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# THINK GLOBAL & ACT LOCAL

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# CAMPUS SUSTAINABILITY AT SYMBIOSIS INFOTECH CENTER

INKING INNOVATIONS

TERRE Policy Centre

Technology, Education, Research and Rehabilitation for the Environment
Leading platform for development through Alternate Path

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## *Abstract:*

*A sustainable campus is one that connects academic theory with social justice practice, promotes socially just and vibrant communities and develops process or management systems that help create a vibrant campus economy & high quality of life while conserving finite resources.*

*The Symbiosis InfoTech center was examined thorough the lens of sustainability to make its societal and ecological impact more visible and to come up with a sustainable plan following the best practices from all across the world and tailoring them to suit the needs of the SIC campus.*

*Feasibility study of setting up a Rainwater harvesting system in the campus was done with the aim of consuming the harvested water saved in the underground water tanks. This will save the fuel consumption of the water tanks that provides water to the campus, reduce the water bill, and recharge the groundwater.*

*While gauging the water consumption pattern, we found that we waste a huge quantity of water in urinals and toilet flushes, which can be saved through simple means. We propose the use of waterless urinals and dual flush systems in the toilets to reduce the water consumption. The waterless urinals are hygienic and have a touch free operation which helps in reducing the spread of communicable diseases. In the dual flush systems, there are two flush knobs; one regular knob and the other smaller one. Awareness has to be raised among people to use the smaller knob for urine disposal which uses half the water used by the bigger knob.*

*Awareness will be raised for the ways to reduce the paper consumption at SIC and using recycled paper for the office work which has similar costs to that of regular paper used at SIC but has lesser carbon footprints. Using recycled papers at SIC can save about 17 trees per year from getting chopped.*

*A unique technology has been looked upon to build the security offices, canteens, and parking spaces which are of a single floor in height. This technology has been proved to have massively cut down the carbon footprint of the building and the structures have proved to be non-brittle, bullet-proof, bio-climatic and low cost. The raw materials can be reused to build other such structures.*

*There is a humungous scope for campus sustainability at SIC. These initiatives keep the students in constant touch with the new happenings the world over and ingrain sustainable thinking in their work ethics which makes them more employable from the view point of an employer and also makes them better citizens of the country.*



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***Introduction:***

*A sustainable campus imbibes and implements the academic theory with socially responsible behavior and develops process or management systems that help create a vibrant campus economy & high quality of life.*

*The environmental problems have become global in scale since 20th century. (Meadows, D.H., D.L. Meadows, J. Randers, and W. Behrens III. 1972)( Millennium Ecosystem Assessment 2005)*

*The Universities, with a huge population and large number of electricity consuming units like ACs, cultural activities, resembles a small city and impacts the environment in a similar way. These universities require a sustainability plan to reduce the negative impact on the environment (Living Planet Report 2008).*

***Materials and Methods Used***

*We have done a feasibility analysis w.r.t. Rainwater harvesting, waterless urinals, Dual flush system, Paper usage, PET project.*

***2.1 Water Conservation at SIC***

***2.1.A Why harvest rainwater?***

1. *To augment groundwater table.*
2. *To improve water quality in aquifers*
3. *Save water bills*

***2.1.B How to harvest Rainwater?***

*Use campus rooftops as catchment areas. The water collected will be stored in a settlement tank or recharge pit built in the ground (Fig1).*

***2.1.C Components of the roof top rainwater harvesting system***

a. *Transportation*

b. *First flush*

c. *Filter*

*Sand Gravel Filters will be used to filter the contaminants from the rainwater.*

*With a total area of 6013.23 sqm, the SIC campus has a potential of saving 1,51,908.72 liters of water for each inch of rain. For Pune with an avg. rainfall of 33.41 in, the total saving would be 5076607.65 liters or 110805.1353 rupees in water bills every year (Fig 2 Tab 1).*

*About 10 underground settlement and recharge tanks of 10,000 liters capacity will be constructed across the campus at specific locations. The water from these 10 tanks will be used daily and any extra water will be sent to a nearby open recharging pit (Tab 2).*

### *2.2 Urinals:*

*In SCMHRD, we have manual flush valve which are the oldest type of flush systems, (Fig3) but saves a lot of water. This system although efficient, still uses water. Approximately, one manual flush of 15 seconds uses about 500ml of water. Total water wasted per month in the SIC building is about 22500 liters amounting to about 491.25 rupees in water bill.*

