

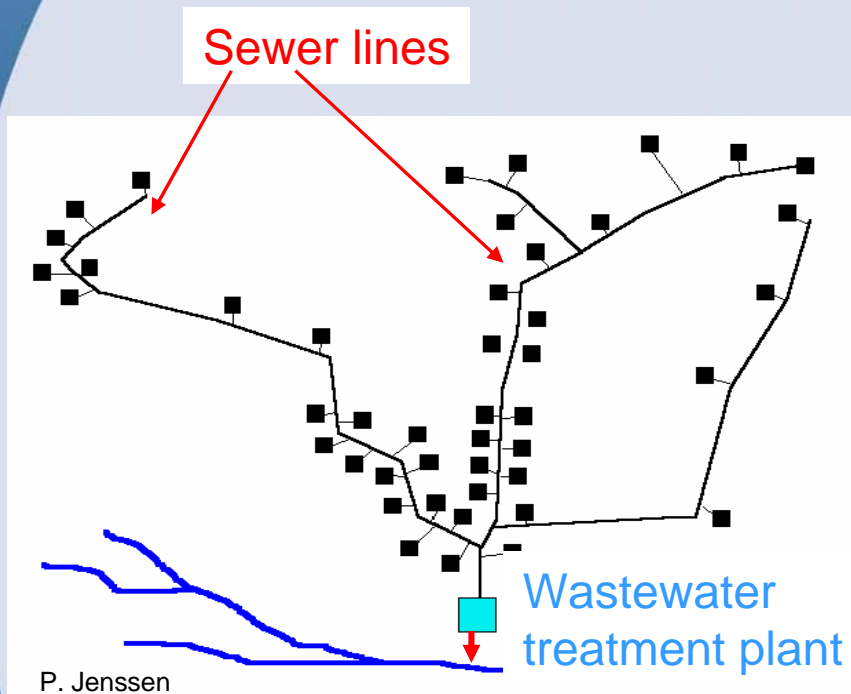
Constructed Wetland For Treatment of Wastewater

Easy Technology Yet to be Promoted !

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UN HABITAT

Conventional Waterborne Sanitation: Investment Cost for Collection



- High Investment for Collection i.e **70 - 90 %**
- Treatment **10 - 30 %**
(Otis 1996, Mork et al.2000)

In the US:

- 37% of all new developments are serviced by onsite or decentralised systems
- over 50% of onsite/cluster systems are in cities and their suburbs
(USEPA 2000)

Source: adapted from (6)

Decentralized Wastewater Treatment is the Current Needs as many of the growing cities in the world still does not have Sewer System

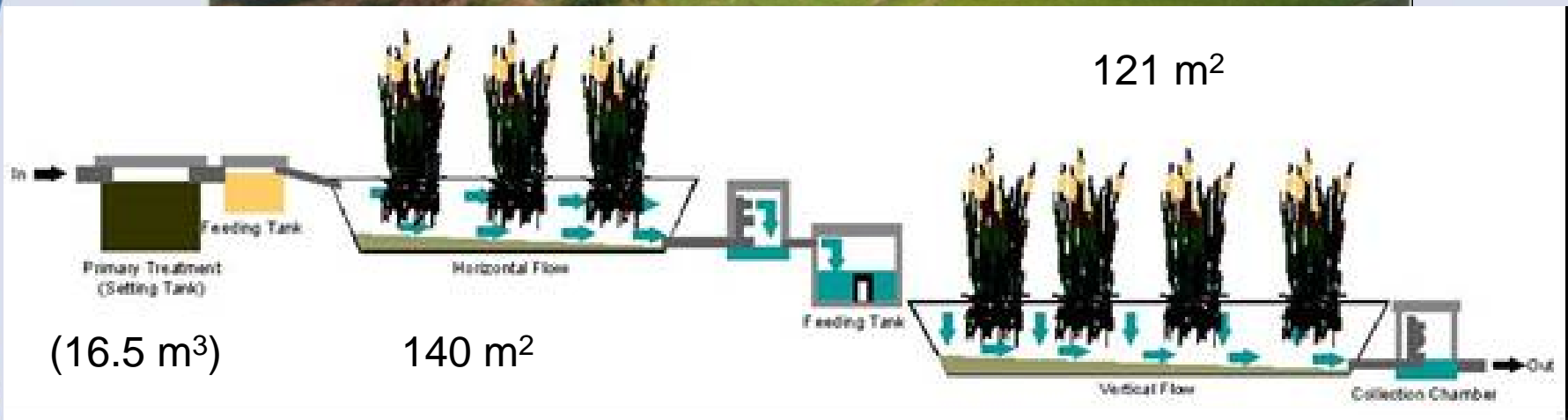
Constructed Wetland could be one of the Options



