23rd WEDC Conference Durban, South Africa, 1997

WATER AND SANITATION FOR ALL: PARTNERSHIPS AND INNOVATIONS

Water from sand-rivers

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FOR THOUSANDS OF years, people have survived through dry seasons by scooping water-holes in sand-rivers in ecological zones ranging from semi-arid to desert. Even today, many rural people use water-holes in sand-rivers as their only water source for domestic use, watering livestock and small-scale irrigation.

Sand-rivers providing perennial water supply

Some sand-rivers provide water throughout all the years due to the favourable features of:

- The floor under the sand in a riverbed forms an upwards dyke which traps water upstream of it. An underground reservoir is thereby created from where water can be drawn.
- Coarse sand and gravel in sand-rivers can trap and store 50 per cent of water in the voids between the solids of sand. Up to 35 per cent of this water can be extracted. In other words, 350 litres of water can be extracted from every cubic metre of sand.

Sand-rivers providing seasonal water supply

The reasons for sand-rivers yielding water for only a short period after flooding, are usually:

Table 1. Extractable volumes of water from various soil types

Soil type	*Silt*	*Fine sand*	*Medium sand*	*Coarse sand*	*Small gravel*	*Large gravel*
Grain, mm	<.5	.5-1	1-1.5	1-1.5	5-19	19-70
Sample, L	4.0	4.0	4.0	4.0	4.0	4.0
Saturated, L	1.52	1.58	1.63	1.80	1.87	2.05
Extracted, L	0.18	0.75	1.00	1.40	1.65	2.00
Extracted	5%	19%	25%	35%	41%	50%

Reason no. 1

Lack of underground dykes to prevent gravity pulling water downstream in a sand-river. The water-holes will therefore dry up a few weeks after flooding.

Remedy

Construct a subsurface of soil which will stop water seeping downstream, thereby creating a larger reservoir.

Reason no. 2

River-floors under the sand may have seepage lines along boulders and fractured rocks which drain water into the deep underground.

Remedy

Unless the seepage lines can be sealed easily, it is recommended to find another site, preferably upstream.

