1 WHAT IS WASTEWATER ?

Wastewater is used water and includes substances such as human waste, food scraps, oils, soaps and chemicals. Domestic wastewater includes water from sinks, baths, toilets, washing machines and kitchen. Wastewater from businesses and industries are more complex as water is used for a wide variety of purposes. Wastewater also includes storm water runoff which contains a lot of contaminants like hydrocarbons washed off from urban surfaces such as roads, parking lots and rooftops (Mara D, 1978 *Sewage Treatment in Hot Climates)*

1.2 Domestic wastewater production and disposal

Rapid population growth in peri-urban areas has created an increased demand for water for domestic consumption and a proliferation of waterborne sanitation. On-site sanitation remains the most common form of sanitation in many cities in less developed countries (eg. septic tanks). The quantity of wastewater generated by domestic households depends upon the level of water consumption. Water consumption varies considerably

- Where communities use public taps or in remote rural areas, domestic water use may be as low as 10 litres/ per capita per day

- In urban areas water consumption may be as much as 200 litres per capita per day in affluent households with connections to a reliable water supply system (Feachem et al. 1983).

The quality of domestic wastewater is determined by the household water consumption and usage and is described in terms of the concentration of pollutants and pathogens. Table 1.1 summarises the categories of wastewater and faecal sludge that are produced by typical domestic households.

Table 1.1 Types and sources of domestic wastewater and faecal sludge

Greywater (sullage)	Produced by personal washing, laundry, cooking and cleaning	↓ Increasing concentration of pollutants and pathogens
Black water	Produced by pour-flush toilets and water closets containing urine and/or faeces	
Septage	A type of faecal sludge produced from septic tanks, aqua-privies, and cesspools.	

Depending upon the type of wastewater, domestic households rely upon one of the following to dispose of wastewater:

- On-site disposal of wastewater: disposal of wastewater on the household plot or on-site disposal by soakaway (into the ground);
- Drainage and disposal : disposal via drains or sewers to natural water courses..
- Wastewater reuse: direct wastewater reuse by communities to irrigate fields in neighbouring fields or for aquaculture.

In peri-urban areas where municipal drainage and sewerage infrastructure is non-existent, many communities develop informal systems for managing wastewater. This generally involves the construction of rudimentary drainage systems to transport waste to the nearest disposal point. Figures for typical Asian cities given by Strauss et al (2000a) suggest that the percentage of inhabitants served by on-site sanitation facilities varies from between 65% and 95%.

In peri-urban areas, increasing populations, combined with increasing water consumption and a proliferation of waterborne sanitation, create widespread wastewater disposal problems. In many cases, wastewater is discharged locally onto open ground and vacant plots, creating ponds of foul-smelling stagnant water. Children and others may come into contact with polluted water especially as they often play in open areas where wastewater and refuse collects.

The mechanised pit emptying services provided by municipal authorities and medium to large sized entrepreneurs tend to provide limited coverage which rarely reach the urban poor. In other situations, the private sector responds to community needs, notably for cleaning on-plot sanitation and for transporting and disposing of septage. However, in general, these do not offer a comprehensive service and do not serve the poorer communities. As a result, services in low-income areas are usually provided by micro-entrepreneurs using manual emptying methods which pose considerable health risks to both the emptiers and the public when the septage is dumped into nearby surface drains or into lanes.

At the same time, increasing competition for limited water resources has resulted in a tendency for farming communities in peri-urban areas to use untreated wastewater for irrigation and aquaculture. Farmers often find it cheaper to exploit wastewater than to incur capital and recurring costs in pumping groundwater to irrigate crops. The re-use of wastewater for irrigation is likely to be most prevalent in regions in which water from other sources is scarce for part or all of the year.

The nutritional value of wastewater (eg nitrogen and phosphorus content) can increase the productivity of farming and thus contribute to the livelihoods of peri-urban communities (Edwards, 2000). These qualities provide a strong incentive for agricultural reuse. For instance, in Hubli Dharwad, India, vegetables produced outside the kharif season (the normal growing season) can fetch 3-5 times the price obtained during that season (Brook and Dávila , 2000).

Increasing conflicts between traditional rural livelihoods and the modern economically-driven urban livelihoods in peri-urban areas, combined with increasing competition for limited water resources causes many problems. This results in widespread reuse of wastewater by farming communities who use untreated wastewater for irrigation (food

produce and other plants) and aquaculture (culture of aquatic plants or fish). Much wastewater reuse occurs in surface waters that have been faecally contaminated by improper sanitation which provides a valuable source of nutrients for aquaculture and agriculture in peri-urban areas (UNEP, 2002). While some wastewater reuse takes place in large-scale and organized food production systems, the majority of wastewater reuse occurs in informal and localised systems.

Domestic wastewater together with discharges from industry and agriculture has an impact on environmental conditions in rivers and coastal waters. Discharges of waste water add to the general nutrient load contribute to eutrophication problems in rivers and coastal waters.

The impacts of discharges of wastewater include the unsightly littering of the rivers, creating foul smells and potential health hazard. Continued pollution may threaten the survival of aquatic life in rivers.

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