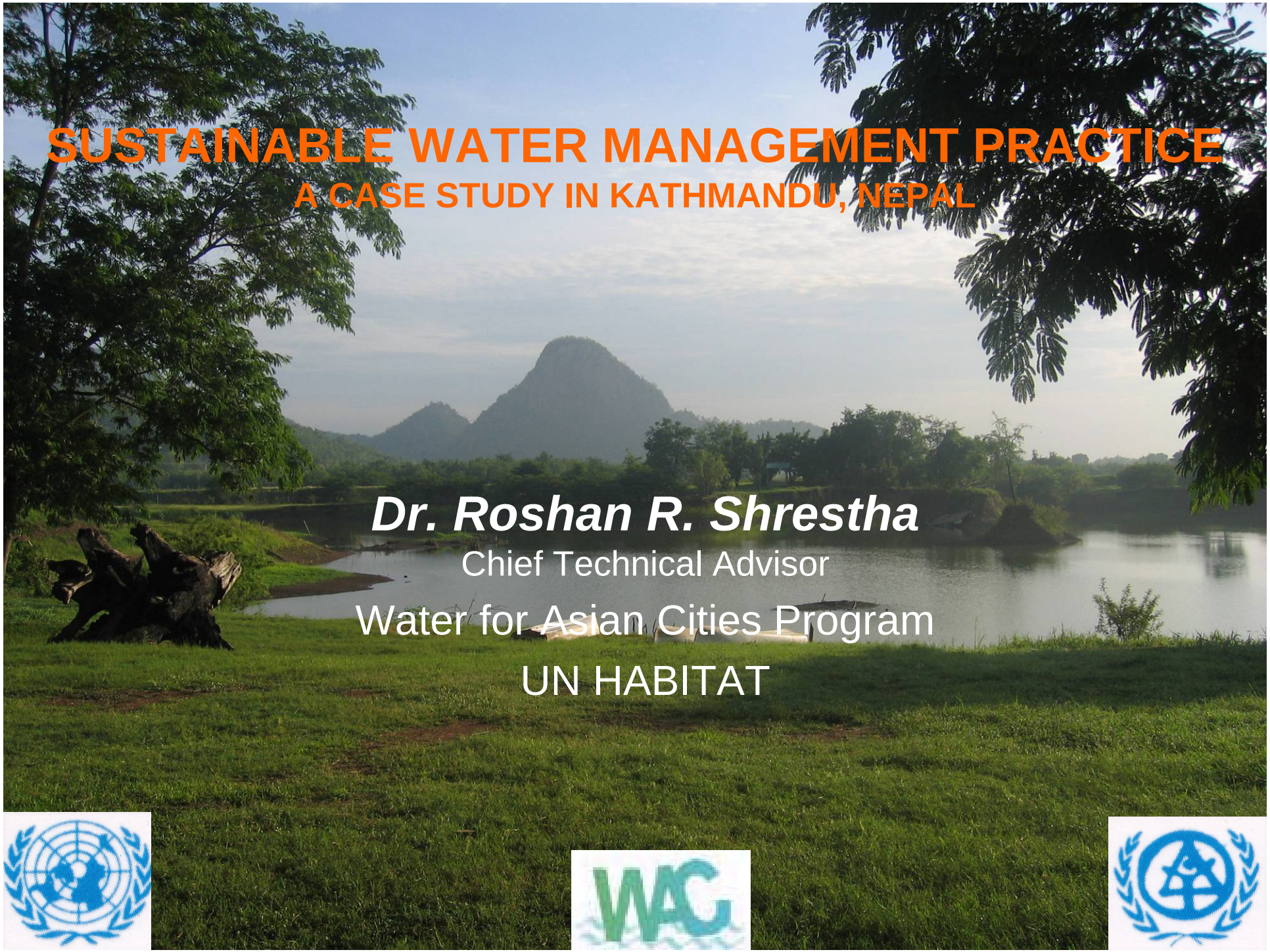

SUSTAINABLE WATER MANAGEMENT PRACTICE

A CASE STUDY IN KATHMANDU, NEPAL

Dr. Roshan R. Shrestha

Chief Technical Advisor

Water for Asian Cities Program

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Water Shortage in Cities

Drying up Water Resources

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Pumping of water at household level

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Water Treatment Plant

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Extraction of Fossil Water

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Finally, Such a precious water dumped into the river without any treatment

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Centralized Wastewater Treatment Plants not in Operation !!!

