and encouraging school students to promote water conservation activities so that they become competent and committed water citizens of our nations.

“Catch them young, watch them grow” (UNICEF, Malawi), this points to the transdisciplinary approach needed, involving the schools and campuses for sustainable practices

Water Problem in Peri Urban Area

55% of the world’s population lives in urban areas, a quantum increase is expected to 68% by 2050. Out of which 90% is taking place in Asia (*White Paper on A qualitative framework to Evaluate the extent of Integrated Urban Water Management in Indian Cities, 2021*). Rapid urbanisation has triggered the growth of cities beyond the boundaries. The haphazard development in periurban areas has created a threat to the ecological balance of the area. The ecological factors that are affected - are biodiversity, green cover, and pollution of groundwater.

While the core township may continue to enjoy the privileges of an established public water supply system, suburbs and periurban areas are almost entirely groundwater-dependent

The trend of surface and groundwater use across the large cities in India according to Kulkarni and Mahamuni (2014) is an equal share of surface water

and groundwater, though groundwater share is unacknowledged in the civic water supply.

In urban areas, the water supply is regulated by the Municipal Corporation (water sources - Surface water + groundwater). In peri urban areas the major source of water is borewells and wells, which are privately owned and the withdrawal of water from these sources goes unaccounted (Figure 4). The authors feel the need of intervention in replenishing these groundwater sources at the local level through effective youth participation to achieve water independence.

NITI Aayog reported that 21 cities in India will be deficient in ground water by 2020.

Peri Urban areas have seen development happening in the form of gated communities (residential), large institutions (educational) and industrial developments.

All these 3 typologies have a substantially large area under them. These developments have private governance and hence have more flexibility and autonomy in managing their natural resources (Figure 5). Authors believe that this opportunity of self regulation can act as a catalyst for water conservation.

Case Study: Peri Urban Nashik

The campus is a mini community where educational institutions impart learning. Practice can inculcate habits as a duty on the campuses of educational institutions. Habit formation is possible through experience and practice (*Jalshakti toolkit foreword*).

Favourable climatic conditions along with good connectivity to major cities of Maharashtra, Nashik is fast converting into a metropolis. The rise in population is also increasing the infrastructure development in the periurban areas. Comparatively low land cost coupled with loose administrative rules implied to peri urban areas has resulted in large campuses cropping up in peri urban areas of Nashik.

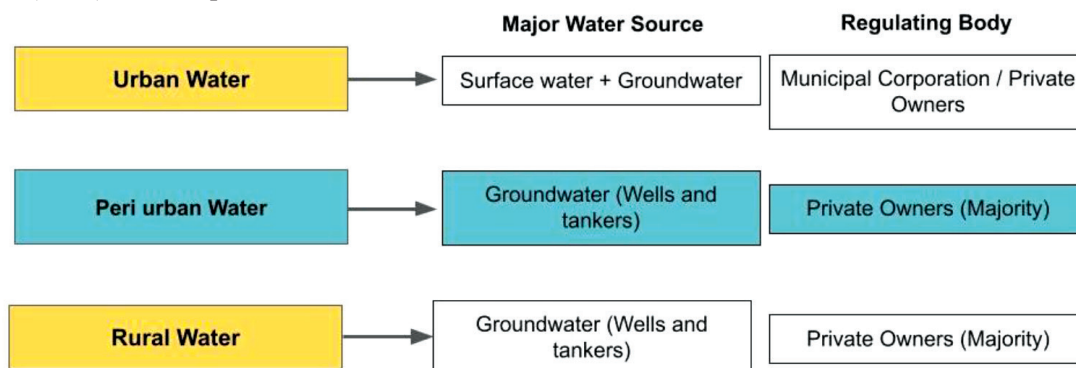


Figure 4: Domestic water use/consumption scenario.

