Co-operative Sanitation Project, Pellsrus Township, South Africa

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A lack of sanitation in the township next to Jeffreys Bay, South Africa, means that not only is the beach strewn with waste, but the township dwellers are faced with health hazards. Some possible solutions are presented here.

The situation of Pellsrus Town ship, adjacent to Jeffreys Bay, South Africa poses conditions of human poverty with severe environmental degradation. In particular, the famous beach strand along this portion of the Eastern Cape Province is constantly threatened by pulses of contaminants, flushed from the township area by storm drains. The pollution of this valuable coastal resource is of major concern to the more affluent residents, surfers, shell collectors and tourists, but it reflects a greater problem of health issues for those in the township.

As of summer 2005, there existed a large population of squatters living in informal settlements among more than 8000 or so people resident in established township housing. Local, regional and national government entities have promised decent housing structures with water and sewer services for all the poor in South Africa.[1] However, such provisions have yet to be realized in most areas. The municipal government had previously located 12 single-unit chemical toilets among the squatters. Even these were removed when maintenance became a problem. A high concentration of human waste covered much of the ground area in and around the squatter shelters. During rainfall, faecal material, along with large quantities of uncontained solid waste and household 'grey water' pollutes the runoff from the township and is then deposited onto the beach. Established township dwellings surround a vegetated wetland ravine. This gently sloping valley functions as a natural drainage route from the informal squatter settlements. The wetland serves as a highly degraded public area where children play amidst rubbish and additional concentrations of excrement.

The deplorable environmental conditions in and around Pellsrus attracted the concern of one author (R. Seebach) as he served locally with an international NGO. His interest led to a two-month period of research and practical outreach in the summer of 2005.[2] To start with, important contacts were established with a number of relevant parties: township residents and their leaders, local church leaders, educators, municipality officials, key commercial interests, regional scientists and prominent citizens in dominantly white Jeffreys Bay. Cooperation from the Department of Geology at Wheaton College, Illinois, USA enabled application of some potential remedies considered in the study and reported here.

Natural environment

Thesis study and the practical outreach of Summer 2005 were designed for a distinctive geographic context. Local topography has a consistently gradual slope toward the coast, with a few minor stream incisions. The region is characterized by a Mediterranean climate, with light to moderate rainfall precipitation throughout the year. Most rainfall events are quite gentle, but heavier rates do occur. In 1968, nearly 50cm of rain fell within 24 hours. Storm-water samples indicate a good correlation between periods of substantial precipitation and higher levels of coliform bacteria. Township drainage tends to follow roads and flow into storm drains, the largest of which includes the wetland area, before emptying onto the beach. All local streams are ephemeral with little base flow and no springs are observed during dryer periods. Lighter precipitation on soil surfaces produces considerable infiltration with generally slow groundwater percolation down slope. Unfortunately, the high degree of surface cover by pavement, dwellings and waste, does not allow much natural

Model tower garden

Jeffreys Bay wetland, where rubbish is dumped indiscriminately.

Rubbish on the beach near the township outflow drain

infiltration which would disperse and purify contaminants.

Eastern Cape land-use practices over the last century or so have degraded indigenous biomes by the introduction of invasive shrubs and 'weeds' as well as by stripping large plots of nearly all vegetation.[3] In addition to the township development described above, this alteration of natural components (and thus natural systems) has greatly diminished the capability of land to process effluent and to prevent the erosion and transportation of sediment.

The marine ecosystem of the Eastern Cape is rich yet fragile, supporting numerous important fisheries and diverse tourism interests. Repairing the environmental degradation of Pellsrus and surrounding communities will certainly help protect the coastal environment and thereby provide economic stability and a healthy resource base for future generations.

The philosophy behind this co-operative project is that a healthy environment will contribute to health among the human residents. Certainly, the corollary relationship is sadly true; an unhealthy environment does cause human illness.

Project selection and initial implementation

Residents of Pellsrus and its informal settlements suffer from high rates of HIV/AIDS infection and unemployment.[4] In addition, digestive-tract, respiratory and skin disorders are very common, especially among younger children. Although improvement of environmental conditions can be seen as a noble end in itself, the Pellsrus project aims to improve human life too.

