

Orangi Pilot Project: the expansion of work beyond Orangi and the mapping of informal settlements and infrastructure

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ABSTRACT This paper describes the work of the Pakistan NGO, Orangi Pilot Project–Research and Training Institute (OPP–RTI), in supporting improved provision for sanitation and other services in Orangi and other informal settlements in Karachi, and in other cities and smaller urban centres in Pakistan. It also describes an OPP–RTI programme to map and survey informal settlements in Karachi, and the youth training programme that supported this, and also the support for OPP–RTI partners in mapping in other urban centres. Improving infrastructure and services, and house upgrading in informal settlements, has been hampered by a lack of maps showing plot boundaries and existing infrastructure. Documenting and mapping these informal settlements has a number of important repercussions for urban policy, planning and infrastructure investment, as it demonstrates people's involvement and investment in development. As a result, planning agencies and local governments have realized the need to support this work, rather than ignoring or duplicating it, and this has had important implications on how infrastructure is planned, financed and managed. As the paper describes, this includes greatly reducing or removing the need for international loans to finance such investments.

KEYWORDS governance / mapping / planning / sanitation / surveys

I. INTRODUCTION

The Orangi Pilot Project–Research and Training Institute (OPP–RTI) is an NGO working in the informal settlements of Orangi Town in Karachi, and in other cities in Pakistan.⁽¹⁾ The OPP–RTI's low-cost sanitation programme supports communities to develop their own "internal" sewerage development (sanitary latrines inside homes, underground sewers in lanes, and neighbourhood collector sewers). This can then be linked to "external" development (trunk sewers and treatment plants), ideally built by local government (Figure 1). Projects in Orangi and in 248 other locations in Pakistan have demonstrated that communities can finance, manage and build internal sewerage development provided that they are organized and supported with technical support and managerial guidance. Mapping has been an essential part of this process, documenting certain infrastructure for the first time.

The sanitation system developed by the OPP–RTI for Karachi uses existing informal sewerage that follows the natural slope of the land through various natural drainage channels or *nalas*. With technical and

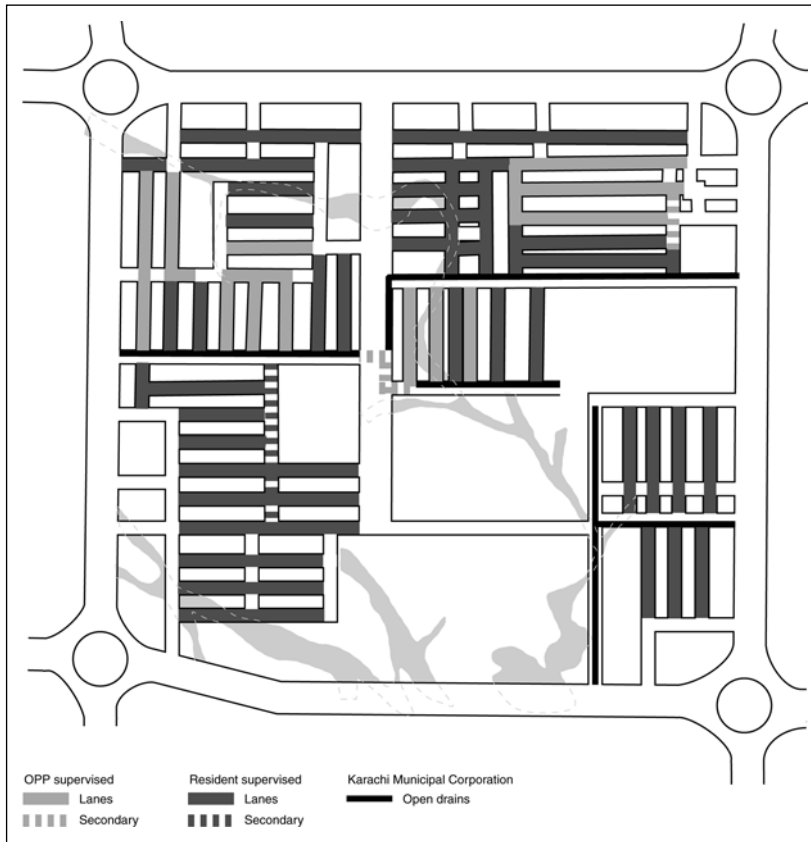


FIGURE 1
An example of the mix of lane and secondary sewers in a settlement

SOURCE: Based on a map for Section 13 prepared in 1989 by the Orangi Pilot Project–Research and Training Institute.