TREATED WASTEWATER

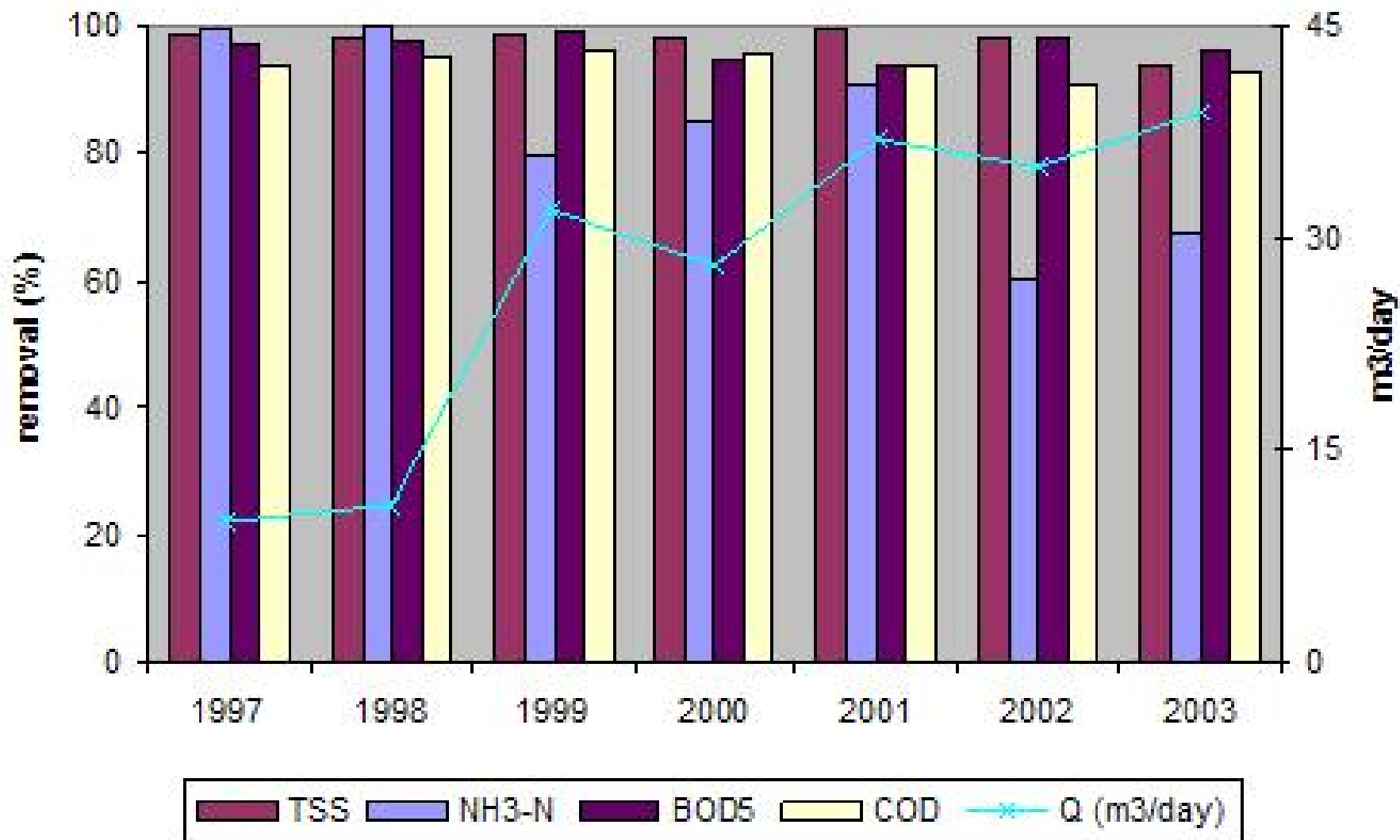


Constructed Wetland for Treatment of Hospital Wastewater in 1997

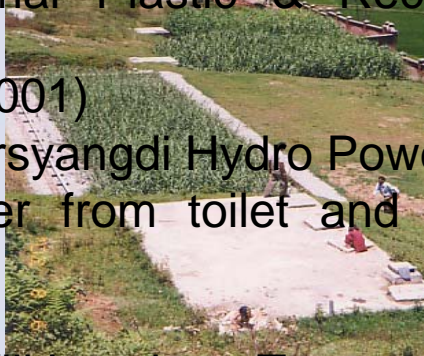




Pollution removal rate of Dulikhel Hospital CW (1997-2003)



1. Dhulikhel Hospital (1997)
2. Septage Treatment Plant, KMC (1998)
3. Gray Water Recycling, Private House (1998)
4. Malpi International School (2002)
5. Sushma Koirala Memorial Plastic & Reconstructive Surgery Hospital (2000)
6. Kathmandu University (2001)
7. Staff Quarter, Middle Marsyangdi Hydro Power Station (2002)
8. Recycling of Wastewater from toilet and laboratory, ENPHO (2002)
9. Kapan Monastery (2003)
10. Faecal Sludge and Landfill Leachate Treatment Plant (2002)
11. Gray Water Recycling, Private House (2003)
12. Shuvatara School (2004)
13. Bagmati Area Sewerage Construction/Rehabilitation Project, BASP (under construction)
14. Community Scale Madhyapur Thimi Municipality Wastewater Treatment Plant (2005)
15. Poly Clinic, Ilam (under design)
16. Manohara Land pooling Area (under design study)