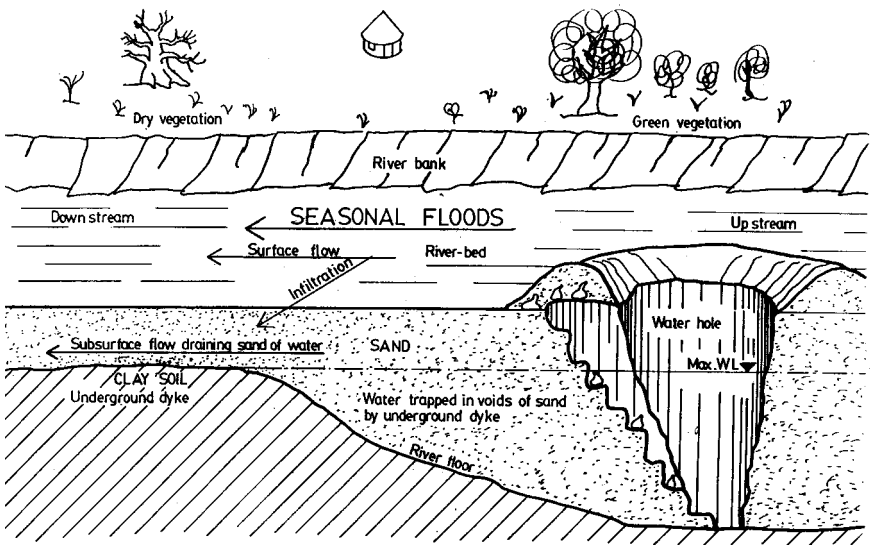

Figure 1. Longitudinal profile of a sand-river trapping water

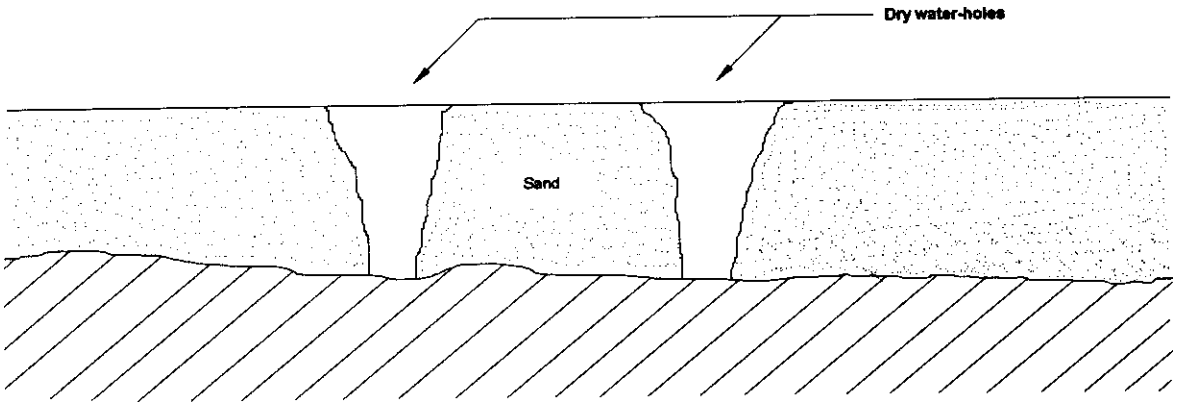

Figure 2. Water-holes dry up quickly in sand-rivers without underground dykes

Reason no. 3

The volume of sand in a reservoir is not large enough to store sufficient water.

Remedy

A sand dam of stone-masonry can be built if both riverbanks are of sufficient height. Sand dams increase the volume of sand and water by forcing flash-floods to deposit coarse sand.

Reason no. 4

The voids between the solids of fine sand are so small that only little water can be extracted from them.

Remedy

The recharge of a hand-dug well can be improved by increasing the diameter of a well, or by installing infiltration galleries of perforated PVC pipes, gravel or coarse sand. Another option is to build a sand dam to trap coarse sand and deposit it on top of the finer sand, but this option requires high river-banks as well as being expensive.

General guidelines

Build a subsurface dam before building a sand dam

Subsurface dams are cheap and easy to build of soil, while sand dams are much more complicated and expensive. It is therefore recommended to build a subsurface dam before building a sand dam in order to find out whether a doubtful sand reservoir is watertight, and the subsurface may also supply so much water that there is no need for building the sand dam.

Equipment for investigating sand-rivers

Knowledge of water-indicating vegetation and dowsing are useful for locating underground dykes and underground water reservoirs in sand-rivers.

Detailed investigations can be conducted by hammering a probing rod into the sand at certain intervals. Based on the data found on the rod when it is pulled up, a longitudinal profile can drawn of a potential part of a sand-river.