*In the hostel rooms, urinals are not available. A typical toilet consumes about 6 liters of water for urine disposal and that comes to about 2700 liters of water per toilet (Tab 3).*

### *2.2.A Waterless urinals*

*Waterless urinals don't require water to flush and they can be promoted to use at different public places to save water, energy and for harvesting urine as a resource.*

*Waterless urinals looks similar like conventional urinals in terms of design and can be used in same manner (Fig 4). They do not require water for flushing. Urine is usually sterile and contains largely water, which doesn't require additional water for flushing into the drainage lines. The dry and touch free operation of waterless urinals helps in reducing the spread of communicable diseases. The Odor trap mechanisms used in these waterless urinals use sealant liquid and have microbial control which helps in preventing odor to develop inside the drainage lines connected to urinals.*

***Advantage of using waterless urinals :***

- *It helps in saving large quantities of water*
- *Conserve electricity that is being used for pumping water*
- *Optimize the cost of plumbing accessories at supply and consumption ends*
- *Reduce emission of green house gas and pollution of water bodies*

*AIn SIC campus, we recommend the usage of waterless urinals. In the existing urinal bowl we will install the odor trap membrane assembly containing a membrane, which needs to be replaced every year, and biological blocks which costs about 20-30 rupees per ball and need to be replaced after every 5 days.*

### *2.2.B Dual Flush System*

*In the dual flush system, there are 2 flush handles, one of about 3 liters capacity used for urine disposal and the other for solid waste disposal of 6 liters capacity (Fig 5). If implemented, this system will save water to the tune of 4215750 liters and reduce the cost of water bill by 263930.6 rupees per annum*

*The maintenance cost of a dual flush system is almost zero, and the SIC will start reaping profits in less than a year (Tab 4).*

### *2.3 Paper usage:*

*Paper can be made from a wide variety of sources like cotton, sugar cane waste, bamboo, hemp, wheat straw (Fig 6). Regardless of the source, they all require cellulose (Fig 6). The primary sources of cellulose are:*

*a. Wood*

*b. Recycled paper*

*We recommend to reduce the consumption of paper by following the below mentioned steps.*

*1. Printing and writing on both sides of the paper.*

*2. Using recycled paper*

*3. Avoid printing single line e-mails or unnecessary copies of documents*

*4. Store user manuals, policies, notices on e-mails*

*There should be separate waste bags to collect paper. The waste papers will be used by S.H.A.P.A.T.H, the CSR cell of SCMHRD as raw materials, to prepare paper bags as alternate livelihood for the re-habilitation of trafficked women.*

*The cost of recycled paper is about 140-170 rupees per bundle. The bundle that SIC generally uses costs about 160-180 rupees (Tab 5 and Tab 6). Thus, the cost of shifting to recycled paper will be almost zero while we are saving the environmental cost of cutting down trees.*

### *2.4 PET Project*

*Objective is to construct a small canteen by using waste plastic bottles.*

*Following are the advantages of plastic bottles over bricks:*

1. *Low cost*

2. *Non-Brittle - (Unlike bricks)*

3. *Absorbs abrupt shock loads - Since they are not brittle, they can take up heavy loads without failure.*

4. *Bio climatic*

*While making a clay brick, it is observed that the bottle brick is far more energy-efficient. The technology also reduces the carbon emission that happens during the baking of an ordinary brick. The heat generation from cement factories can also be reduced as this technology uses only five percent cement. The foundation for the entire construction is obtained from building waste and so the mountains from which granite is blasted out can be saved too. PET Bottle can last as long as 300 years (Fig 7 Tab 7).*

***Results and Discussion :***

*For implementing the above strategies, the Yearly fixed cost is 809400 and Maintenance cost is 92400. The Yearly Savings will be 392171.7.Thus we will be able to achieve breakeven in 2 years and 5 months.*

*Furthermore, we can scale these sustainability initiatives to include storm water harvesting, Waste water treatment plant, Biogas treatment plant, building canteens and security rooms, parking spaces using PET bottles. We can set up a green supply chain by asking our paper venders to collect the waste papers from the campus, recycle it and then supply that recycled paper to us. Bamboo plantation will be carried out to beautify the campus as Bamboo has one of highest CO2 sequestration capacities among other plants i.e 50 Kg of CO2/Year.*