Source: Authors

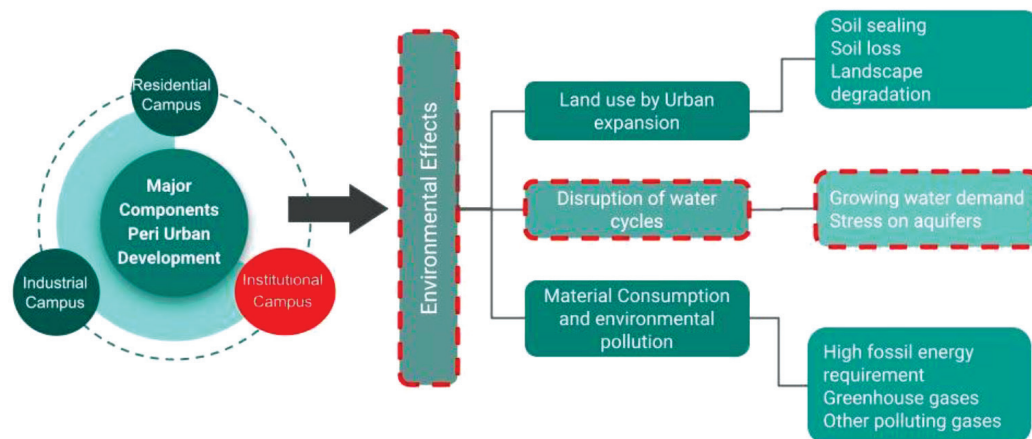


Figure 5: Peri Urban Development and its Environmental Effects.

Source: Graphic modified from: Bueno, Carlos & Coq-Huelva, Daniel. (2020). Sustaining What Is Unsustainable: A Review of Urban Sprawl and Urban Socio-Environmental Policies in North America and Western Europe. Sustainability. 12. 4445. 10.3390/su12114445.

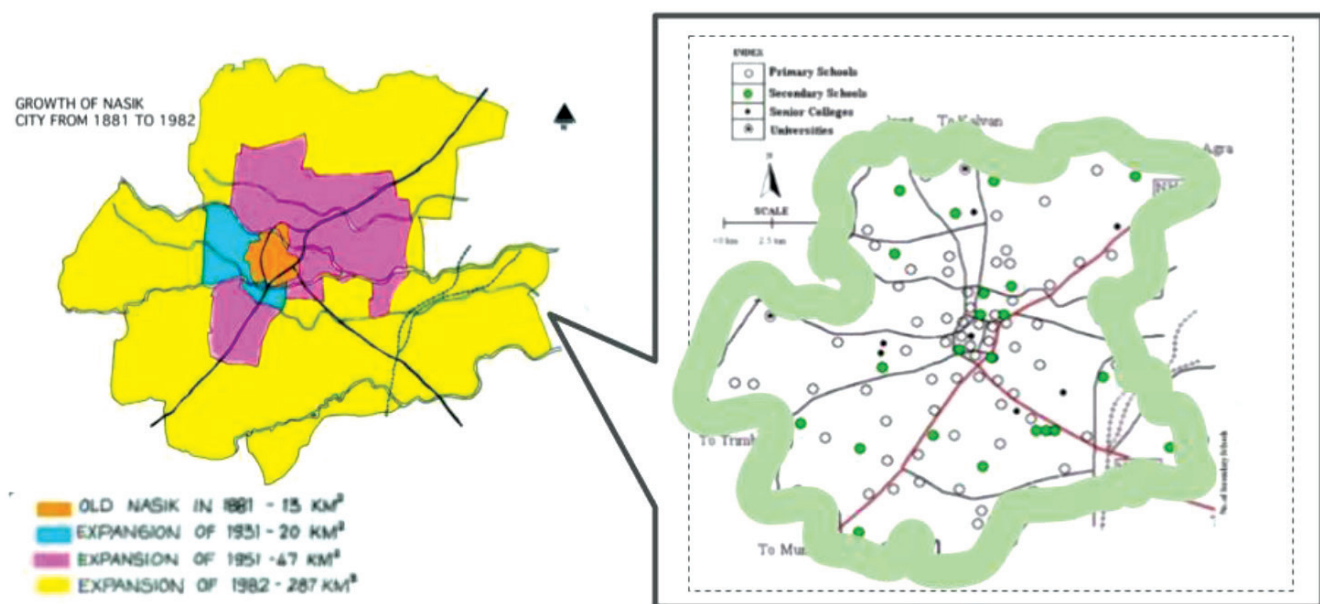


Figure 6: Growth of education institution campuses in Nashik.

Source: RAMAYAN TO GLOBALAYAN: TRANSFORMATION OF NASIK by Sulakshana Mahajan, City, Space, and Globalization

Peri Urban zone of Nashik includes 177 institutional campuses (schools and colleges) (Figure 6). These campuses can act as leaders for rainwater conservation and the neighbouring villages can follow it.

Rainwater harvesting practices are now a mandatory factor in the development rules of cities in India. In periurban areas, the ratio of undeveloped land is more for Nashik. The surface water runoff is mostly wasted and drained into the nalla/ river. This quantum of water should be used to charge the aquifers present in the peri

urban zone - which will ultimately affect the water table level and more water will be available for irrigation purposes, which is the main activity in this zone.