The township initiatives were the first attempts to deal with the waste-water problem in an integrated way. Remedies were selected that could be started over a brief two-month period and that would potentially show some immediate benefits. After community surveys had been carried out and after contacting interested parties, the student team compiled a synoptic map of the area utilizing ArcPad[tm] GIS technology. Important spatial data included the topographic limits of the wetland, storm drains and drainage vectors, locations of solid-waste concentrations and their volumes, location of the informal settlements, and points where water samples were analysed. Other relevant information (not depicted on the map) also provided the location of exposed bedrock and the now-removed chemical toilets. Data enabled the implementation of four initial sub-projects (see accompanying boxes for details):

- A solid-waste plan prepared and submitted to the regional municipality
- The establishment of two types of household test gardens for greywater irrigation
- The construction of a demonstration 'ecosan'[5] urine-diversion toilet
- A community-based clean up of the wetland area with the planting of donated indigenous tree saplings.

Solid waste plan

Mobile GIS technology illustrated the amount of solid waste littering the wetland and surrounding areas. Data were compiled into a map and presented with recommendations for improvements to the municipality at a town-hall meeting. The focus of the study was to demonstrate the insufficiencies of maintaining a skip system for collecting township rubbish. Proposed solutions to the problem included door-to-door collection services, creating proper incentives for cleanliness and a check system to avoid indiscriminate dumping of rubbish.

Gardens

Tower gardens were established to aid the drainage of cooking and washing water, habitually poured onto roads and paths. The structures are simple vertical gardens in which grey water is poured down a central stone column to promote ground infiltration and to provide the moisture needed in an outer column of earth and compost to grow healthy vegetables. Benefits are obvious;[6] in one study conducted in Durban, plants fed by grey-water grew more than twice as fast as those irrigated by tap water only. Nutrients in the 'dirty' water made additional fertilization unnecessary.

Trench gardens formed a second project introduced to remove solid waste from the environment and to emphasize the value of composting.[7]

Toilets introduced

Toilets chosen for the community utilize a pedestal with a divided panel to separate urine from faeces. Such technology[8] is now being employed globally, especially in regions like Pellsrus where water tables are too high for pit latrines and chemical toilets are

Pellsrus wetland ravine, where children play in foul ditchwater

too difficult to maintain. Urine-diversion toilets offer the benefit of being virtually odourless; they provide natural fertilizers via urine and composted faeces, and can be established even in small spaces within existing shacks. With proper education and training, these toilets could serve multitudes with no other available facilities.

Wetland

Preliminary wetland restoration began in cooperation with a local primary school. After children received basic wetland educational lessons, they and their adult leaders participated in an environmental clean-up competition. Following the collection of solid waste, the children planted 50 indigenous trees and other wetland plants donated by a local nature conservationist. Prizes donated by community businesses were awarded for the excellent efforts. The children's joy and enthusiasm testified to the hope there must be for the future. A school teacher leader believes that the project will stimulate a new environmental club.

All four components were completed at a foundational level during the two months of work. The immediate consequences were encouraging, but assessment of the project would need to be made periodically. However, it must be strongly emphasized that without the direct involvement of key local individuals, particularly two church pastors and some teachers from the affected area, there could be little hope for sustainability.

Community ownership of each improvement offers the only possibility of long-term success. Supplying and building the gardens and toilets will potentially equate to employment for township residents in a small enterprise business context. Recycling and intentional solid-waste management should also add jobs while reducing the polluting waste stream. Other projects that deserve attention for the future include:

- construction of storm-flow interception structures and permanent protected status for the wetland area, which has the potential to be a unique recreational park for the residents,
- sanitary lifestyle and environmental stewardship education for school children, and
- a feasibility study for utilizing low-cost local materials for brick making.

About the authors

Jeffrey Greenberg, Rudi Seebach, Andrew Luhmann, Deborah Zylstra, Jed Wentz are at Wheaton College, Illinois, USA and Rhodes University, RSA. The research described in this article was the basis of a Masters thesis in environmental management conducted through Rhodes University in Graham's Town.

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Aerial photos incorporating GIS map with a) wetland indicated by solid line, and ditches and underground pipes shown by dotted line; and b) a closer view with white areas representing concentrations of solid waste