Pilot Project–Research and Training Institute, Pakistan”, Working Paper 17 in Poverty Reduction in Urban Areas Series, IIED, London; this can be downloaded at no charge from <http://www.iied.org/HS/index.html>.

1. Several papers in previous issues of *Environment & Urbanization* have described the work of OPP and of the Urban Resource Centre in Karachi. See Urban Resource Centre (1994), “The Urban Resource Centre, Karachi; an NGO profile”, *Environment & Urbanization* Vol 6, No 1, April, pages 158–163; also Orangi Pilot Project (1995), “NGO profile: Orangi Pilot Project”, *Environment & Urbanization* Vol 7, No 2, October, pages 227–236; Hasan, Arif (1990), “Community organizations and non-government organizations in the urban field in Pakistan”, *Environment & Urbanization* Vol 2, No 1, pages 74–86; and Hasan, Arif (2005), “The political and institutional blockages to good governance; the case of the Lyari expressway in Karachi”, *Environment & Urbanization* Vol 17, No 2, October, pages 127–142.

managerial support from the OPP–RTI, local people in Orangi have built and financed sewers in 5,479 lanes containing 98,527 houses and supervised external development work. As a result of this project, excellent relations were built with local government engineers and administrators, and the OPP–RTI has thus been able to lobby successfully for converting the Orangi natural drains into box trunks.

The OPP–RTI initiated a Youth Training Programme in 1994 to provide training in surveying and mapping. Along with the mapping process itself, this had a number of important repercussions on policy issues related to infrastructure and *katchi abadi* upgrading, planning concepts in local government and community-managed development work. Documenting *katchi abadis* showed people’s involvement and investment in development in clear terms. As a result, planning agencies and local governments have realized the need to support this work, rather than ignoring or duplicating it.

OPP–RTI partner CBOs and NGOs outside Karachi have also

BOX 1
Lists of acronyms and local terms

ADB	Asian Development Bank
CRC	Conservation and Rehabilitation Centre
GKSP	Greater Karachi Sewerage Plan
KAD	<i>Katchi Abadi</i> Directorate
KDA	Karachi Development Authority
KDP	Karachi Development Plan
KMC	Karachi Municipal Corporation
KUDP	Karachi Urban Development Programme
KWSB	Karachi Water and Sewerage Board
KWWMP	Korangi Waste Water Management Project
LPP	Lodhran Pilot Project
NESPAK	National Engineering Services Pakistan
OPP-RTI	Orangi Pilot Project-Research and Training Institute
SKAA	Sindh <i>Katchi Abadi</i> Authority
SPA	Sub-Project Area
TTRC	Technical Training Resource Centre
UC	Union Council
URC	Urban Resource Centre
YTP	Youth Training Programme
<i>katchi abadi</i>	squatter settlement on government land
<i>naib</i>	deputy
<i>nala</i>	natural drain
<i>nazim</i>	mayor
<i>tehsil</i>	sub-district
<i>thalla</i>	yard manufacturing building components
<i>zila</i>	district

developed expertise in mapping as a result of the OPP-RTI strategy of supporting NGOs and CBOs wishing to replicate its programmes. The OPP-RTI now has maps of many *katchi abadis* and catchment areas of the main Karachi *nalas*. It has also started to collect maps for other sectors and schemes in Karachi and other cities in Pakistan, which would be useful to many CBOs, NGOs and government agencies. The OPP-RTI has begun to digitize these maps, and wishes to establish an autonomous mapping unit to carry on all this work.

II. CONTEXT

a. Outline of new local government in Pakistan

Pakistan is a federation of four provinces, each with its own elected provincial assembly. There is also a national assembly, in which each province is represented in proportion to its population, and a national senate, in which each province is represented equally. Each province is divided into *zilas* (districts), divided in turn into rural and urban *tehsils* (sub-districts). The *tehsils* are divided into union councils, which are the lowest administrative units. The average population of a union council

(UC) varies between 8,000 and 100,000 depending on the location. In Karachi from where the OPP operates it varies between 50,000 and 100,000. The larger cities, which include the provincial capitals, are run as city districts and divided into *tehsils*, or towns, and the towns into UCs. The *zilas*, *tehsils* and UCs are headed by *nazims* (mayors) and *naib nazims* (deputy mayors), elected by councillors who are themselves elected by voters aged 18 and over. Of all councillor seats, 33 per cent are reserved for women, workers, peasants and minorities. There are 103 *zila* governments in Pakistan, 335 *tehsil* councils and 6,022 UCs.