***Tables :***

| Months | Water consumed | Potential water saved | Actual water saved | Avg Rainy day | Avg rain per day |
|---|---|---|---|---|---|
| *June* | *14661000* | *1112699* | *890159.2* | *9.6* | *92724.91667* |
| *July* | *19334194* | *1110102* | *888081.6* | *12.2* | *72793.57377* |
| *Aug* | *19929797* | *905609* | *724487.2* | *9.8* | *73927.26531* |
| *Sept* | *19746534* | *919891.7* | *735913.36* | *7.9* | *93153.58987* |
| *Oct* | *19654903* | *556998.6* | *445598.88* | *4.7* | *94808.27234* |

***Tab.1.*** *Rainwater harvesting system Savings*

| Construction of 10 pits | 150000 |
|---|---|
| *Pipes network (40 network, 90 feet each)* | *3600 feet/1080 m* |
| *Miscellaneous* | *20* |
| *Pipes cost rupees per m (110mm diameter)* | *150* |
| *Total Pipes cost* | *165000* |
| *Labor cost* | *157000* |
| TOTAL | 472000 |

***Tab.2.*** *Rainwater harvesting system Cost of construction*

| | No. | Usage per day | Water saved (ltrs) | Total water saved per day(ltrs) | Total water saved per year | Cost per unit (1000ltr) | Total water cost per year | Total electricity cost per year | Total cost per year |
|---|---|---|---|---|---|---|---|---|---|
| *Urinals* | *60* | *25* | *0.5* | *750* | *273750* | *21.82661* | *5975.036* | *11461* | *17436.04* |
| *Toilet* | *350* | *15* | *3* | *11250* | *4215750* | *21.82661* | *92015.55* | *171915* | *263930.6* |

***Tab.3.*** *Savings from model urinals*

| | No. | Fixed costs per urinal | variable cost per urinal (per year) | Total Cost per urinal (per year) | Total Cost per year |
|---|---|---|---|---|---|
| *Urinals* | *60* | *100* | *1440* | *1540* | *92400* |
| *Toilet* | *350* | *700* | *-* | *245000* | *245000* |

***Tab.4.*** *Cost of construction for Bio toilets*

| | Bundles per month | Pages per bundle | weight per page(gm) | Total weight(gm) | Total weight(gm) per year |
|---|---|---|---|---|---|
| *Paper* | *33* | *500* | *5* | *82500* | *990000* |