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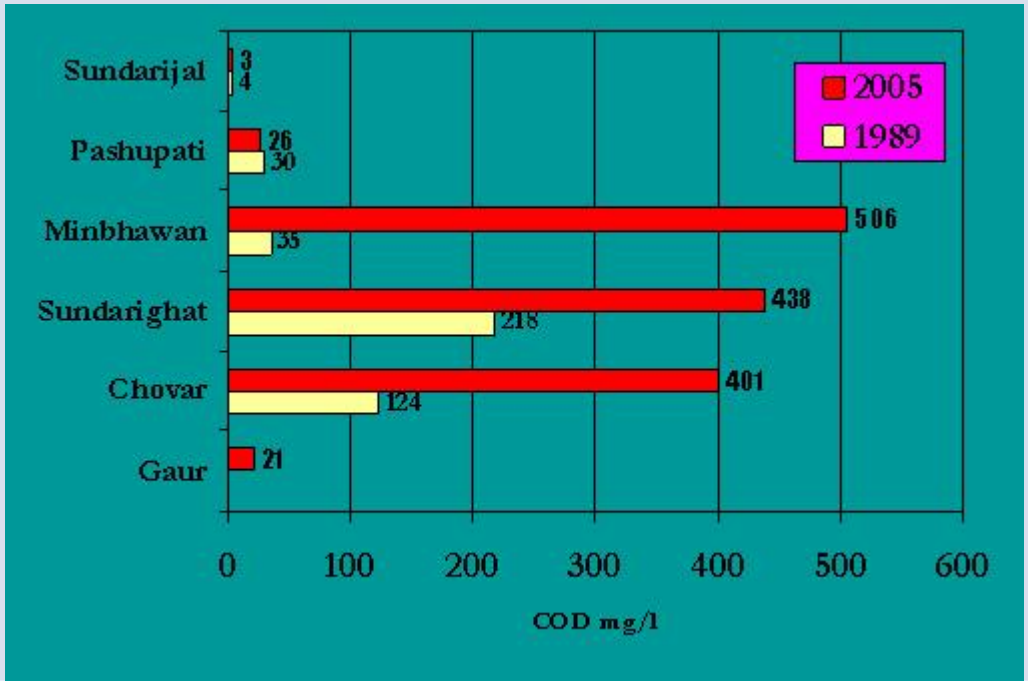
Pollution River



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How to Solve this Situation ?

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Eco-House

House Without City Water Supply
Reuse & Recycle of Waste

Built in 2002 occupies 135 m^2 Area

Rainwater catchment

Rainwater catchment

Roof tanks

UDD toilet

Solar heater

Dug well for Ground water recharge

Greywater Treatment Plant

Garden

Water collection Tank

Biosand filter for water treatment

Rain Water Harvesting

- Rain water for 7-8 months (April to October/November)
- More than 180 m3/year of rainwater harvesting potential as it has 90.4 m2 of roof area