According to the Devolution Plan 2001, all three levels of local government have considerable autonomy. They can raise funds and plan and implement physical and social developments independently, and are supported by their own bureaucracy. The *zila nazim* is responsible for the district administration as a whole, and is assisted by a senior bureaucrat, the district coordinating officer, who coordinates the functioning of all government departments in the district. However, before devolution to district level, the provincial government and its line departments controlled all planning and implementation. The Devolution Plan 2001 is having enormous teething problems, as procedures to make it operative have yet to be developed and the old order is not willing to surrender powers. Many communities and professionals feel that the old system was easier to deal with.

Karachi is the largest city in Pakistan and has a population of 13 million. As a result of the enactment (under Devolution Plan 2001) of the Local (City) Government Ordinance 2001, Karachi is now a district headed by a *nazim* and a *naib nazim*. The district is divided into 18 towns and the towns into 178 UCs. Each town and UC has its own *nazim* and *naib nazim*. The city government's house of representatives is composed of 178 *nazims* from the union councils, 59 women's seats (33 per cent), nine workers and peasants seats (5 per cent) and nine minorities seats (5 per cent), totalling 225 seats in all.

Election to the position of *nazim* and *naib nazim* is through the elected councillors, and as such are indirect. After the enactment of the Local (City) Government Ordinance 2001, the pre-existing agencies related to development and operation and maintenance, which previously had been under the provincial government, were dissolved and became part of the new city government. Thus, all planning, implementation and operation and maintenance, at least in theory, has been centralized within the city government, or allocated to the towns and UCs.

b. The housing demand–supply gap in Pakistan

Pakistan requires 350,000 new housing units per year for its urban areas, but the formal sector can only supply 120,000. The demand–supply gap is accommodated through *katchi abadis* (unauthorized settlements on government land) or through the informal sub-division of agricultural land on the periphery of cities and towns. It is estimated that 9 million people live in *katchi abadis* in the urban areas of Pakistan, and another 15 million in such informal sub-divisions.⁽²⁾ Initially, both types of settlement are unserviced, but over 15–20 years they manage to acquire water, electricity, gas and some sort of social infrastructure. However, sewage invariably flows into cesspools or into the natural drainage system. The physical and social infrastructure acquired is through ad hoc

2. Author's own calculations based on figures from the government of Pakistan.

3. Data acquired from the Karachi Building Control Authority and the *Sindh Katchi Abadi* Authority (SKAA), 2001.

4. Information provided by the Urban Resource Centre, Karachi, which monitors evictions in Karachi.

arrangements made by the residents themselves, or through small, unconnected projects implemented by local government councillors for their constituencies, or as “gifts” and political patronage through funds provided by the government to members of national and provincial assemblies.

Karachi has an annual housing demand of 80,000 units. In the last five years, the formal sector has supplied 26,700 units per year.⁽³⁾ The demand–supply gap has been accommodated in *katchi abadis*, with a total population of over 6 million. Between 1992 and 2003, 25,438 housing units were demolished as a result of mega projects and to satisfy the land hunger needs of a strong nexus of politicians, bureaucrats and developers.⁽⁴⁾

Since 1973, the government has been operating a *Katchi Abadi* Improvement and Regularization Programme funded by loans from the World Bank and the Asian Development Bank (ADB). Through this programme, people pay for land and development and acquire a 99-year lease. However, the programme has improved and regularized only 1.5 per cent of *katchi abadis* per year, and thus has not been a success. The reasons for the poor performance of the programme are as follows:

- it has not included any proper community participation, and so cost-recovery through lease charges has been poor;
- there is a lack of capacity in government institutions to involve communities and to develop innovative engineering and procedures for community participation;
- the process of acquiring a lease is complicated; and
- since people have a de facto tenure security, they are not motivated to transform this into a de jure one.

The programme has also increased Pakistan’s foreign debt, which is difficult to repay. There is no programme for the improvement of settlements in informal sub-divisions of agricultural land, although their conditions (except for security of tenure) are no different from those of the *katchi abadis*.

c. Mapping urban infrastructure in government agencies

The most important agency providing maps in Pakistan is the Survey of Pakistan, a federal government institution. Over the years, it has produced aerial maps of all Pakistani cities. The last aerial maps were produced in 1969 (and prior to that, in 1955) and updated for the larger cities by the Surveyor General of Pakistan in 1972–74. More recently, the Survey of Pakistan has been working in collaboration with the Pakistan Space and Upper Atmosphere Research Commission, which is the National Space Agency. This commission has a wide range of remote-sensing data products, including the National Land Use Mapping Project. However, none of the planning departments in the districts in Pakistan or at the federal level are making use of its products. They are still relying on the 1969 aerial maps and their revisions, adding to them in an ad hoc manner.