***Tab.5.*** *Total amount of papers used in SIC*

| 990kg | 24 trees | 103-413 kg CO2 |
|---|---|---|

***Tab.5.*** *Paper to Co2conversion*

## *Graphs and Figures*

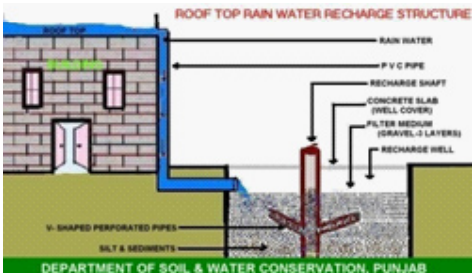


***Fig 1. Representation of a model rainwater harvesting system***


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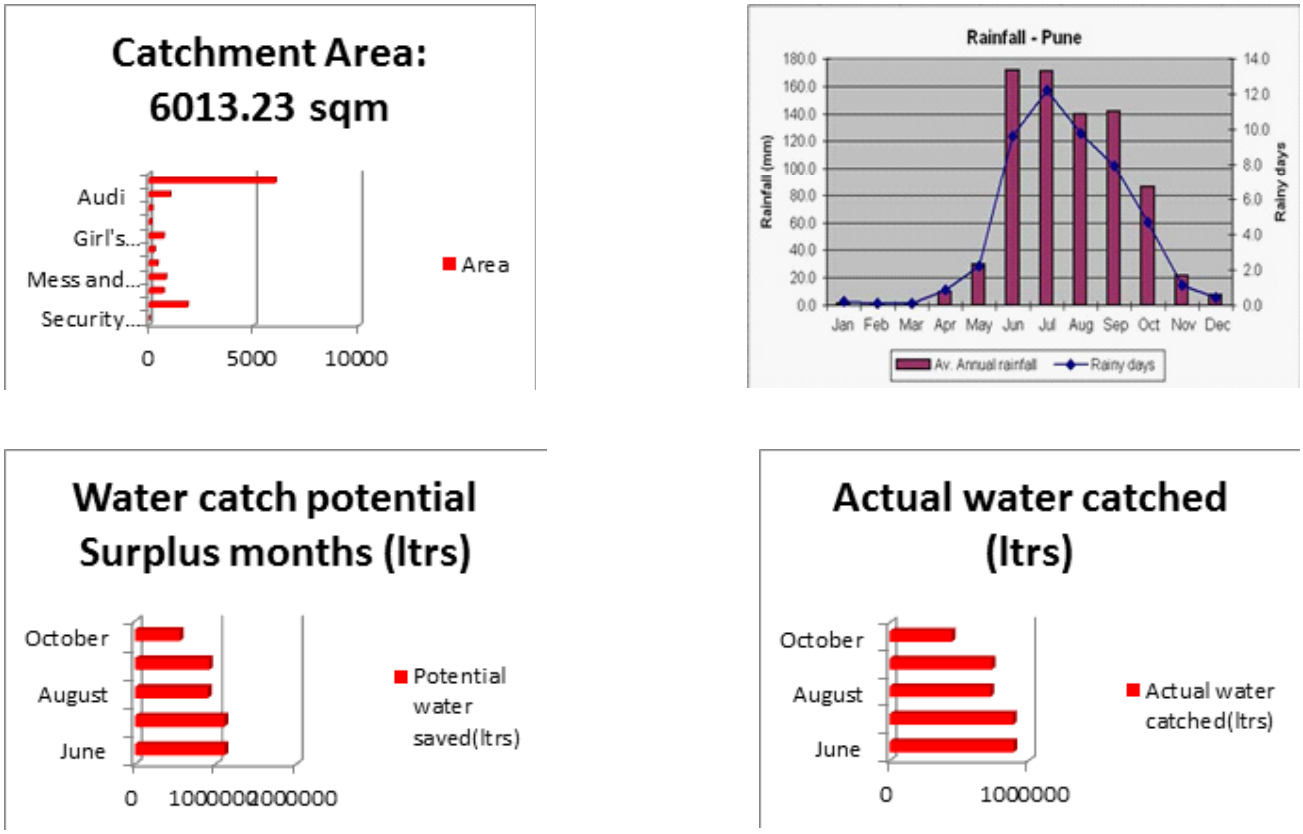


*Fig 2. Rainwater harvesting system water saved*

*Fig 3. SCMHRD Urinal*

*Fig 4. Biological Blocks*

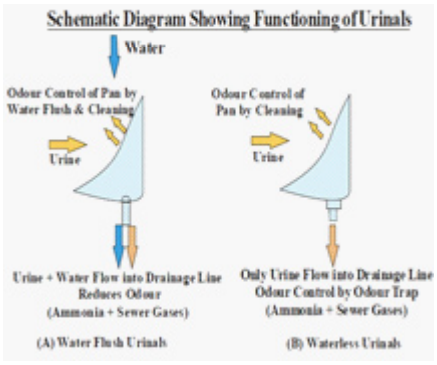


*Fig 5. Waterless Urinal*

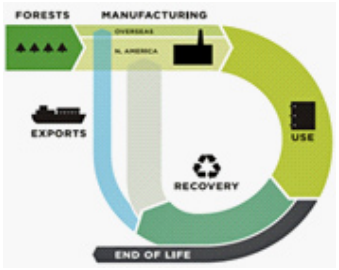


*Fig 6. Lifecycle of a paper*

*Fig 7. Wall made up of PET bottles*

## *References*


1. *Meadows, D.H., D.L. Meadows, J. Randers, and W. Behrens III. (1972). The Limits to Growth. New York: Universe Books. ISBN 0-87663-165-0;*

2. *Millennium Ecosystem Assessment (2005). Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC. pp. 1-85. Retrieved on: 2009-07-08-01*

3. *World Wide Fund for Nature (2008). Living Planet Report 2008. Retrieved on: 2009-03-29;*

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