Aspects of Participation

There is a need to formulate a method that is useful for water replenishment which involves the user/owner. These future users/owners are the youth of today. Three fundamental aspects comprise a triangle of participation

for young people: Challenge, Capacity and Connection. Adults also today are constantly learning to give their active citizenship an interpretation in an informal and personal manner. There are three distinguished dimensions in this learning process that are necessary basic conditions and in varying combinations and accents steer the learning process, namely challenge, connection and capacity (Jans and De Backer, 2002)

The bottom up approach of delegating the decision-making power to the local community can be managed and integrated with youth participation, to make it a sustainable model.

In order for young people to actively participate in society the 3 dimensions of governance, stakeholders and institutional participants should be clear, understood and communicated (Figure 7). When each aspect of the triangle is met youth participation is ensured.

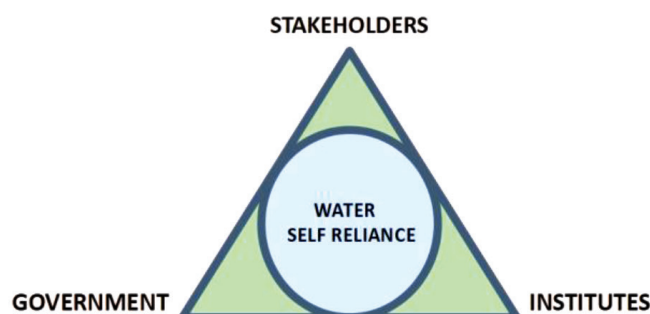


Figure 7: Aspects of youth participation.

Source: Authors

Methodology

The research paper is based on a methodology that involves the analysis of space (peri urban in particular) with regard to the participatory approach (stakeholder involvement)

The paper intends to find the link between the implementation of SDG and the participation of youth (school children). The study identifies the peri urban area of Nashik city as the area under constant threat of unplanned development, which may lead to a crisis arising due to overconsumption of existing groundwater. The ownership of groundwater in India is undefined. The research method adopted is.

- Understand the groundwater issue and policy.
- Identify implementation areas that are liable to the exploitation of groundwater sources.
- Evaluate the involvement of school children as ambassadors of water conservation - empowering institutions as role models for sustainable development of the area (Figure 8).

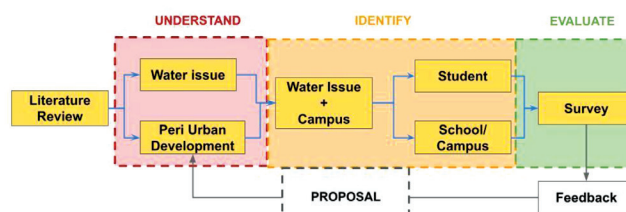


Figure 8: Research methodology flowchart.

Source: Authors

Three random day schools in peri urban Nashik were selected. Each school had an average student count of 900. The schools were located within 3 km off the city limit, near the eastern and northern perimeter. The age group of students identified for the survey was 12 to 15 years (7th to 10th standard). 15% of the class participated in the survey. An interaction with the students on the topic of water issues and rainwater harvesting was conducted prior to the survey. The authors intend to give a customised proposal to each school to become leaders in groundwater replenishment.

- **Level 1:** Implementing rainwater harvesting on the school campus.
- **Level 2:** Creating awareness in the neighborhoods.

Discussion

Observation and analysis of the primary survey revealed the inclination and knowledge of students in the subject. The primary survey revealed that 83% of students were willing to become water monitors. 94% of students were ready to share the school experience of water harvesting to the villages around to propagate the habit of water conservation (Figure 9).

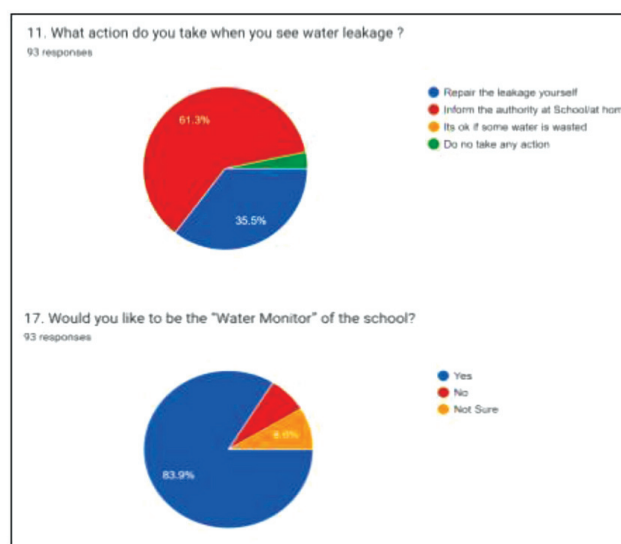


Figure 9: Sample of result analysis from the questionnaire.