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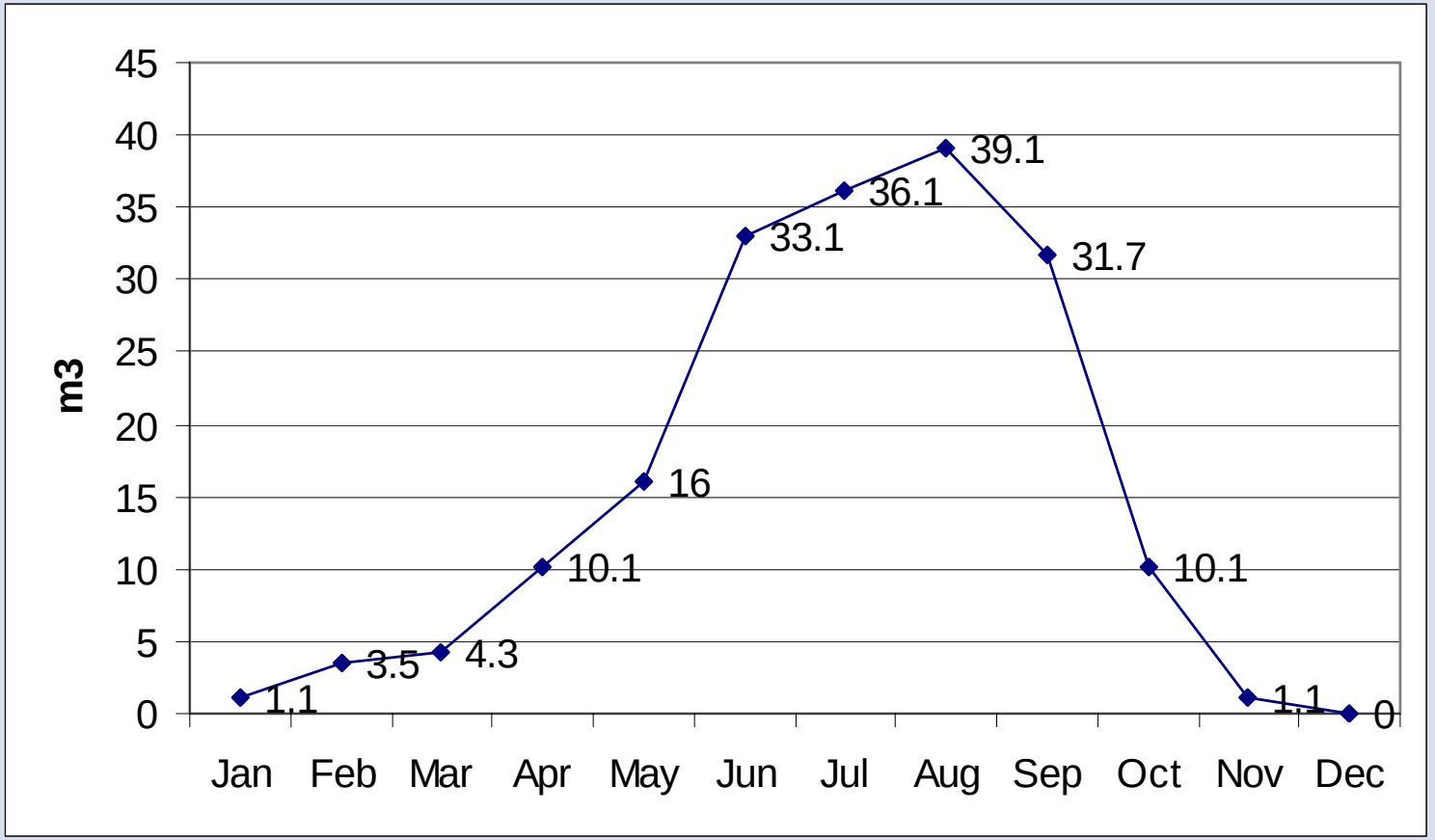
Rainwater Harvesting



90.4 m2 roof area can collects rainwater more than 185 m3/year.

Average rainy days: 69 days,

Average annual rainfall: 2600 mm (3 years average – 2005 to 2007)