Maps made since 1969, which are available to the planning agencies, are only of settlements that they have planned, or of those informal settlements that they have regularized. The planning and mapping of

planned settlements has been done in-house, while the survey of *katchi abadis* has been done by private consultants hired by the *Katchi Abadi* Directorate (KAD) and authorities of the eight larger cities. The *katchi abadi* surveys are limited to those settlements on government land, and do not include settlements developed as a result of the informal subdivision of agricultural land and which constitute the bulk of the informal settlements in Pakistan that need to be integrated into the city infrastructure plan for which maps are required. Water and sewage agencies, and electricity and gas companies use the available maps, or make maps (or have them made by consultants) of areas into which they are extending their services. There is no standard scale to these maps and they are seldom comparable. As such, no urban area in Pakistan has a proper map, and agency representatives interviewed for this study felt that a proper city map, which can be regularly upgraded, is the most important requirement for planning purposes.⁽⁵⁾

The urban planning and implementation departments of the larger urban areas have the capacity for plane-table surveys,⁽⁶⁾ as they have theodolites and other related equipment. However, such planning agencies would be limited to no more than 25 urban areas, while UCs all over Pakistan do not have the capacity to prepare maps.

For the UNDP-supported Karachi Master Plan 1975–85, proper land use plans for the city were developed through aerial surveys. Again, for the UNDP-supported Karachi Development Plan 2000, an operational digital mapping system (using remote sensing) was developed within the now-defunct Karachi Development Authority (KDA) to replace the old analogue mapping system. These maps had scales of 1:25,000 or 1:50,000, and they were developed for bulk water supply, population projections, land use, telecommunication zones, metropolitan boundaries, electricity billing, gas lines, primary water supply, sewage, roads and drains. Due to their small scale, it was not possible to develop maps for the informal settlements. Professionals working on the Karachi Development Plan 2000 were trained in an approach to urban planning based on computer technology. However, because of civic strife in Karachi, and associated political repercussions, the KDA could not function as planned. By 1990, the mapping unit had ceased to function, most of its trained personnel migrated to North America, and the equipment subsequently became obsolete and non-operational.

There are other problems in addition to the lack of adequate maps. In the informal settlements, communities organize to lay sewage lines to the nearest drainage channels, depressions and water bodies. They also tap existing government water lines and extend them informally to their settlements. The state also provides funds to members of the national and provincial assemblies for the development of infrastructure in their constituencies. Much of these funds is spent in an ad hoc manner in informal settlements. Previously, the government provided similar funds to ward councillors, and they invested these in water supply, sewage drainage (often through open drains) and road paving. Billions of rupees have been invested in this informally planned and built infrastructure, although none of it has been documented. However, some of the infrastructure is of reasonably good quality, and much of it can be rehabilitated and integrated into an overall city infrastructure plan. Sadly, this investment is completely ignored in the development of most plans for upgrading informal settlements.

5. Interviews with the Deputy Director of Planning (Shahid Saleem) of the Water and Sewage Department of the district government, and Deputy District Officer (Javaid Sultan) of the Master Plan Group of Offices of the city government.

6. This is a method of surveying widely used in topographical surveys.

d. Satellite imagery mapping

The major consulting firms in Pakistan use satellite imagery for their work. They have a direct link with the image providers, and the necessary skills to use and develop that imagery. It is estimated that about 20 firms have this capacity and capability, along with staff and equipment. Three of them also provide imagery at commercial rates and have training programmes for professionals wishing to acquire skills in mapping and Geographical Information Systems (GIS)[NB1]. Numerous informal commercial training centres provide “tuition” in computer-aided design[NB2], map drawing and computer literacy. In addition, there are formal institutions, both public and private, which offer the same facilities through certificate, diploma and degree qualifications. In Karachi, there are five such institutions; however, their fees are prohibitive for the poor and lower-middle income groups, and they cannot meet the demand. Hence, the “tuition centres” have developed and thrive. In the informal settlements of Pakistan, acquiring computer literacy is a priority for young people, and these informal centres are their only option because of the lower fees.