CW for Kathmandu University





1,500

1,180 m²

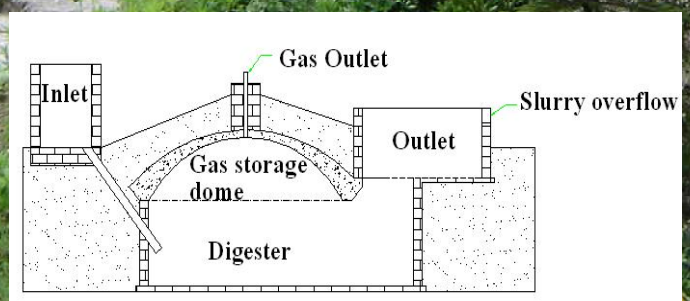
1,645 m²

VF Constructed Wetland

HF Constructed Wetland

SDB

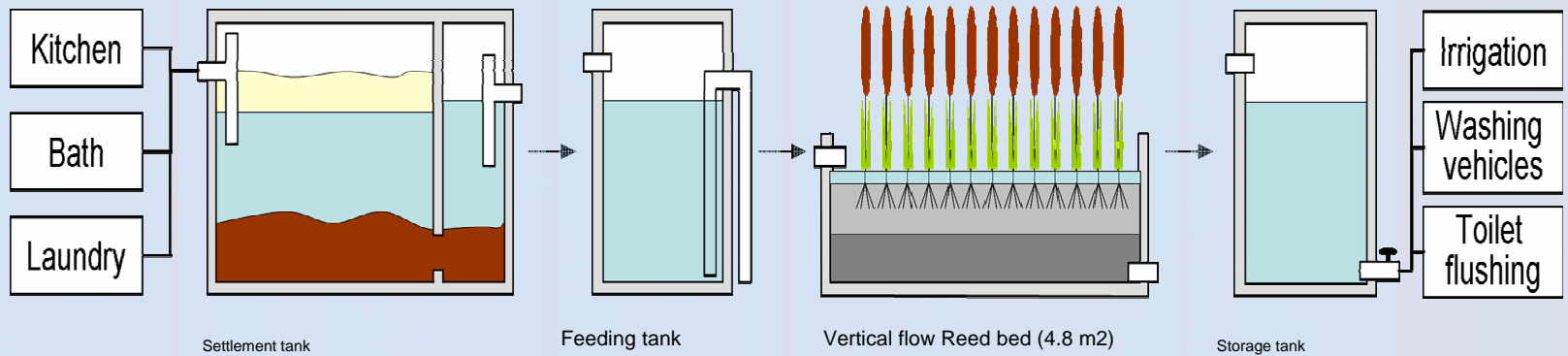
ABR



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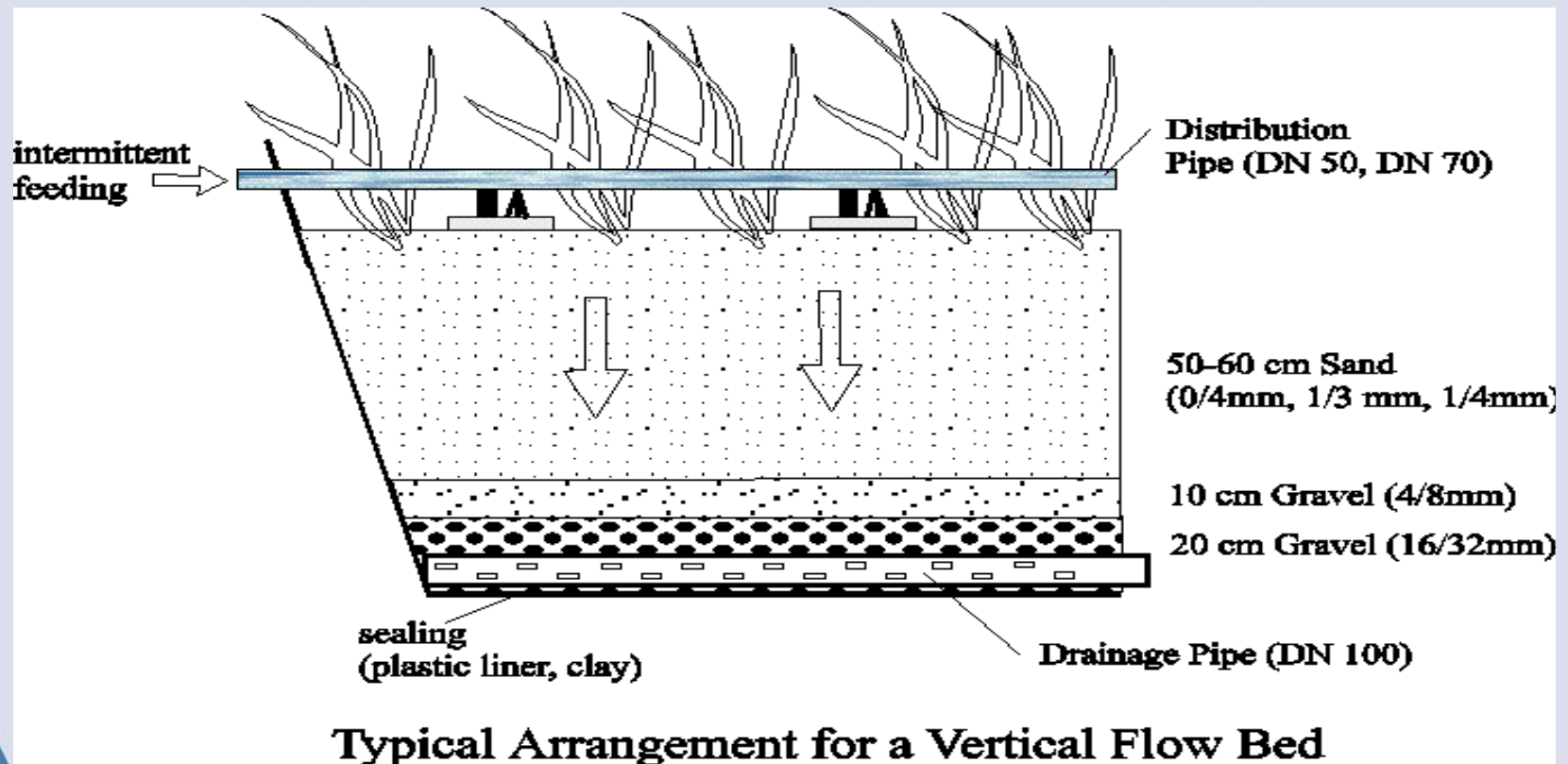


