



Community based SWM project preparation

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MOST INDIAN MUNICIPALITIES, despite spending 30 to 50 percent of their total municipal services budget on Solid Waste Management (SWM), are unable to provide satisfactory SWM services. Recognizing the need to develop a sustainable SWM model, particularly for small towns of India, and at the request of the Government of India (GOI), the Regional Water and Sanitation Group - South Asia (RWSG-SA)¹ is assisting the Government of Goa (GOG) in project preparation, planning and implementation of a community based solid waste management system for Panaji, the capital of Goa. This paper discusses the project preparation process followed by the RWSG-SA and salient features of the proposed SWM system.

Current SWM practices in Panaji

Panaji the capital of Goa, is a small but well developed town with a population of 42,915, as per 1991 GOI census. Panaji with an area of 7.6 sq. km, is popular for its beautiful beaches and historical churches.

Panaji Municipal Council (PMC) is responsible for collection, transportation and disposal of solid wastes generated within the municipal limits. Households and establishments including hospitals, private nursing homes, restaurants, etc., deposit their wastes in communal waste storage bins, for subsequent collection (manual) and transportation to an undeveloped and unsanitary dumping site at Chimbhel, 7 km away from Panaji. A large number of waste pickers make their livelihood by collecting a variety of recyclable wastes from bins and the disposal site. Silt from storm water drains and construction wastes are collected separately by the PMC's engineering division for disposal in low lying areas. The current SWM practices need substantial improvements, particularly in the areas of collection and safe disposal of infectious wastes from hospitals and nursing homes; transportation and disposal systems; organizational reforms and optimal use of resources to maximize the manpower and vehicle productivity.

Project preparation process

The five major elements for developing a sustainable SWM project, details of which are discussed below, were studied by a multi-disciplinary project preparation team sponsored² by RWSG-SA.

Quantity and quality of wastes

Reliable data on quantity and quality of wastes are important for the design of optimal collection, transportation and disposal options. Detailed field investigations were

carried out to measure the quantity (waste generation rates) and quality of wastes from each category of major waste generators such as: households, restaurants, shops, hospitals, markets and street sweeping. Based on these measured values, the total quantity and the physical and chemical characteristics of combined wastes were computed. This information was supplemented with the quantity of wastes recycled by the non-formal sector - waste pickers and waste dealers.

Salient findings of field investigations:

- Panaji generates daily about 22 tons of wastes (refuse) and about 11.5 tons of construction wastes. Households (40%) and restaurants (27%) are the two major waste generators.
- About 1.8 tons, 8% of total wastes, are collected daily by waste pickers for recycling.
- Panaji wastes are suitable for composting -70% organic with a C/N ratio of 17; and NOT suitable for incineration - low net calorific value (1300 kcal/kg) and high moisture (65%).

Community needs and perceptions

A social survey, covering about 10% of households and establishments, was carried out to (a) study the current practices on waste storage and community level disposal; (b) assess the community perception of the existing primary collection system; and (c) evaluate community preferences and willingness to pay for improved primary collection services.

The major issues raised by the community are: inadequate number and faulty design of bins; irregular clearing by PMC workers, and the wet and unhygienic conditions around the bins.

Meetings with representatives of other major waste generators, restaurants, hospitals and nursing homes revealed their preference for a personalized 'door-to-door' system and their willingness to pay for the improved service level.

The social survey findings formed an important basis for the development of a sustainable SWM model. For example, the Panaji survey provided some unexpected

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² The Panaji SWM Study was financed by a grant from the Government of Norway.

results; people in Panaji are not interested in 'door-to-door' collection of wastes; people are willing to make a monthly payment of Rs.10/- (US\$ 1 = INR 31.806/94 rate) per household for a communal primary waste collection system with an improved bin design and daily clearance through a mechanized system.

Collection, transportation and disposal

The findings of the field investigations and the social survey helped in identifying possible options to improve the existing collection, transportation and disposal of wastes. Considerations on the use of indigenous technologies; availability of facilities for operation and maintenance (O&M); resource recovery potential; and capital and O&M costs influenced the selection of an optimal option.

Transportation being the major cost of a SWM system, specific unit cost analysis for different options was carried out to evaluate the impact of the improved system on manpower and vehicle productivity.

Various disposal options such as composting, pelletization, incineration, etc. were evaluated. The potential for resource recovery and revenue generation influenced the decision for composting organic wastes from vegetable markets and restaurants.