NGOs and CBOs such as the Pakistan Wildlife Fund and the Citizen Police Liaison Committee also make extensive use of satellite imagery and related technologies for their work. They have all the necessary equipment and staff for this purpose. They also provide images and their digitization at commercial rates to other organizations, along with training.

e. The Orangi Pilot Project

Orangi is one of Karachi’s towns, and consists of an agglomeration of *katchi abadis* with a total population of 1.2 million; it is divided into 13 union councils. The Orangi Pilot Project (OPP) was established in 1980 with the purpose of overcoming the constraints faced by the government in regularizing and improving *katchi abadis*. The objectives of the project were to:

- understand the problems of Orangi and their causes;
- develop solutions that people could manage, finance and build, through action research;
- provide people with technical guidance and managerial support to implement the solutions; and
- in the process, overcome constraints that governments face in the upgrading of *katchi abadis* (and other informal and low-income settlements).

Participatory research identified four major problem areas: sanitation, employment, health and education, with sanitation considered the most important. Programmes have been developed around these four issues.

In 1988, the OPP was upgraded to four autonomous institutions:

- the OPP–RTI (Orangi Pilot Project–Research and Training Institute), dealing with sanitation, housing, education, research and training;
- the Orangi Charitable Trust, dealing with microcredit;
- the Karachi Health and Social Development Association, dealing with health and gender issues; and
- the Rural Development Trust.

f. The OPP–RTI's low-cost sanitation programme

The OPP–RTI's low-cost sanitation programme is its most important programme. The institute divides sanitation into "internal" and "external" development. Internal development consists of sanitary latrines inside homes, underground sewers in lanes, and neighbourhood collector sewers. External development consists of trunk sewers and treatment plants.

Projects in Orangi and in 248 other locations in Pakistan have demonstrated that communities can finance, manage and build internal development as long as they are organized and are provided with technical support and managerial guidance. Local governments can support the process by building external development, provided they accept the "internal–external" concept and train their staff in OPP–RTI methodology and in working with communities. The technical assistance of the OPP–RTI has consisted of providing communities with plans and maps, estimates of labour and materials, tools, training for carrying out the work, and supervision of work. The OPP–RTI's research has developed new construction standards, techniques and tools that are affordable by poor communities and are compatible with the concept of communities' involvement in construction. The institute does not collect money from communities – the local people collect and use it themselves.

In Orangi, more than 95,000 houses have built their neighbourhood sanitation systems by investing Rs 90 million (US\$ 1.4 million) (Figure 2). To do the same work, local government would have invested Rs 630 million (US\$ 10.5 million).⁽⁷⁾ All sewage discharges into the natural drainage system, as is the case in more than 80 per cent of Karachi. Infant mortality in communities that built sanitation systems between 1983 and 1993 fell from 128 per 1,000 in 1983 to 37 per 1,000 in 1993. The ratio of investment from the OPP–RTI compared to community monies is 1:18.2.

The OPP–RTI sanitation programme has been scaled up by:

- local government building external sanitation in Orangi;
- government agencies and departments adopting the OPP–RTI concept and methodology with the OPP–RTI as adviser and trainer; and
- OPP–RTI-supported NGOs/CBOs developing partnerships with local governments.

In 11 towns in Pakistan, in addition to Orangi, 41,900 households⁽⁸⁾ have built their internal sanitation within existing external sanitation systems, or with the support of local government in building the externals. In two replication projects, water supply systems have also been developed on an internal–external basis. In three towns, the replication project has become consultant to the government for water supply, sanitation and road-paving projects all being built on the internal–external concept. The OPP–RTI partner CBOs and NGOs have learnt how to make maps (some use computers, and some also use satellite images and GIS) and to develop extension literature. Their activists are constantly negotiating with local, provincial and federal government representatives and agencies.

A community development network has been established, linking all the partner organizations, and they meet every quarter at a different

7. OPP–RTI (2004), *99th Quarterly Report, July–September*, OPP–RTI, Karachi.

8. OPP–RTI (2004) *100th Quarterly Report, October–December*, OPP–RTI, Karachi.



FIGURE 2

The sewers in Orangi financed, managed and maintained by the residents

SOURCE: Orangi Pilot Project–Research and Training Institute.

replication project to present findings and discuss their programmes. Local government officials of the area are also invited to the network meetings, and site visits are arranged. Some partners are stronger in community participation and others in technical matters. They contact each other directly for support, and often plan joint negotiations with government agencies.

