OFF - PIPE BUILDING: A HYPOTHETICAL MODEL FOR SOLVING WATER CRISIS

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Abstract: Water is a precious God gift, which is freely available in nature. About 71% part of the Earth's surface is surrounded by water, but surprisingly we are facing water crisis. It is a severe problem and philosophers are predicting that the third world war will be fought for water. Although natural balance favors and fulfils our requirement of water but water crisis is the biggest man made crisis of present time. We know that water cannot be created and cannot be destroyed, but it can be changed from one form to other form and we are changing pure water into polluted water. We can see three types of water in nature i.e. pure water, grey water and black water. The delicate water supply and demand moves round these three types of water. The question is, can we reuse the grey water and black water? What is the risk in reusing this water? Can we develop such colonies, which are water sustainable? How can we recycle the water easily? How can we use the low cost green technology, through which we can fulfill the demand of water in a colony or small town, without supplying the water from external sources? Can we reduce the water distribution cost by using the sustainable approach? I have tried to give answers of these questions in this paper. My concept of this paper is based on universal law that:

"**Matter is neither created, nor destroyed but it can be changed from one form to other form**"

At present we are converting pure water in to polluted water and now we have to shift towards reversible conversion of water. The paper describes theoretical concept to achieve this conversion.

Keywords: Black water, green technology, grey water, sustainable use, water crisis.

Introduction: At present 50 - 60% people in India are not getting safe drinking water and it is estimated that by 2025, 66% population of world will not get clean drinking water due to water scarcity in India (Garg and Hassan, 2007). As a result of rapid development, increasing population and unequal distribution of water, the demand for water far outweighs its supply. In addition the water sector in India has significant and problematic issues related to management. In spite of a sizeable water resource base and vast land resource, India continues to struggle to meet its water sector infrastructure requirements, including operation and maintenance costs. India has about 16 per cent of the world's population as compared to only 4 per cent of its water resources. (UNICEF, FAO and SaciWATERs, 2013). Availability of fresh water will decrease by 66% up to 2025. According to estimates, uncontrolled discharge of untreated domestic/ municipal wastewater has resulted in contamination of 75 per cent of all surface water

across India (MoUD, 2009).Conflicts around water are becoming the order of the day. These are conflicts over equitable access, competing uses, water quality and pollution, dams and displacements, privatisation of water, industrialization and inter-state conflicts (Paranjape and Joy, 2011). So, new approaches to long-term water planning and management that incorporate principles of sustainability and equity are required (Gleick, 1998). Our hypothesis is that water can neither be created nor destroyed but it can be changed from drinking water to sewage and sewage to drinking water. If we look at the water scenario at present then we see that 84% water evaporation occurs from oceans and 16% from terrestrial zone. There is 76% rainfall in oceanic area and 24% rainfall in terrestrial areas so there is 8% profit. But there are problems like, flooding, drought/ Intense rain, overpopulation, discrimination - poor and rich and human psychology due to which cost of water is increasing. The construction of zero water supply or water independent buildings may help in overcoming water crisis in future. We have done a case study in Ujjain and based on this study we have developed a model which predicts the viability of such buildings may help in construction of such buildings in Ujjain.

Materials and Methods: The data regarding rainfall, cost of water supply pipelines and other factors was collected form Nagar Nigam Ujjain. Mathematical calculations were used for determining the water input and output per building and other correction factors were calculated. The model for entire city was developed based on the calculation of per building.