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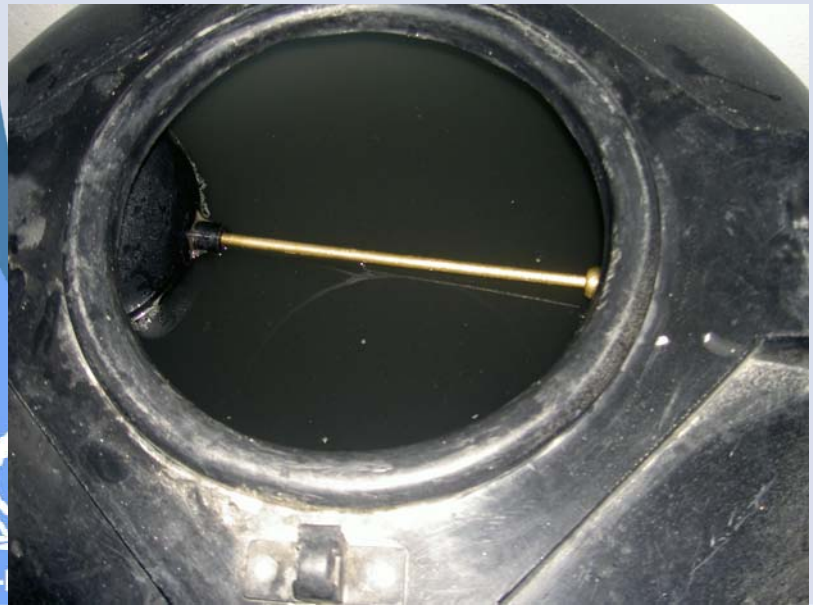
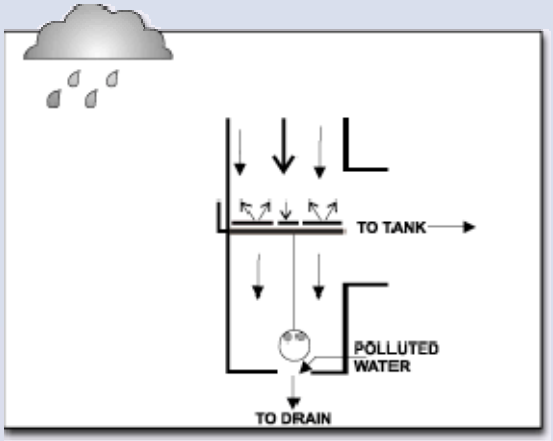
Dug well for groundwater collection and recharge

First Flush Devise for Cleaning of Roof during Rain





Water Tank and Dugwell filled with Rainwater

Water Tank

Dug well

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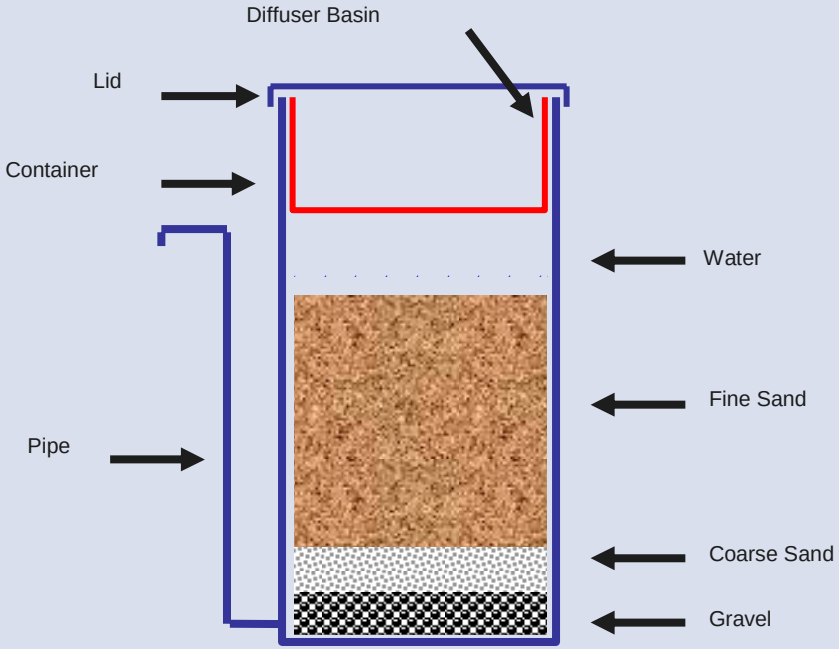
Treatment of Water



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Water Disinfection (SODIS)

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Feaces & Urine Separation Dry Toilet