III. THE HISTORY OF THE MAPPING PROCESS AT THE OPP-RTI

a. From the lane to the circle

The OPP-RTI's low-cost sanitation programme consisted of the following stages:

- holding meetings to mobilize people at the lane level to form an organization for building their underground lane sewer;
- electing, selecting or nominating a lane manager, who applied to the OPP-RTI for technical assistance and managerial guidance;
- on receiving the application, the OPP-RTI survey team visited and surveyed the lane and established benchmarks;
- at the OPP-RTI office, a map of the lane was prepared, giving the position of the manholes [NB3](along with their details and invert levels), the diameter and joint details of the RCC pipes, and the disposal point which, inevitably, was a natural drainage channel. Since it does not rain in Karachi for more than 10–12 days a year, the channel is almost always dry of stormwater; and
- the lane manager and the lane committee collected money from the people and organized the work.

Map-making and the preparation of estimates were very important parts of the programme. Initially, a draughtsperson, a surveyor and an adviser (who was a teacher at the local polytechnic) were employed for the map-making process, which centred around the lane alone. However, requests were soon received from lanes far away from the natural drains, so the only way in which they could connect to the natural drainage system was through collector sewers. Therefore, an overall plan of Orangi was required, on the basis of which a drainage master plan could be developed and within which the lane and collector sewers could be accommodated.

In 1983, the UN adviser to the project suggested that a surveying company should be hired to document the Orangi settlements and prepare the plan. However, the OPP director and OPP consultants decided to use students from the Department of Civil Engineering at the University, and from the Architecture Department at Dawood College, to document the settlements. There were two reasons for this. First, the concept of community participation in urban planning and infrastructure development would be introduced to academic institutions and, as a result, their involvement with such programmes would increase and could also lead to changes in the curriculum. Second, it was felt that if 30 to 40 students moved across Orangi, accompanied by activists and the OPP's social organizers, discussions and debates on the sanitation system and on the need to develop collector sewers would take place and, subsequently, people's involvement in the process of developing a sanitation

system for Orangi would grow. The OPP's decision has since been justified on both counts.

The first step in documenting the settlements was to acquire whatever plans were available for Orangi from the aerial surveys of Karachi and from the *Katchi Abadi* Directorate (KAD) of the Karachi Municipal Corporation (KMC). These plans were on different scales and were incomplete, since the settlements had expanded well beyond the limits marked on the maps. Also, the plans had no contours, levels or land usages marked on them, although the natural drainage system was.

Students were trained to conduct "walk-through" surveys. They walked along the lanes in groups of two or three, accompanied by an area activist and/or an OPP social organizer. They identified and marked the direction of the slope of the lane or road, the land use along it, existing infrastructure (usually open drains built by the councillors), and marked the extensions to the existing settlements. The extensions were marked not through accurate measurements but by "steps", however, this was accurate enough to prepare a master plan. Once lanes in the extension areas applied for assistance, accurate dimensions were included.

At the time (1983), Orangi was divided into 15 councillors' wards, or circles as they were called in Karachi, and the councillors had development funds provided by the KMC. The OPP felt that people would not be able to afford the cost of building the collector sewers, and that the councillors should be persuaded to invest in them. For this reason, the OPP documented each councillor's circle separately, in booklet form, and called it the "circle handbook". Each handbook consisted of maps showing the natural drainage system, existing infrastructure and proposed collector sewers to which lanes could connect. In addition, major landmarks and social sector facilities were also identified. Estimates for the proposed collector sewers were provided to the councillors on request. Community organizations and lane residents were informed about the circle handbooks and told that these had been provided to their ward councillors. As a result, people started pressuring their ward councillors into building collector sewers as per the design and estimates of the OPP. Only three councillors collaborated with the OPP, so in the other wards people formed confederations of lanes, collected money and built the collector sewers themselves. In the process, the Orangi settlements were documented to a single scale for the first time. Details for each lane sewer and collector sewer that had been built or was built subsequently were collected and marked on the Orangi map.

The university and college students, and the OPP social organizers and community activists, carried out the mapping process under the supervision of OPP sanitation director, Perween Rahman, and her technical team of three. Many of the social organizers acquired technical expertise by going through the process⁽⁹⁾ and, after graduating, a number of the students who participated became involved as teachers, consultants and employees in organizations related to the upgrading of informal settlements and to programmes of community participation.⁽¹⁰⁾

b. Attempts at replications in Karachi

Between 1985 and 1988, a number of Karachi communities outside Orangi applied for assistance from the OPP to replicate the sanitation programme. Attempts to do this were made in three settlements.

9. For details, see Hasan, Arif (1997), *Working with Government*, City Press, Karachi; also Hasan, Arif (2000), *Working with Communities*, City Press, Karachi.

10. For example, Dr Sohail Khan and Dr Mansoor Ali, both now teaching at WEDC, Loughborough University, UK, participated in the survey when they were engineering students at the NED University, Karachi.

