

## Good Practice 9

# Low-cost Combined Sewerage

### A. Unsettled wastewater

In low-income coastal areas in the state of Rio de Janeiro, Brazil, low-cost combined sewerage has been successfully used and shown to be less expensive than simplified sewerage and separate stormwater drainage (Guimarães and de Souza, 2004). The design basis is as follows:

1. The drainage area should not exceed 12 km<sup>2</sup>;
2. The design stormwater flow is that resulting from the local 10-year flood [determined, for example, by the Wallingford modification of the rational (Lloyd Davies) method (May and Kellagher, 2004)];
3. The minimum sewer diameter is 400 mm;
4. The sewer gradient is determined for the peak daily wastewater flow in the dry season and the sewer diameter selected to carry the 10-year storm flow [thus the design calculations are similar to those for simplified sewerage ('Good Practice 8' - see also Mara et al., 2001)].

### B. Settled wastewater

In India the solids-free effluent from a pour-flush toilet leach pit is discharged into a stormwater drain (Sundaravadivel et al., 1999), and in Vietnam household wastewater is settled in a small solids interceptor (septic) tank prior to discharge into a stormwater channel (Beauséjour and Nguyen, 2007; Beauséjour, 2008). The septic tank could be the dwarf unit developed in India (Sagar, 1983). Otherwise the design should follow the principles in A above.



Low-cost combined drainage at Lai Xá, Vietnam

### References

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