Results and Discussion: The study reveals that in Ujjain the infrastructure cost for water supply is about 0.70 – 0.90 Cr/ km (Pipeline) and infrastructure cost for sewage collection without treatment is about 0.80 Cr/km (Pipeline) and Sewage treatment cost is about 3.5 Cr/MLD. Electricity cost is about 10 Cr/year, Chemical costis about 1.2 Cr/year, the Staff salary costs about 10 Cr/year and cost of repair and maintenance is about 4 Cr/year. Thus the total cost is about 25.2 Cr/year. Thus if we harvest rain water in 100 M^2 Roof Area with approx. 100 cm (1

M) rainfall then we will be able to collect 100 M^3 water /year (100 KL). In Ujjain one family uses about 2,19,000 liters water or 219 KL (600 X 365) and generates 20% Black water (43,800 liters) and eight 80% Grey water (1,75,200 liters). So if we extensively harvest the rain water then total input in the building will be equal to the total output, and such building will be totally water independent. Thus construction of such building will be the solution of water crisis in future (Fig. 1).

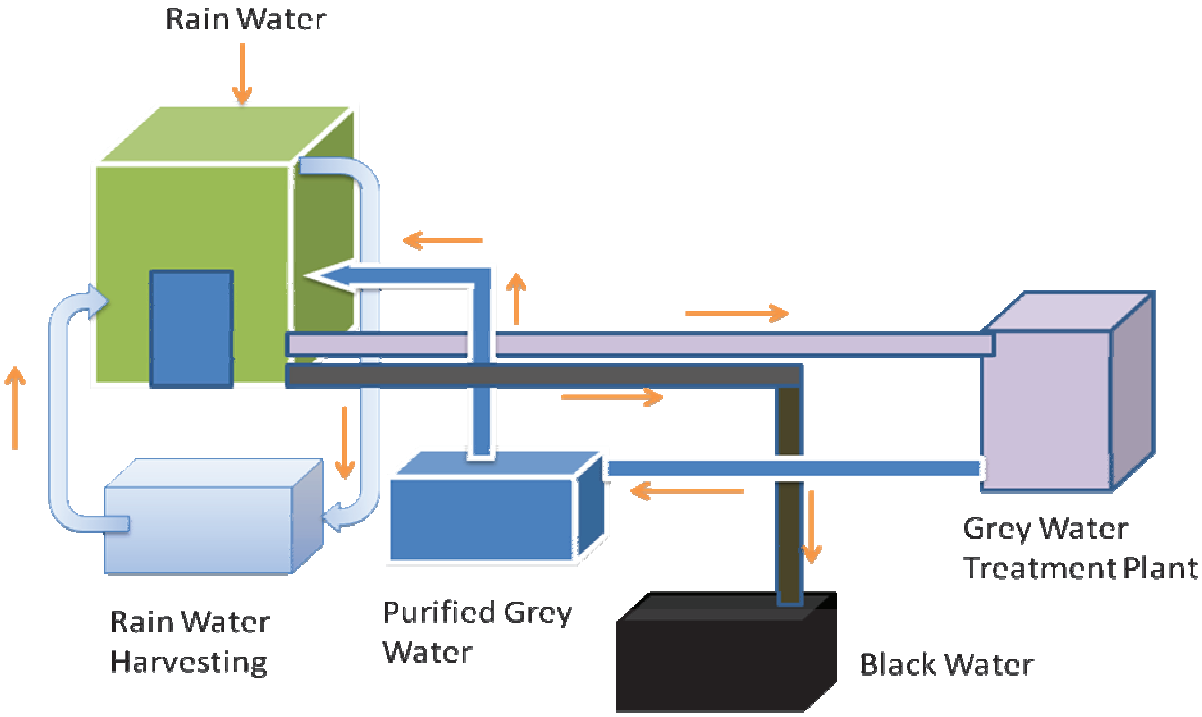

Figure 1: Hypothetical Model of Zero Water Supply Building

Increasing pressure on the Earth's fresh water resources resulting from growing water consumption and pollution, in combination with the impacts of climate change, has led to widely accepted recognition of the centrality of fresh water in sustainable development and the critical need for improved water governance (G.P. Zhang, A.Y. Hoekstra, R.E. Mathews and A.Y. Hoekstra, 2013). This study shows that using integrated efforts of rain water harvesting, aggressive conservation, water cycling and use of living machines we can construct zero water supply buildings in India.

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