However, these attempts were unsuccessful because the OPP did not have the capacity to replicate the role it played in Orangi. The realization was that, for replication projects to succeed, a strong community organization (or activists who can create one) is required at the replication site. In addition, for the replication to be sustainable, mapping, surveying, documentation and monitoring skills should be available in the community. It was realized that these skills would only develop through training local activists and technicians. This was one of the reasons why, in 1988, the OPP–RTI was created and, as noted earlier, the OPP's work in urban areas was decentralized into four autonomous organizations.

c. Manzoor Colony development

Manzoor Colony is an informal settlement with a population of 100,000 living in some 20,000 houses. The Karachi-based NGO, Resource Centre, introduced Manzoor Colony community organizations to the OPP, as they wanted to replicate the OPP–RTI sanitation programme. Through a process of training and supporting local activists and technicians, maps for the settlement were developed along with plans and estimates for an underground sanitation system that drained into the Manzoor Colony *nala* (natural drain). Separate estimates were prepared for each collector drain and each lane, and all surveying was through plane-table surveys using equipment supplied by the OPP–RTI.

Two teams working together carried out the survey of the settlement. The first team consisted of OPP–RTI personnel who took levels, and who trained a local person associated with them in the process. The second team consisted of representatives of Manzoor Colony CBOs, who measured street lengths and counted the houses in each lane. Joint field inspections were carried out and possible sewage disposal points were identified. Regular visits by the CBO activists and technicians were arranged to the OPP–RTI and Orangi settlements, where they met with people similar to themselves, who had built their sanitation systems and were maintaining them. In the process, the community learned about designing a sanitation system, reading maps and preparing estimates.

On the basis of these maps, the community organizations contacted their councillor and asked that the construction of the collector sewers be funded. This was the first community–councillor dialogue in which the community was asking the councillor to fund a specific programme designed and costed by its members. The negotiations failed and the communities funded the collector sewers themselves. They approached the mayor of the KMC, proposing that the KMC should take over the maintenance of the sewage system that the community had built, but the KMC refused, saying that it had neither funds nor personnel for this purpose. As a result, the community organizations contacted the provincial ombudsman and, after a number of hearings, the ombudsman ruled in favour of Manzoor Colony and instructed that the Karachi Water and Sewerage Board (KWSB) should take charge of the maintenance of sewerage lines laid by the people.

A community activist and members of the Manzoor Colony community organizations' water and sewerage committee pleaded the case for Manzoor Colony. No professional lawyer was hired. In all these negotiations and hearings, the maps of the settlement were presented as evidence, and substantiated the point of view of the Manzoor Colony

CBOs. These maps were later used in the lease and regularization negotiations that were successfully conducted by the Manzoor Colony CBOs with the KMC. They were also used for negotiating a reduction in the lease and development charges that individual houses have to pay for acquiring ownership papers, amounting to the sum that the households had spent on sanitation.

An important spin-off of the documentation of Manzoor Colony, and the drainage of its people's-built sewage system into the *nala*, was the desilting and conversion of the *nala* into a box trunk sewer. The OPP-RTI's association with the *nala* conversion into a box trunk also provided learning for the OPP-RTI regarding the various actors and factors that are involved in determining how development takes place, and regarding corruption and its relationship to inappropriate planning and construction through formal process in low-income settlements. An account of these events has been disseminated by the OPP-RTI and contains many lessons for development planners and activists.⁽¹¹⁾

d. Sanitation documentation and the ADB-Orangi project

The OPP-RTI has a map of Orangi that it has developed as described in the sections above. This map is on a scale of 1:6,000, and includes all people's-built infrastructure marked in pink, all local government-built trunk sewers marked in green and the open paved drains built by the KMC marked in black. The map has been updated continuously since 1984. Tables are produced quarterly, which give statistical details of the sanitation programme, and are included in the OPP-RTI's quarterly report. Box 2 shows the scale of the construction by local people in Orangi. The total investment by people in sewer lines, secondary sewers and sanitary latrines exceeds 90 million rupees.⁽¹²⁾

With this information to hand, the OPP-RTI was very concerned in November 1990 to see a press report that an agreement for upgrading 2,300 acres in Orangi had been signed between the KMC and NESPAK, a reputed Pakistani firm of engineering consultants. On further investigation it was discovered that this was part of the ADB-financed Karachi Urban Development Programme (KUDP) and that Kenhill, a foreign engineering firm, was the main consultant. Part of the project was to prepare designs and implement water supply, sanitation and road paving for 10 sub-project areas (SPAs) in Orangi. The project was going to finance and build lane sewers and collector drains for the SPAs. However, the trunk sewers were to be built later under a separate loan package that had not yet been negotiated.