Institutional needs

The inherent institutional inadequacies that affect the service delivery were analyzed. Issues like fragmented responsibilities, insensitive legal environment, lack of work norms, employment of untrained staff, etc. were specifically addressed, to identify the institutional improvements needed to sustain the proposed SWM system.

Financial management and cost recovery

For optimal utilization of scarce financial resources and to ensure sufficient funds for O&M and capital replacement, the project included options for improving the SWM accounting procedures and cost recovery from house holders, hospitals and restaurants. Discounted cash flow analysis of capital investments and estimated annual recurring costs for different cost recovery scenarios (50 and 100% recovery) were carried out to facilitate the financial evaluation of different options.

Recommendations to improve the existing swm situation

Brief summary of recommendations, evolved as a result of the above described process, is given below:

Primary collection system

- *Replace the existing bottomless cement concrete bins with suitable numbers of metallic bins, a minimum of one bin within 50 m of all households. The area surround-*

ing the bin should be paved with cement concrete or asphalt.

- *Collect the restaurant wastes from 'door-to-door', twice a day, on a full cost recovery basis. The six existing closed body vehicles should be used for servicing 200 restaurants per day.*
- *Collect the infectious wastes separately from hospitals and nursing homes for incineration at the Goa Government Medical College Hospital, on a full cost recovery basis.*
- *Use the existing garbage compactor exclusively for collecting the organic wastes from the municipal market.*

Street sweeping

- *Divide Panaji town into 97 "beats", and employ a minimum of 78 sweepers to work throughout the year.*
- *Provide the sweepers with more efficient tools such as long handle brooms and handcarts with containers, to improve their productivity.*

Transportation of wastes

- *Procure five vehicles, fitted with a simple hydraulic device for direct transfer of wastes from the communal storage bins and tipping, for daily clearance of all the bins.*
- *Use the existing vehicles for transporting construction wastes and silt. Four workers, instead of the 35 employed at present, should be adequate for collecting and transporting construction wastes.*

Waste disposal

- *Install a manual composting plant for processing 8 tons of restaurant and market wastes everyday. With proper marketing, it is not only possible to fully recover the production cost of Rs. 325/- per ton, but also possible to make a modest profit. In the neighboring states of Gujarat and Maharashtra, good quality compost is sold at Rs. 1,300/- per ton.*
- *Develop the abandoned laterite stone quarry pit at Talaulim village, into a sanitary landfill site for disposing of the remaining wastes, which amounts to about 12 tons per day (excluding 1.8 tons of wastes collected by waste pickers). It is estimated that this landfill site will have a useful life period of 15 years.*
- *Improve the existing dump site operation (until the new site is developed) by spreading the waste and covering it with construction wastes using a hired bulldozer on a regular basis.*

Institutional framework

- *Provide the PMC's sanitary department with complete responsibility for handling all solid wastes except silt, including the management of the vehicle workshop. The engineering department, responsible for construc-*

tion and maintenance of storm water drains, should continue to handle the silt removed from drains.

- *Gradually shift the 'door-to-door' collection, transportation of wastes from restaurants and nursing homes, and operation and maintenance of the composting plant, to the private sector.* However, PMC should clearly define the roles and responsibilities of the contractors, the minimum service levels, the safety measures for handling infectious wastes, the necessary safeguards against delays and inadequacies in the agreed service level, and the direct cost recovery from beneficiaries in accordance with an approved tariff.
- *Reorganize the SWM department* on the basis of work norms and the manpower suggested for the improved SWM service.
- *Sustain the waste pickers contribution to resource recovery*, by organizing them into a formal group with the help of a local NGO, providing them with tools to sort out wastes, raising their status to that of waste collectors, and providing either free or low-cost medical facilities through the state health department.

Financial viability and project preparation

In the last four years, PMC's SWM expenditure has almost doubled and in 1991-92, it spent about Rs. 7.2 million, 40% of its total income, on SWM. With a capital investment of about Rs. 5.5 million for implementing the above recommendations, the annual recurrent costs could be reduced to about Rs. 4.8 million.

Discounted cash flow analysis of the investment and the estimated savings for two different scenarios, (a) with 100% cost recovery for collection of restaurant and hospital wastes and for operating the compost plant; and (b) 50% cost recovery, indicates that the investment pay-back period varies from three to five years and the debt service ratio from 1.67 to 3.10.

On the basis of the comprehensive analysis and attractive rate of returns on investment, PMC has been able to obtain a loan from the Housing and Urban Development Corporation to finance part of the investment cost. PMC has just started the project implementation process with active community participation, facilitated by a local NGO, and the whole system is expected to be in place by mid 1995

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