Greywater recycling through CW



V: 250 l

Constructed wetlands with Vertical Sub-Surface Flow (VF)



WASTEWATER RECYCLING, 1998



500
liters



200
liters





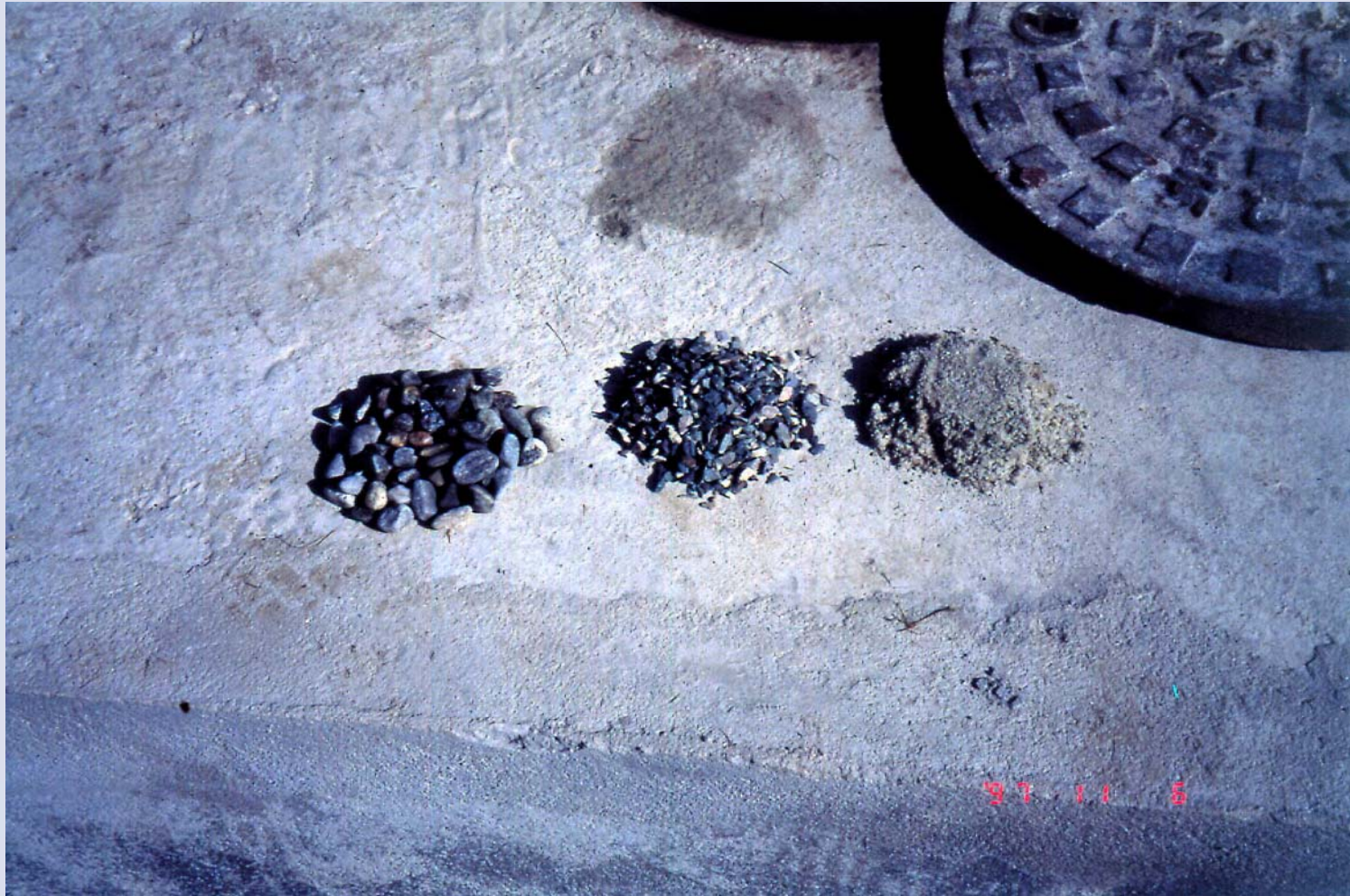




Quality of Gray water Before and After

	Influent range	Effluent range
BOD mg/l	100 to 400	0 to 12
COD mg/l	177 to 687	7 to 72
TSS mg/l	52 to 188	1 to 6
NH ₄ -N mg/l	4 to 26	0 to 2
PO ₄ -P mg/l	1 to 5	1 to 4
Total Coliform col/100 ml	91×10^7	<1000