This shows the self-initiated drive in the students to help in the water conservation drive.

The sources of water in the peri-urban schools were 30% borewells, 50% Gram Panchayat supply (part of it through wells) and 10% of the times tankers.

Water cycle and the importance of water are taught in school at the secondary and higher secondary levels. 47% of students are aware of the underground water sources and could relate to the questions regarding it. 61% of students confirmed that they were concerned and would inform authorities in case of water leakages and 35% said that they would repair the leakage on their own.

The authors analyzed that the students have knowledge and willingness to work but lack application opportunities. So, it slackens their interest as they are unable to correlate this issue in their day to day life. Providing opportunities for direct involvement in the field, will give them the feeling of importance and ensure the inculcation and propagation of the importance of water replenishment. This will also allow inculcating the qualities of team building, leadership, problem-solving skills in the students, in turn partially fulfilling the NEP 2020 vision

Conclusion

The discussions on ground water conservation in this paper point out the need to coin the principle of “Owner Replenishes”- for water conservation on the lines of “Polluter Pays”. Groundwater is still considered a private resource in peri urban areas, owner replenishes is a concept where the land owner becomes the active person to be included in the conservation process.

The spatial study of the peri urban zone indicates the fragility of the natural resources present. The groundwater remains the main source of water for existing and developing green infrastructure in these areas. Institutions (educational) campuses developed in this zone can act as role model in water conservation for the neighbouring rural area. The campus is the hub where water conservation strategies are implemented by means of teaching methods of measuring, auditing, metering and managing water conservation. This in turn enables students to participate in the urban planning process when the peri urban zone turns into urban. The guidelines laid by the Jalshakti campus toolkit enhance the participation of internal as well as external stakeholders.

This transdisciplinary approach of engaging the students with the community drives twofold benefits - one, of committed habit formation in them and second, of becoming a leader and a resource person for future green development of the area. The authors find the connection between the Sustainable Development Goals linking water with sustainable development of cities, achieved through appropriate education (Figure 10). Education empowers the youth to participate in

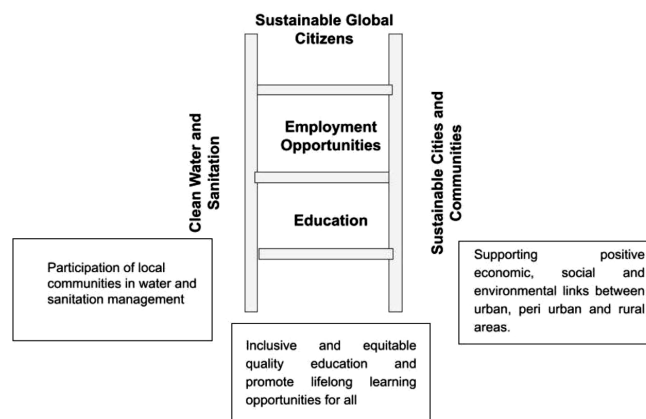


Figure 10: Transdisciplinary connection for water reliance.

Source: Authors

the implementation process which can ensure water independent societies.

References

- Bueno, C. and D. Coq-Huelva (2020). Sustaining what is unsustainable: A review of urban sprawl and urban socio-environmental policies in North America and Western Europe. *Sustainability*, **12**: 4445. 10.3390/su12114445.
- Department of Drinking water and Sanitation, 2009; World Bank, 2010.
- Global indicator framework for the SDG and targets of the 2030 Agenda for Sustainable Development. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- https://archive.unescwa.org/sites/www.unescwa.org/files/events/files/water_sdgstargets.pdf
- Jal Shakti Campus Toolkit.
- Margat and Van der Gun (2013, Figure. 5.4, p. 128). Updated by the last author, using reported national data.
- Million, A. and A.J. Heinrich (2014). Linking participation and built environment education in urban planning processes. *Current Urban Studies*, **2**: 335-349.

Peri-Urban Landscapes; Water, Food and Environmental Security, University of Western Sydney, July 2014.

Sulakshana Mahajan, RAMAYAN TO GLOBALAYAN: TRANSFORMATION OF NASIK, City, Space, and Globalization.

The United Nations World Water Development Report 2022, GROUNDWATER Making the invisible visible.

UN World Water Development Report, 2022.

United Nations General Assembly (UNGA), 2015.

UNICEF, Malavi

White Paper on A qualitative framework to evaluate the extent of Integrated Urban water management in Indian cities, 2021.