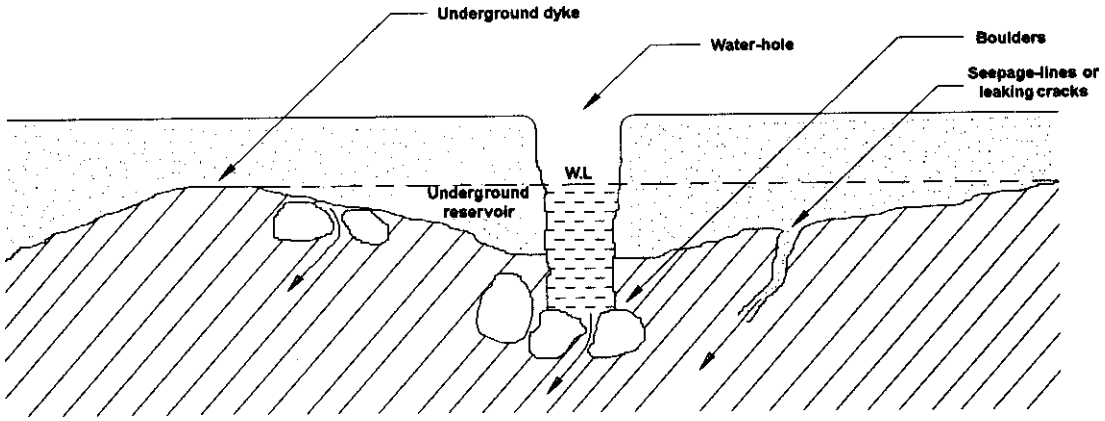

Figure 3. Undesirable drainage of a sand reservoir

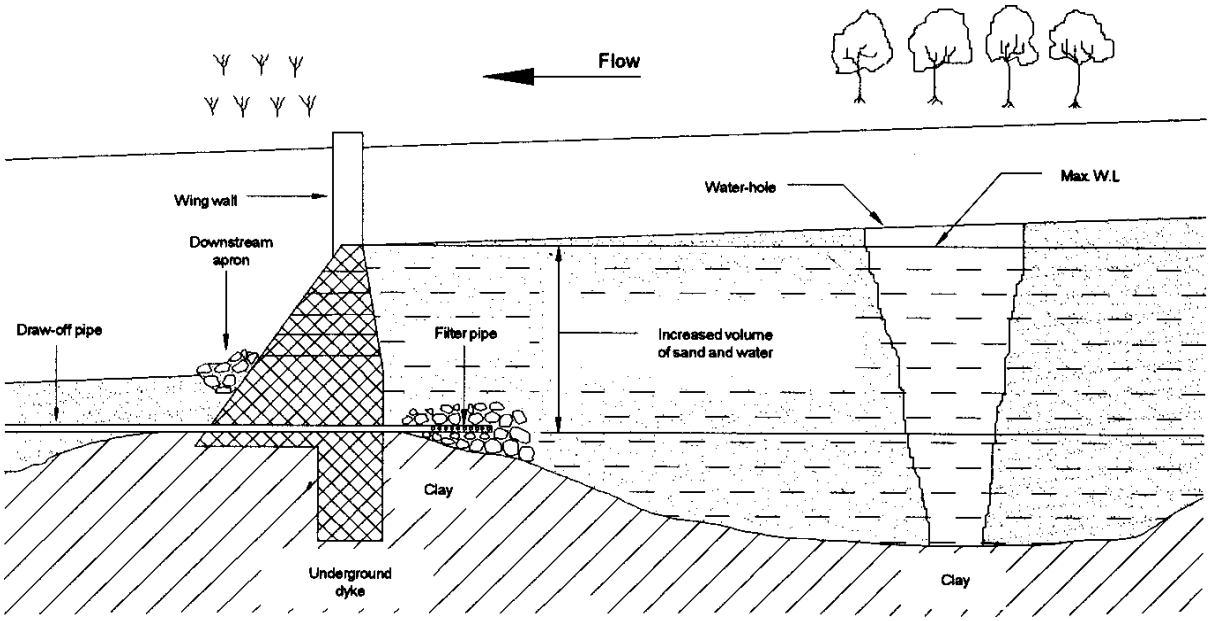

Figure 4. A sand dam has raised the level of sand and water in its reservoir, thereby increasing its capacity greatly

The length and various widths of a sand-river are measured along with the gradient of the sand surface. The gradient is found by sighting along the water-levels in a circular ring of transparent hose-pipe filled half-way by water. These data are used for estimating the volume of sand in a reservoir by the formula of:

Volume = max. length × max. width × max. depth/4

The extractable volume of water from a sand-river is found by draining water from a 20 litre container filled with sand saturated with water, and multiplying the result with the volume of sand in the reservoir.

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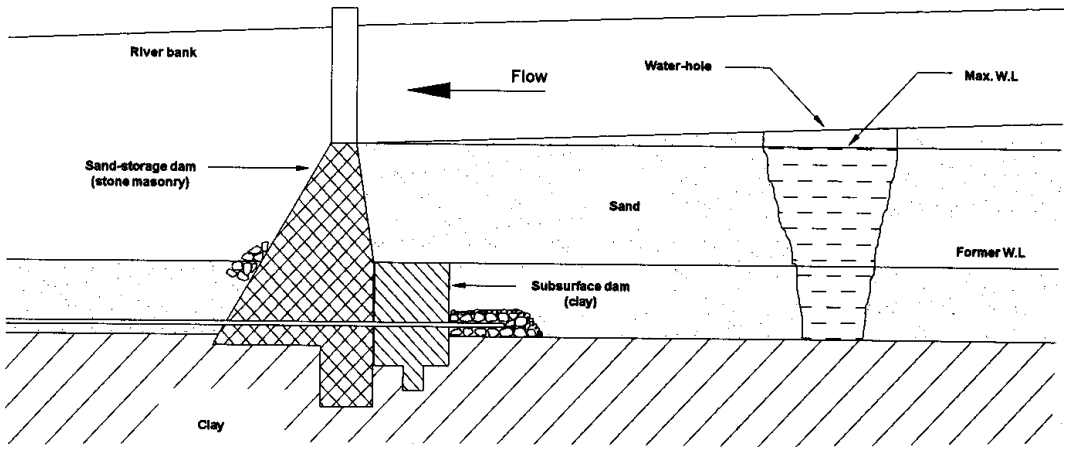

Figure 5. A cheap subsurface dam should be built of soil before the construction of an expensive sand dam will take place