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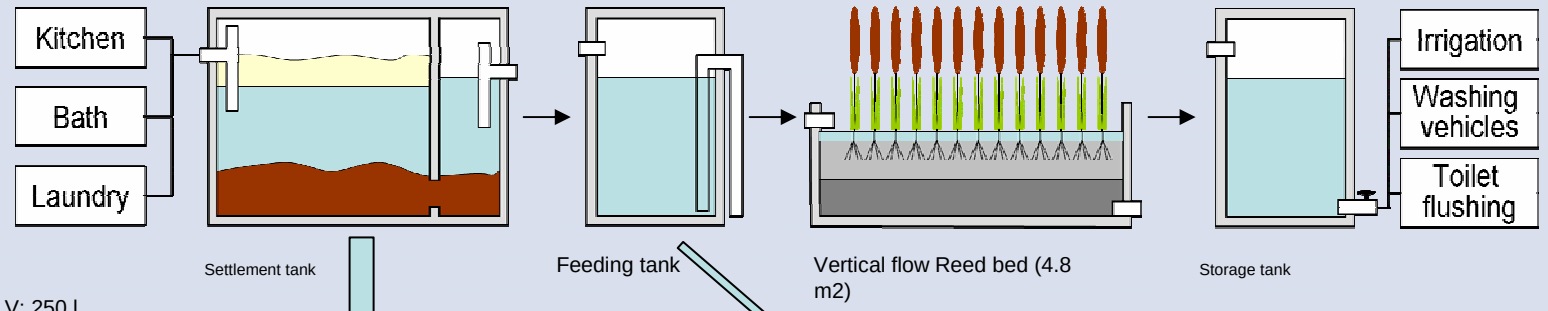
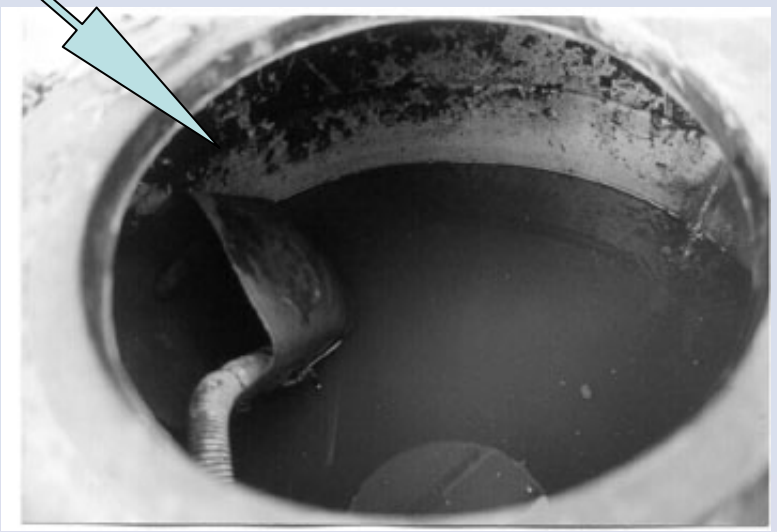
Greywater recycling





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Greywater Treatment & Reuse

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Home Compost Bin & Vermi composting (*Eisenia foetida)*

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WATER SUPPLY & DEMAND

Type of water use and requirement	Liters/month	%
Drinking & cooking	900	7
Dishwashing, bathing, showering, & laundry	7500	55
Toilet flushing, cleaning vehicle & gardening	5250	38
Total Water Demand	13650	100
Reuse of Treated Greywater	5250	38
Clean Water Requirement	8400	62

