International Journal of Research in Engineering, Science and Management
Volume-2, Issue-12, December-2019
www.ijresm.com | ISSN (Online): 2581-5792

Automatic Hand Sanatizer Dispenser Unit

Ambuj Katare[1], Akash Patel[2]
[1]*Student, Department of Journalism, Jagran Lakecity University, Bhopal, India*
[2]*Technocrats Institute of Technology, Bhopal, India*

***Abstract*: Water is one of the most crucial elements in our national developmental planning for the 21st century. It is becoming a subject of great concern for the country as a lot of cities and parts of states of the country is facing the problem of water crisis and unavailability of clean drinking water with proper hygiene. Institutions like Offices, Colleges, Universities, Schools, Hospitals, Corporate Societies, Public Sector Units, Government and Semi- Government Organizations, Residential Societies, Public toilets, Shopping Malls, Shopping Complex etc. uses a lot of water in washing hands as well as there is a lot of wastage of water during washing of hands. Hygiene as well is now the priorities of people as they are getting more and more concern about their health and hygiene.**

***Keywords*: Water wastage, Sustainability, Hygiene.**

1. Introduction

Water is a necessity for life just as air and the importance of water in a life of a human is at most. In the last decade, it's been observed that water crisis along with its wastage has raised in a great manner and is becoming a matter of great concerns of the economies of the world as well as the organizations like World Health Organization, United Nations, etc. There has been a lot of development worldwide and setting up of industries, urbanization, development of health facilities etc. But these developments led to the higher water usage and wastage. These developments have created a big question mark on the sustainability and sustainable development.

In urban India, however, the number of waterbodies is declining rapidly. For example, in the 1960s Bangalore had 262 lakes—now only 10 hold water. Similarly, in 2001, 137 lakes were listed in Ahmedabad city—65 of them have construction work underway. Hyderabad is another example—in the last 12 years, it has lost 3,245 ha of its wetland [2].

Most of the river basins in India and elsewhere are closing or closed and experiencing moderate to severe water shortages, brought on by the simultaneous effects of agricultural growth, industrialization and urbanization. Current and future fresh water demand could be met by enhancing water use efficiency and demand management [1].

Every year there is a decrease in water levels in different regions of the country as well as the world. The ground water level of these regions is depleting drastically due to the unorganized consumption of water. As well as, the available resources of water have been polluted by human activities which is making the water not suitable for usage and causing water scarcity. Groundwater in India is not in its pristine condition due to over extraction and contamination. Extensive groundwater mapping, recharging of groundwater by RWH and restricting informal extraction of water resource is needed to maintain the water balance. The current water conservation regime in India doesn't effectively undertakes these practices. In urban India, however, the number of waterbodies is declining rapidly. For example, in the 1960s Bangalore had 262 lakes—now only 10 hold water. Similarly, in 2001, 137 lakes were listed in Ahmedabad city—65 of them have construction work underway. Hyderabad is another example—in the last 12 years, it has lost 3,245 ha of its wetlands.[2] States need to build on this momentum, and upgrade their water management practices to show outcomes and not just outputs. [5]

2. Approach and Objective

This document's approach aligns with the UN's Sustainable Development Goals to be achieved by 2030 regarding availability and sustainable management of water and sanitation for all. It also aligns with goals set by the National Water Mission and National Mission on Sustainable Habitat of conserving water, minimizing waste, promoting alternative technologies and encouraging community involvement to increase water-use efficiency by 20 per cent by 2017.

The objective of the study is to assess the water used by an individual for washing hands and after using washroom and before taking a meal. This study will also discuss about the wastage of water during washing hands in a privately-owned Higher Education institute, a shopping mall and a petrol pump outlet in Bhopal, Madhya Pradesh, as there is a lot of unnecessary water flowed while the tap remains running. In the end will talk about the ways and technologies that can reduce the use of excessive water and save as much as water as possible to attain maximum sustainability as well as to maintain health and hygiene.