Materials for VF-CW



Greywater Treatment Plant for a family (5 person)



Area : 4.8 m²

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

Cost of Graywater treatment system : USD 400

Direct saving on expenses in water : USD 10/month

Wastewater from Laboratory and Toilet

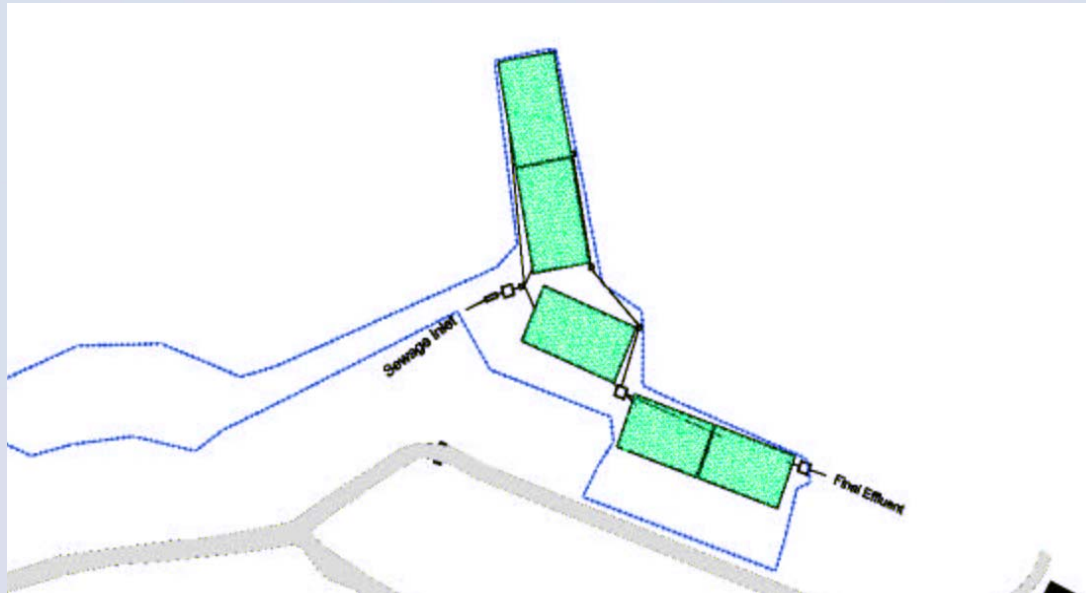
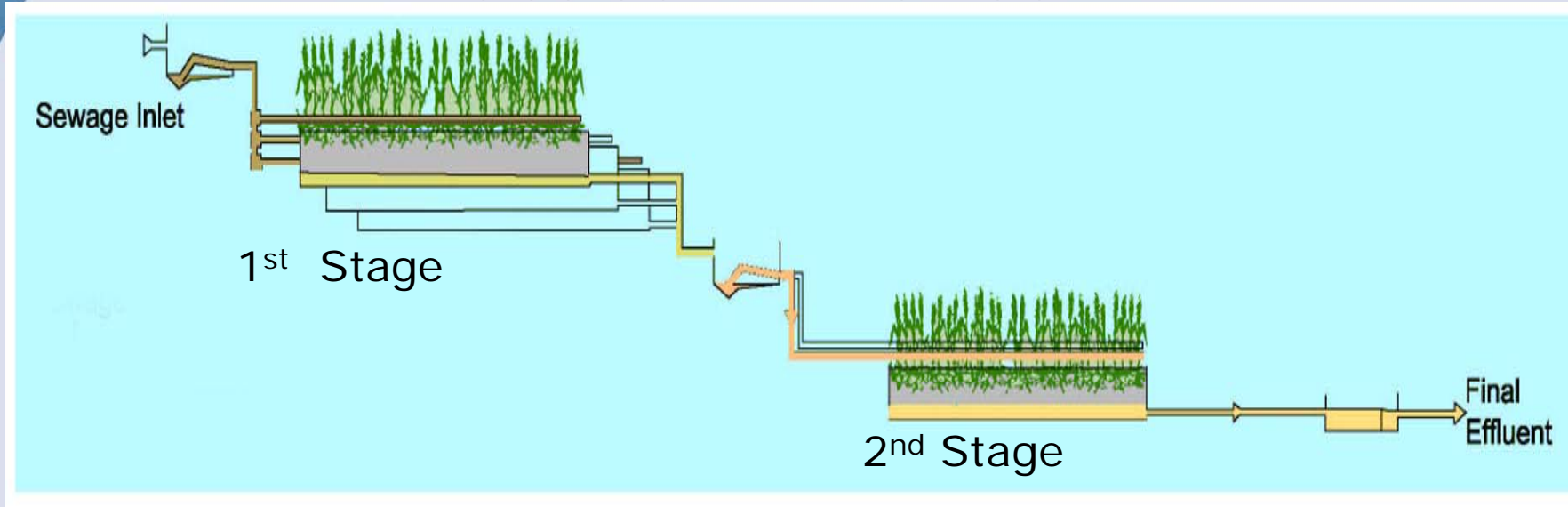