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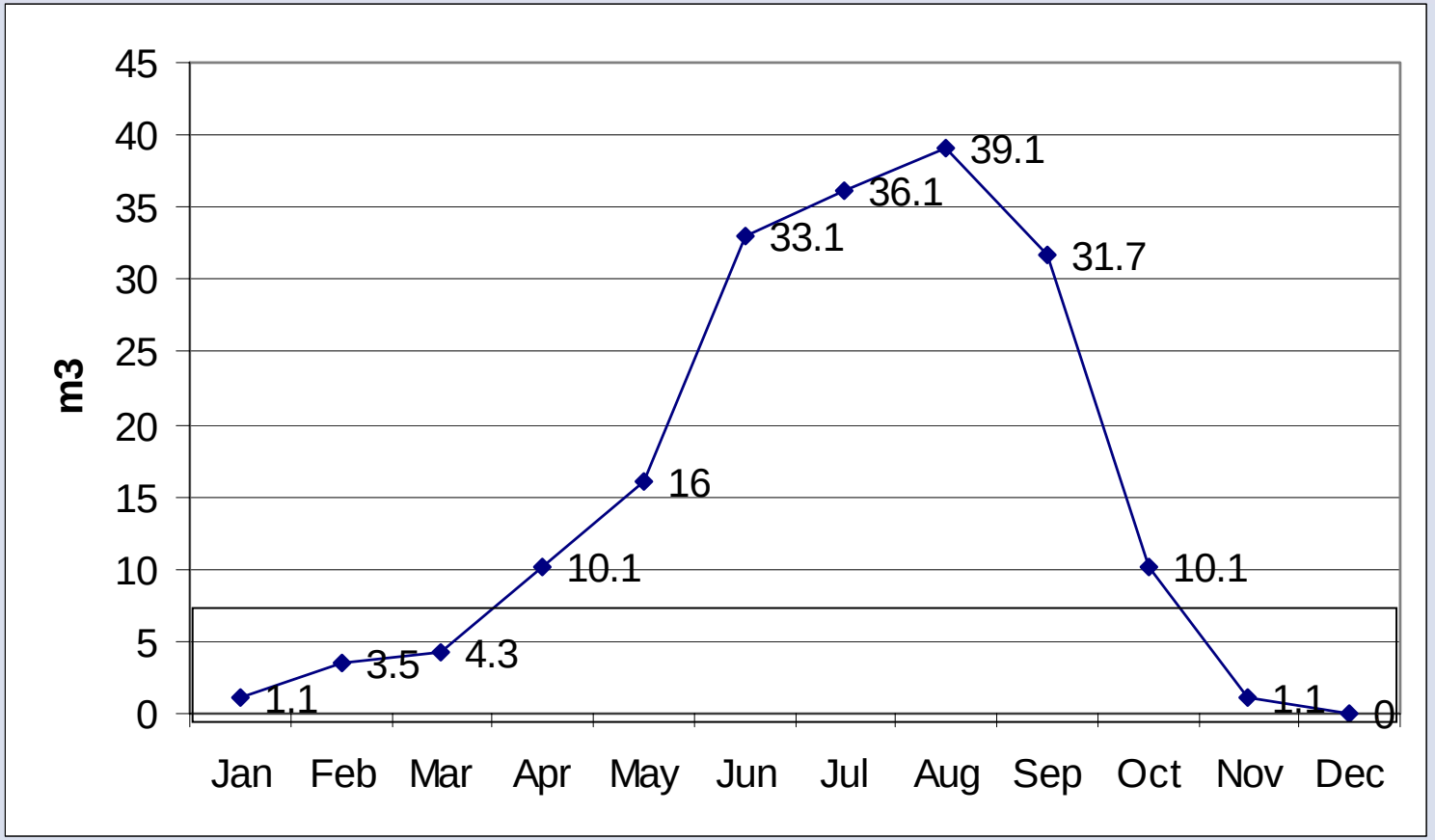
Rainwater Harvesting and Water Demand



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How About the Cost ?

- Total cost of the building : USD 43,000
- Additional cost for this system : only about 2.4 % more
- Cost has already been recovered as USD 370/year needs to be invested in procuring water if such systems were not installed
- In addition to the cost for buying water, it saves significant amount of time to extract water from the city water supply and relieves from mental tension for not having sufficient water.

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Established as a Demo Site

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Perception from Visitors

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- Needs strong communication strategy, education and promotional programme
- Politicians and Local Authorities should be involved in the process so that they endorse this concept

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Need to change Behaviour of the People

Human Values Based Water Education in School

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National and International Media Coverage

Syria pulls troops out of Lebanon after 29 years Page 5 Druk Air's new airfare Page 10 Reyes shoots Gunners to victory Page 11 Boss returns Page 12

Nepal's No. 1
English Daily

ECO-H

Panal

Short

By Nanoti Neenbang

SHORTAGE of clean drinking water and pollution of water bodies are the major issues of the urban settings today. Kathmandu is itself an example where the people are struggling against the increasing water demand. The Melamchi has become a far-fetched dream. However, there are several techniques like rainwater harvesting, wastewater recycling and ecological sanitation system that can be implemented at a single household to community level to overcome the water scarcity problem. Few individuals and institutes have already taken the initiatives.

Eco-home is located in Dallu planning area of Kathmandu City built in 135 square meter of land. Dr. Roshan Raj Shrestha, Chairman of Environment and Public Health Organization (ENPHO) is the owner of first Eco-home in Nepal, a perfect example of how a house can be built in an environmentally friendly way. The house has features like rainwater harvesting and groundwater recharging, greywater recycling and energy solutes.

The cost difference between the normal house and eco-home are almost same. The additional cost is around Rs 20,000-25,000 for separate plumbing which takes only two or three months to be recovered," says Shrestha.