- Policy framework for water conservation/efficiency and energy efficiency will lead to making India a water-frugal economy and meeting the SDGs.
- Strategies introduced to improve existing management models by working on demand management including usage of water efficient fixtures, reducing NRW and operating, maintaining and monitoring these systems
- Energy efficiency is not only for sustainable urban water management but also a tool for carbon

mitigation in cities

- Water-sensitive urban design and planning approach can lead to mainstreaming intervention for water and resource efficiency leading us to becoming a water prudent society.

3. Literature Review

Scientific management of water is increasingly recognized as being vital to India's growth and ecosystem sustainability. [5] About 20–50 per cent of water that is pumped into the water supply system is 'lost' because of leakage, theft, burst pipeline, non-payment of water tax etc. [2]. India is suffering a very significant water crisis with economic growth, livelihoods, human well-being, as well as ecological sustainability at stake. In order to tackle the multi-faceted drivers and impacts of water scarcity, states must adopt a water lens into policy making and planning across sectors [5].

4. Water availability and use

India counts for 2.45% of land area and 4% of water resources of the world but accounts for 16% of the world population. Total utilizable water resource in the country has been estimated to be about 1123 BCM (690 BCM from surface and 433 BCM from ground), which is just 28% of the water derived from precipitation. About 85% (688 BCM) of water usage is being diverted for irrigation (Figure 1), which may increase to 1072 BCM by 2050. Major source for irrigation is groundwater. Annual groundwater recharge is about 433 BCM of which 212.5 BCM used for irrigation and 18.1 BCM for domestic and industrial use (CGWB, 2011). By 2025, demand for domestic and industrial water usage may increase to 29.2 BCM. Thus, water availability for irrigation is expected to reduce to 162.3 BCM. With the present population growth-rate (1.9% per year), the population is expected to cross the 1.5 billion mark by 2050. Due to increasing population and all-round development in the country, the per capita average annual freshwater availability has been reducing since 1951 from 5177 m3 to 1869 m3, 1140 m3 in 2050. Hence, there is an urgent need for efficient water resource management through enhanced water use efficiency and water wastage reduction.

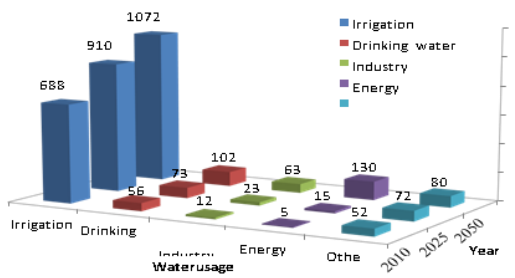

Fig. 1. Projected water demand by different sectors (CWC, 2010)

A. Urban hubs to witness severe water shortages which could risk urban growth in India

India's urban population is expected to reach 600 million by 2,030 and fulfilling its water needs will be a great challenge. Estimates suggest that the demand-supply gap for the domestic sector will stand at 50 BCM in 2030, with the demand expected to double by that time. the present situation is also not ideal. 5 of the world's 20 largest cities under water stress are in India, with Delhi being second on the list. Additionally, 8 million children below the age of 14 in urban India are at risk due to poor water supply.

Water supply infrastructure in the major metropolitan cities of the country, which was never designed to cater to such large population sizes, will be unable to serve the urban population. As of 2014, no major city in India supplied 24x7 water to its entire urban population, and only 35% of urban households in India have piped water in their dwelling as the primary source to support drinking water needs, while others rely on piped water to plot/yard, tube wells, and public taps amongst other sources.44 These water delivery challenges will further exacerbate as migration to major urban cities in search of better livelihood opportunities continues, and additional stress is put on the already-insufficient water resources and inadequate infrastructure. As of 2015, India treated only 30% of the wastewater generated in the country. Lack of adequate infrastructure in cities to handle their own wastewater will add to the problem, and improper solid waste management may even lead to contamination of remaining groundwater resources.

In such circumstances, water shortages will become more frequent and water rationing by states will intensify further. Industrial growth in and around cities will be severely compromised as companies will move their operations to more water-secure locations. All these challenges can together create serious water scarcity conditions for urban dwellers where their basic water needs are not met. This will also endanger the aspirations of rural Indians seeking a better life in urban India and nip rural-urban migration forces that are a part of India's journey towards becoming an industrialized modern economy.