Recycling of treated wastewater for toilet flushing saves cost for water buying from tanker.

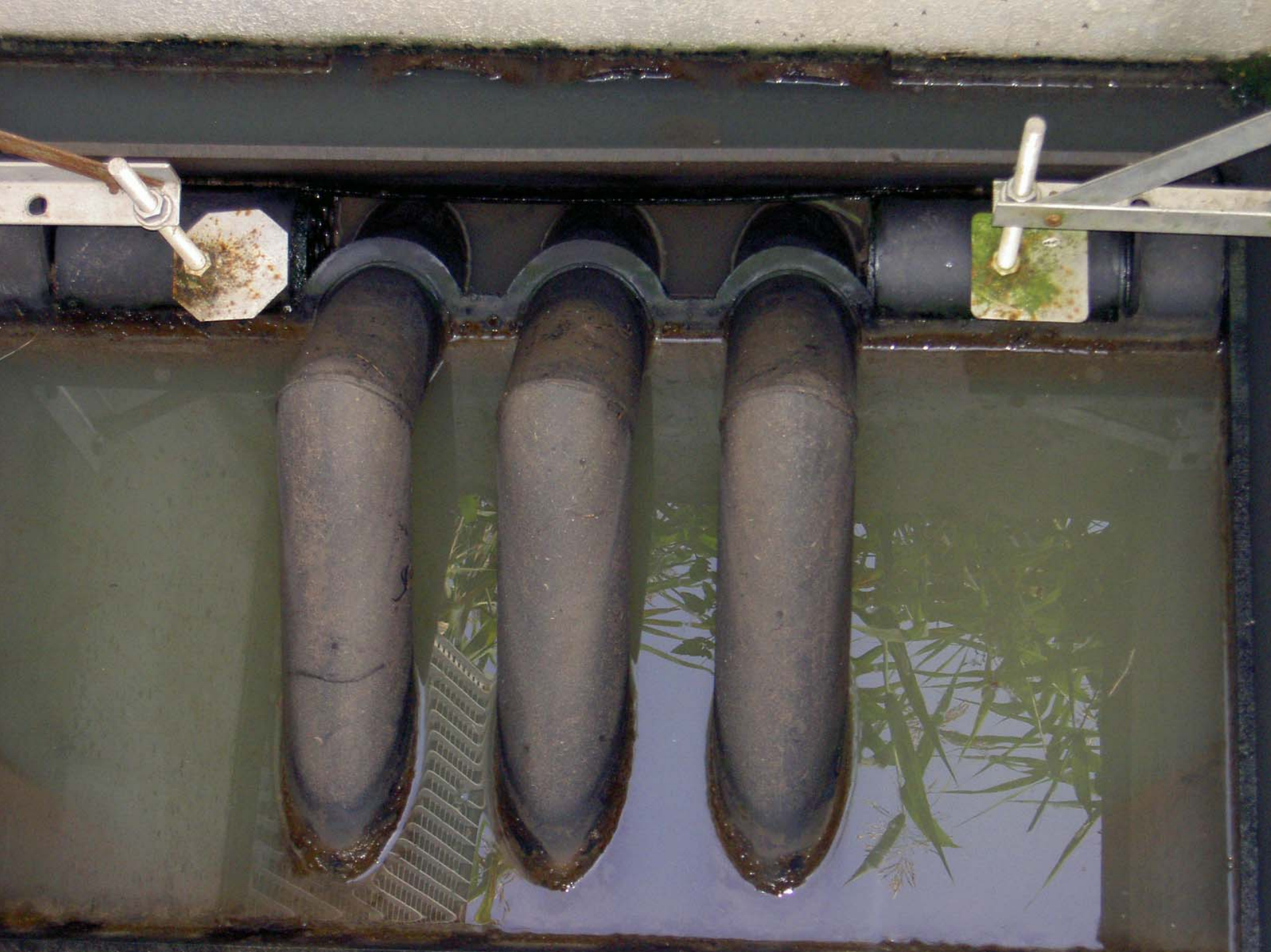
Estimation of Area

- 0.75 m² of surface area should be enough to treat wastewater generated by a person per day.
- For treatment of 1 m³ of wastewater about 7 to 10 m² of area is required.
- Size of the wetland can be determined by effluent discharge quality criteria and purpose of treated water for further use.

New Concept without Settlement Tank Practice in France











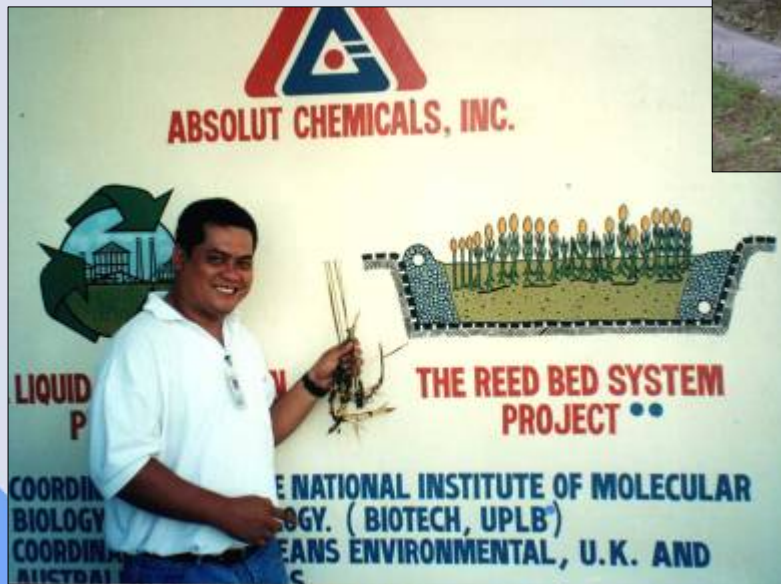
2003/ 5/27

GK Fishermans Village

Bayawan City, Philippines Oriental Negros
2,800 sq.m.



Absolut Chemicals Alcohol Distillery Lian, Batangas, Phillipines 300 sq.m.



Issues on CW

- Wastewater treatment is still not a priority for city in developing world
- CW though simple technology but still not yet aware
- Limited professional consultants and not interested in cost reduction
- Research findings of Academics and Scientists are not yet transformed into full scale system

Issues.....

- Primary treatment for large scale CW has yet to be improved in terms of cost and design
- Filling materials are not easy to access in all places leads to increase in cost
- Not easy to access land because of cost and NIMBY SYNDROM
- Communities involvement inadequate
- Recycling of greywater is not culturally acceptable

O & M issues.....

- CW is a LOW maintenance system, but people often think it as NO maintenance system.
- Some major O & M
 - Care less in sludge removal from primary treatment
 - Cleaning of distribution pipes
 - Flushing system particularly intermittent feeding
 - Care Taker

Clogging of Bed due to selection of inappropriate media



Accumulation Sludge in Settling Tank and clogging of bed