Talking about the comfort, he says," there are no different amenities adopted in the foundation of walls and windows so it is affordable as well as comfortable like any ordinary houses. However for building eco-home, concepts must be given to civil engineers for designing the piping systems."

SURVIVAL PLANS
Architect William McDonough on designing for the future
PAGE 8

FT House & Home

SATURDAY OCTOBER 15 / SUNDAY OCTOBER 16 2005

Eco-properties are coming of age as environmentally sound

Ample water, even when the main runs dry

In Kathmandu, Roshan and Sunita Shrestha run a home that is a model of environmental self-sufficiency. Binod Bhattarai pays a visit

To a casual visitor, the home of Roshan and Sunita Shrestha at Dallu in the south-western outskirts of the Nepali capital is just another middle-class residence. The two-and-a-half storey, four-bedroom, white brick-and-mortar building at the foot of Soyambhunath Stupa – a famous Buddhist shrine – is not much different from the roughly 700 houses in the area.

But Shrestha residence has something that most in Kathmandu don't – adequate water supply.

"I have a connection to the mains but there is no supply," Roshan says. "So, "we use rainwater for seven months and well-water for the remaining five."

Shrestha, chief technical advisor at the UN Habitat's Water for Asian Cities Programme, became interested in water conservation in the mid 1980s while working on an Italian project that studied water quality. After that ended, he and his co-workers set up the charity Environment and Public Health Organisation (ENPHO) to promote low-cost conservation techniques, and he decided to turn his home into a site for showing how to optimise water use.

"We had ideas for solving water scarcity in the household but did not have a place to demonstrate the technologies," explains Bhushan Tuladhar, general secretary of ENPHO. "Roshan's house has now become a model."

Roughly 116 cubic metres of rain (116,000 litres) falls on the Shresthas' 90 sq metre rooftop each year, and they collect and store it all. It passes through a small, 200-litre tank, which flushes out dust and dirt, and is then deposited in a much larger underground tank, with excess water diverted to a backyard well. This provides about 5,400 litres of water for use each year, or 60 per cent of what the five-person family needs. But, since all the plumbing was planned and installed when the house was built three years ago, nothing shows on the exterior. The pipes converge on a landing covering the storage tank and from there water is diverted to different storages.

The Shresthas also use water from the 10,000-litre well, but only in the dry season and only after pumping it through a bio-sand filter (fabricated in a used paint drum) to remove iron, dust particles and odour and then employing solar purification technique developed in Switzerland. It is usually Shrestha, the resident scientist, or his 13-year-old son Suchit who fill plastic soda bottles and place them in sunlight for six to seven hours, allowing ultraviolet rays to kill microbes.

The last source of supply is wastewater from the kitchen, bathroom and washing, which is collected and treated in a "constructed wetland" set up in the family's 30 sq metre backyard. This consists of a variety of reeds (*Phragmites karka*) planted in sand and gravel, which creates an underground shelter for pollution-digesting microbes that obtain oxygen from the plants and food from the wastewater. The biological processes clean the water, which is then stored separately, and used for gardening or washing the car.

Worm waste disposal

There have been times when neighbours have scolded Shrestha for scrubbing down his vehicle, asking how he can waste water when they don't have enough to drink. "At first many don't believe me when I tell them I do not use water from the mains," he says. "Eventually I end up teaching them to collect rain and recycle wastewater for non-drinking purposes."

His education efforts are not just limited to neighbours, however. Shrestha frequently hosts tours for groups in Nepal and foreign visitors on tours of his home organised for World Water Day in March, Earth Day in April and World Environment Day in June. Inspired by its success, ENPHO and other non-governmental organisations have intensified campaigning for water harvesting and reuse.

But they also remain focused on their home market of Kathmandu, the Nepali capital that was until the late-1960s often compared with the mythical Shangri-la. Now, it is an unplanned, overcrowded urban sprawl of about 1.6m people with an acute shortage of drinking water. Although the city needs around 190m litres per day, its supply is roughly 130m during the wet season and 100m during the dry months. About 40 percent of taps run dry from March through June.