B. Need for urban water efficiency and conservation

Rapid and unregulated urbanization and outdated urban water management models impacts water quality and quantity by jeopardizing the security and safety of our existing water resources. Cities are overwhelmed with water-related challenges [2].

The Indian water management model shows that sources of water are the primary and most important part of the water supply system (see Figure 2: Water management in India). This means that the conservation of locally available sources, i.e. groundwater and water bodies, is essential for sustainability of available water. In India, however, they are overexploited and neglected.

Waterbodies are an important part of urban ecosystems. They perform significant environmental, social and economic functions recharging groundwater to act as sponges, supporting biodiversity and providing livelihoods.

In urban India, however, the number of waterbodies is

declining rapidly. For example, in the 1960s Bangalore had 262 lakes—now only 10 hold water. Similarly, in 2001, 137 lakes were listed in Ahmedabad city—65 of them have construction work underway. Hyderabad is another example—in the last 12 years, it has lost 3,245 halves of its wetlands outdated urban water management models impacts water quality and quantity by jeopardizing the security and safety of our existing water resources. Cities are overwhelmed with water-related challenges.

The Indian water management model shows that sources of water are the primary and most important part of the water supply system (see Figure 2: Water management in India). This means that the conservation of locally available sources, i.e. groundwater and waterbodies, is essential for sustainability of available water. In India, however, they are overexploited and neglected.

Waterbodies are an important part of urban ecosystems. They perform significant environmental, social and economic functions—recharging groundwater to act as sponges, supporting biodiversity and providing livelihoods.

In urban India, however, the number of waterbodies is declining rapidly. For example, in the 1960s Bangalore had 262 lakes—now only 10 hold water. Similarly, in 2001, 137 lakes were listed in Ahmedabad city—65 of them have construction work underway. Hyderabad is another example—in the last 12 years, it has lost 3,245 halves of its wetlands [2].

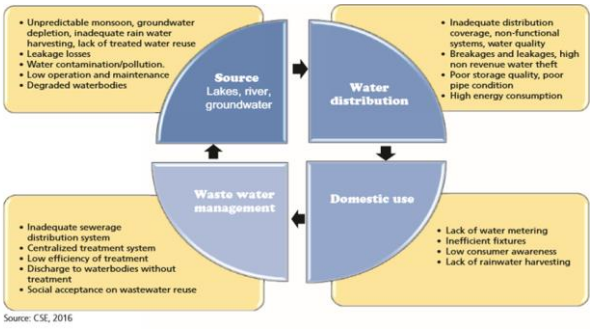

Fig. 2. Water management in India

5. Observations

In the targeted shopping mall, the washroom of which was studied during the study there were automatic taps with sensors in them installed which dispersed water when a human hand approach towards them. It was observed that the taps dispersed water for approx. 45 seconds. In the meantime, an individual after using the washroom washes hand for 20-25 seconds only. We found that even after the individual has finished washing his hands, the tap kept running and dispersing water as it been automated accordingly. The water kept running until it turned off automatically which caused a lot of water wastage. Similarly, the tap disperses the same amount of water every time when someone washes hands and hence the wastage in totality is huge. During the day, there were approx. 200 people used the washroom and washed their hands. So, at the same time the wastage of water will be very high.

For washing our hands an individual requires maximum 500 ml (approx.) of water but the tap dispersed 1200 ml of water every time that means there is a wastage of 700 ml water every time. And when we talk about the total wastage in a day considering 200 hand washes daily, the figure goes to 140000 ml i.e. 140 liters of water. It's an alarming figure.

Talking about the educational institute, there were 150 students presents in a floor and each one of them washed their hands thrice a day. Thus, the total of 150 students washes their hands 450 times per day. So, the total water used for washing their hands is 540000 ml i.e. 540 liters a day considering 1200ml water usage in each hand wash. The institution has 4 buildings with 3 floors each with a total strength of one floor is 150 which includes the students and the staff members. The total water used by them to wash their hands in one day is 540*3*4 i.e. 6480 liters daily. When we talk about a month, the total waster used by the institution for washing hands in a month when it operated on 25 days of a month is 162000 liters. In a year the institute will use 1944000 liters of water.

