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Subsurface drainage technique (SDT)

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DURING THE DECADES-long military occupation, the Israeli neglect of the basic infrastructure of the West Bank and Gaza resulted in its severe deterioration. Consequently, only 35 per cent of Palestinian families are connected to reliable and hygienic sewage systems. In rural areas, where roughly 10 per cent of families are connected to sewage systems, most communities depend on cesspools for the disposal of their sewage. In the Palestinian territories, cesspools cause a wide range of environmental health problems to the local community. Most cesspools have inadequate linings, resulting in the seepage of sewage into the water table. Cesspools tend to be built very close to houses, which exposes the residents to contaminated soil and groundwater. In rocky areas, the pores of the surrounding rock become periodically blocked by the sewage in the cesspool. The blockages limit the filtration of sewage thereby reducing the cesspool's capacity. In an effort to avoid costly evacuation procedures, cesspool owners try to minimize the amount of sewage going into the cesspool by disposing of waste water from their kitchens and sinks in the streets. This disposal of waste water in public places causes a variety of different health and environmental problems.

A save the children alternative

The high cost of installing a sewage network in every Palestinian village and the general lack of sewage treatment facilities required that a inexpensive and safe alternative to cesspools be developed. In addition, it was necessary that the sewage disposal unit be easily and cheaply replicated so that the technology could be readily available to even the poorest of Palestinian communities. In co-operation with Birzeit University, Save the Children (SC) developed the Sub-surface Drainage Technique (SDT) unit, a low-cost and environmentally safe alternative to cesspools. The construction of SDT units in disadvantaged rural areas is now a major focus of SC's environmental health activities. In addition, in each village in which SDT units are built, complementary educational activities are held to train the beneficiaries in their proper use and encourage other community members to replicate the SDT model. As in all SC activities, the involvement of the targeted communities is encouraged in order to achieve sustainability through a sense of community ownership and understanding of the technology. Part of this community involvement in SDT projects is a requirement that beneficiaries contribute to the construction costs.

Description of the Sub-surface Drainage Technique (SDT) unit

The SDT unit consists of three main parts:

1. the sewer line from the house;
2. the sedimentation tank; and
3. the biological filter.

The SDT unit is a low-cost unit that does not require a great deal of maintenance. The unit needs cleaning only every three years.

The sewer line

The sewer line carries the sewage from the house to the septic tank. The line should be installed underground at least 15 m away from the house and down hill from any nearby well or spring, with water-tight joints and a uniform slope of not less than 0.002 cm. The line should have as few bends as possible, with no bend exceeding 45°.

The septic tank

The septic tank is the main part of the SDT unit, in which:

- suspended solids are physically removed through sedimentation;
- conditions suitable for anaerobic bacteria are created to allow the decomposition of the remaining solids;
- residual solids are stored.

The septic tank should be made of concrete or lined blocks and hermetically sealed. The sealing off of the tank creates the conditions necessary for the propagation of the anaerobic bacteria contained in the sewage, such as darkness, lack of air and sufficient nutrition. The tank should have a total volume of 3x2x2 meters and be divided into two chambers, with the first chamber constituting 2/3 of the total volume. The T-shaped section inflow pipe, which connects with the sewage collection box, should be located 30 cm below the ceiling of the first chamber. A T-shaped section outflow pipe should be located 40 cm below the ceiling of the second chamber.

The biological filter

The distribution box outside the septic tank connects the septic tank with the penetration field. The floor of the box must be completely flat to ensure that the liquid effluent load is distributed equally between the PVC pipes. The penetration field consists of perforated pipes laid not less than 60 cm under the surface of the ground with a mini-

Figure 1.

imum slope of 1 percent. The pipes should be perforated with holes at 15 cm intervals and separated from each other by 2 m. . The pipes should be buried in gravel with a minimum thickness of 15 cm and a 5cm layer of ash should be laid over the gravel. The ash layer allows the growth of bacteria and algae in the gravel layer. The bacteria filtrates the soluble matter, decreasing the BOD level. The minimum area of the penetration field should be 80-100m², depending on the soil type. A percolation test of soil in the selected site is therefore a necessary step in the design of the penetration field.

Community participation

Save the Children has found that community investment in its own development ensures long-term sustainability and fosters self-reliance in the future. Therefore, SC encourages community involvement in every aspect of its activities, including the following:

Project design

SC co-ordinates with the village committees, which are formed by SC of local men and women to represent the community, to design and implement educational activities. Participatory Rapid Appraisals (PRAs) are conducted to enable the committees to identify the water, sanitation and environmental health needs that should be addressed in the project activities.

Selection of beneficiaries

The village committee and SC work together in selecting the beneficiaries in the village according to an agreed criteria. The criteria includes considerations of possible beneficiary participation, the degree of poverty and health status.

Implementation of SDT units

The village committee and the beneficiaries are trained at the start of the project in how to construct and supervise the

work. The village committee and, in many cases, local women's committees take on the responsibility of project implementation. SC has found that this increases the community's respect for the committees, making it easier for them to work with the community to find low-cost solutions for its environmental health problems, both during the project and in the long-term.

Contribution to construction costs

Save the Children encourages the beneficiaries to contribute as much of their own physical and financial resources as possible to the construction of the SDT units in order to increase their sense of ownership of the new system. SC provides technical support and contributes the expensive building materials, which constitutes 35 per cent of the total cost. Beneficiaries are encouraged to contribute to the costs of the SDT unit by providing the labour and making a small financial contribution. In some cases, the local committee encourages beneficiaries living near each other to work together in the SDT construction, strengthening the social ties between the families. Although the construction is usually done by men, in families in which the woman is a widow or the man is working outside the village, women build their own SDTs. SC has found that, although this is non-traditional role for the women, most women are successfully construct the units and often do a better job than the male beneficiaries.

Complementary educational activities

Throughout the project implementation, SC and the village committees raise the community's awareness about the SDT units through workshops and public meetings. Topics discussed include the benefits of the SDT units as compared to environmentally unsafe cesspools and the possible use of the filtered water for agricultural purposes, especially in areas of water scarcity. The beneficiaries are also trained in how to use and maintain the SDT units. Through SC's

unique Child to Child program, local schoolchildren are trained to raise the awareness among the other children and their community on how to protect the environment and the dangers of disposing gray water in the street. Children's activities include writing stories, slogans and plays about SDTs and cesspools and organizing marches and plays in

their community on how to keep their village health and clean.

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