Ironically, Nepal also has hundreds of Himalayan rivers but none of them flow through Kathmandu, located in what geologists call a "high altitude" valley (1,300 metres above sea level). The government has plans to augment supply by spending about $300m to bring 170m litres per day of snowmelt from a nearby snow-fed river. But this project, supported by the Asian Development Bank, has stalled following a controversial end-of-August decision by an anti-graft body that found its contracting faulty.

Rainwater remains a viable option, particularly in Kathmandu, which gets more than 1,600 mm each year, most of it from June through September. But its use is limited.

"It requires additional investment for fittings and storage and not everyone can afford it," Tuladhar says. "But all can benefit if some collect rainwater because they save water that others can use."

> In the kitchen is an army of worms whose job is to digest the plant-based household waste

Tuladhar himself lives in rented space with his wife Shiriju, so has instead focused on reuse of organic and inorganic waste. The couple has a table that uses old truck tires for a base, curtain rings made of used plastic bottles and pen stands of chipped glasses.

In the corner of his kitchen, he raises an army of earthworms whose job is to gobble and digest the plant-based household waste. "Composting is aerobic so there is no smell," Tuladhar explains.

But the most interesting conservation tool is another water-conserving device back at Shrestha's house. In the modern bathroom attached to his bedroom, there is a "dry" toilet that has separate outlets for urine and faeces.

The system lets faeces drop two floors vertically into a bin in the basement. A little sawdust or ash is added after use to prevent odours and to facilitate composting. The bin takes about four months to fill up, at which point it's replaced with an empty one. Faeces in the full one takes another six months to convert into soil, which is used in the garden along with compost produced from the kitchen. (The Shresthas grow marigolds, fruiting miniature citrus and guava trees and vegetables on a small terrace and garden. "One year we grew 1kg of tomatoes on one plant on the terrace," says Shrestha. "The space is small but the yield is very high.")

Urine is also eventually delivered to the garden. The second chamber in the dry toilet is flushed using a faucet, and the outflow is collected in a separate basement tank. The liquid decomposes for about 10 days after which it is diluted and used to water the Shresthas' plants.

Dry toilets are actually best suited for use in farming villages where there is less of a cultural aversion to handling waste. But Shrestha and his wife both use theirs. "You have to have one to believe it works," he says. "If it was dirty, smelly and unhygienic, Sunita would not have let me have it attached to my bedroom."

Architects in the UK, agrees: "It's no longer a minority thing or an old hippie thing. This isn't limited to Greenpeace activists. We are seeing a variety of people who are just genuinely interested in finding out how they can live more in tune with the planet."

Today, some small communities of eco warriors in yurts (circular Mongolian tents, for the uninitiated) and

Movie on Eco house called WATER ANGEL

निर्माता

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प्रस्तुती

मह संचार

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Established Eco Community

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Eco Village

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Future Target !

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Problems Encountered

- Not able to get UDD pan – Designing of UDD mold took time
- Took time to explain mason and site engineer during construction
- Once graywater pipe clogged due to accumulation of oil and grease
- Management of urine
- Visitors makes some time problem

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International Year of Sanitation 2008

- UNSGAB suggests IYS (in February 2006 within Hashimoto Action Plan)
- decision of the UN for the IYS 2008 (in December 2006)
- objectives of the IYS (formulated by UNSGAB in May 2007):
  - increase of awareness and commitment from actors at all levels on the importance of reaching the sanitation MDG
  - mobilisation of governments, financial institutions, sanitation providers etc.
  - secure real commitments to develop and implement effective action to scale up sanitation programmes
  - encourage demand driven sustainable solutions and informed choices
  - secure increased financing to jump start and sustain progress
  - develop and strengthen institutional and human capacity
  - enhance the sustainability and effectiveness of sanitation solutions
  - promote and capture learning to enhance the evidence base and knowledge on sanitation

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The Sustainable Sanitation Alliance (SuSanA)

Motivated by the UN‘s decision to declare 2008 as the International Year of Sanitation (IYS), a number of organisations active in the field of sanitation decided in 2007 to form an open network on Sustainable Sanitation to support the IYS

Water existed long before the coming of humankind, and water will exist long after the going of humankind.

However, how we treat water during our brief passage on Earth will determine whether we and our children pass time in a dying world or a living heaven.

Simply – the choice is YOURS

The Holy Order of Water – William E Marks

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Thank You !