In case of the fuel outlet, on an average there is a footfall of 3000 individuals daily. And of these 3000, 30% of them i.e. 90 individuals used the toilet and washed hands. Here the one hand wash caused use of 1.2 liter of water as the taps here dispensed a lot of water. So, 90 hand washed caused a use of 1200ml*90 i.e. 108000ml i.e. 108 liters of water per day. In Bhopal region there are 120 fuel outlets, thus the total usage of water in fuel stations in a day for washing hands is 108*120 i.e. 12960 liters.

6. Solution

The wastage of water can be minimized by installing hand sanitizer dispensers at the places that were described above i.e. in the washrooms in the malls, institutions, corporate offices, hospitals, etc. This not only will save a lot of water and will be better option from hygiene point of view. The sanitizer vending machines will be both automatic and manual as well as will be driven by solar energy*. This will result in saving a lot of water and lead to maximum sustainability.

Hand sanitizer vending machine will be a better substitute of water in case of washing hands in above mentioned purposes as well as it will be an economical measure when we talk about saving water and will be very helpful measure for saving the water that is depleting at a very high rate. The vending machine will comprise of a tank that will store the sanitizer which will be in liquid form and will be dispersed by a nozzle when the sensors senses any hand. The sensor will command the main unit to dispense sanitizer through the sensor. The machine will be invented by the research scholars mentioned above.

The machine will be solar energy operated and will be installed at places like public toilets, schools, universities, hospitals, offices, corporate buildings, shopping malls, fuel stations etc.

7. Working Model of the Machine

The solar energy operated machine will comprise of a battery, an infrared sensor, a printed circuit board unit, 12V DC to DC RS motor and a 20liter container that will be connected from a tube directly to the motor and the dispenser nozzle.

Fig. 3. Infrared Sensor

Fig. 4. Printed Control Board Unit

Fig. 5. 12V RS DC to DC Motor

Whenever a human hand is sensed, the sensor will send command to dispense sanitizer to the PCB unit. The PCB unit then will then send command to the motor to fetch the sanitizer base. When there is a command from the PCB unit, the motor will then fetch the sanitizer through a pipe or tube and will send a certain amount of sanitizer to the nozzle to spray it on the hand sensed.

All of these elements will be connected to a battery unit which will be operated and charged from solar panel installed connected to it. The solar panel will be connected to the machine itself if the machine itself and in case the machine is put under a roof or shade, the panels will be installed on the roof or a place where direct sunlight can fall on panel.

8. Conclusion

The available water level has been observed depleting at a high rate due to human negligence in proper management of its uses for different purposes. According to the results of observation, it is observed that a single hand wash is consuming 800ml of water and a monthly usage for hand wash is 1,62,000 liters. Thus, there is a need for an alternative solution for the purpose of washing hands as it will save a lot of water and thus maximum sustainability can be achieved saving a lot of water that can be used for other purposes such a drinking. There is also a need of establishment of a parameter which talks about the minimum and the maximum amount of water needed to wash hands.

The water usage and wastage can be minimalized by the suggested machine. The above mentioned machine will save a lot of water worldwide and will lead to sustainability as the water resources which are suitable for human uses are reducing a higher rate because of human activities and climate change. For places where the water availability is very less or places where the day to water consumptions very high can get benefited by installing these devices.

References

[1] Kumar Anil and Malik Anurag. (2014). Water resource management in hilly areas: challenges and opportunities.
[2] Suresh Kumar Rohilla, Mahreen Matto, Shivali Jainer, Mritunjay Kumar and Chhavi Sharda, 2017, Policy Paper on Water Efficiency and Conservation in Urban India, Centre for Science and Environment, New Delhi.
[3] “World Urbanization Prospects, 2018 – Population Division”, United Nations, https://population.un.org/wup/Download/.
[4] Charting Our Water Future (McKinsey & WRG, 2009), page 9, https://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/sustainability/pdfs/charting%20our%20water%20future/charting_our_water_future_full_report_.ashx.
[5] Composite water management index (CMWI), NITI Aayog, August, 2019.