The OPP-RTI initiated a dialogue with the KAD and the mayor of Karachi, and explained through the maps prepared at the OPP-RTI that a lot of work had already been done by the people in the SPAs, which needed to be integrated. Also, that if the ADB project financed the lane sewers as well, then the community-government partnership on the "internal-external" model would fall apart. As a result of these negotiations, and because of the maps available through the OPP-RTI, the latter was appointed consultant to the project.

The OPP-RTI then discovered that NESPAK had not made any surveys of existing infrastructure in the settlements, and so had little or no idea of the extent of the work done and the investment that people and the KMC had already made in the SPAs. In addition, they did not have the

11. The longer Working Paper from which this paper is drawn contains more details of the long fight by Manzoor Colony inhabitants against an inappropriate official project to develop a drain that would have displaced many households. See Hasan, Arif (2006), "Mapping informal settlements and urban infrastructure: the experience of the Orangi Pilot Project-Research and Training Institute, Pakistan", Working Paper 17 in the Poverty Reduction in Urban Areas Series, IIED, London, which can be downloaded at no charge from <http://www.iied.org/HS/index.html>.

12. For detailed figures, see the longer Working Paper from which this paper is drawn.

BOX 2
Sanitation built through community-government partnership in Orangi

Cumulative construction by local people, 1981 to August 2004

	Cumulative May 2004	June 2004 to August 2004	Cumulative August 2004	Percentage of total lanes/houses
OPP area				
- sewer line	3,666	39	3,705	97.1
- length (running feet)	879,055	6,010	885,065	
- secondary sewer	297	3	300	
- length (running feet)	133,998	900	134,898	
- sanitary latrines	53,656	400	54,056	98.9
Non-OPP area*				
- sewer line	2,693	10	2,703	77.9
- length (running feet)	707,527	1,326	708,853	
- secondary sewer	132	n.a.	132	
- length (running feet)	42,225	n.a.	42,225	
- sanitary latrines	41,840	95	41,935	82.9
Total Orangi area				
- sewer line	6,359	49	6,408**	87.9
- length (running feet)	1,586,582	7,336	1,593,918	
- secondary sewer	429	3	432***	
- length (running feet)	176,223	900	177,123	
- sanitary latrines	95,496	495	95,991	91.2

*The Non-OPP area is the area that was denied to the OPP by local government until 1987 but people worked there used the OPP model.

**Of these lane sewers, 5,365 were built by people, 1,043 were built by the local government through various councillor funded programmes.

***Of these, the inhabitants built 269, and 163 were built by local government-funded programmes and by the ADB-financed Karachi Urban Development Programme.

SOURCE: OPP-RTI (2004), *99th Quarterly Progress Report*, July-September, OPP-RTI, Karachi.

expertise to make these surveys quickly, nor to document them. This expertise was acquired by the OPP-RTI through necessity over a considerable period of time, and is not "taught" at professional training institutions. NESPAK also had very little idea of the Orangi terrain, and could relate to it only through maps and plans. The second issue related to the Balfours plan for the Orangi trunk sewers (not yet constructed), which were being used as disposal points in NESPAK's proposals.

NESPAK had been asked by the KWSB engineers to relate their work in Orangi to the design of trunk sewers that had been prepared by Balfours under a project funded by the ODA (UK). When the OPP-RTI studied the plans prepared for the trunks, they were horrified. The trunks did not pick up the lines laid by the Orangi communities or the KMC. In addition, the plan required six pumping stations in an area where there are considerable gradients. If the trunks were to be built, they would run dry unless the Orangi residents were to dig up their sanitation lines and lay them all over again.

The sanitation system developed by OPP-RTI, on the other hand, follows the natural slope of the land and, through various *nalas*, reaches the main Orangi *nala*, which then drains into the Lyari River. The OPP-RTI felt that the trunks should either be laid in the *nalas* beds or parallel to them. It also happens that the Greater Karachi Sewerage Plan also envisages trunks in the bed of the Lyari River.

In addition, the OPP-RTI was concerned by the enormous cost of developing the proposed trunks and realigning the existing system to link with them. This could not be done without acquiring another major loan, and the psychological burden on the communities would be disastrous in terms of any further work to be managed and financed by the community.

After a number of meetings with the OPP-RTI and KAD, it was decided by the KWSB to shelve the Balfours design and drain the sewers into the open *nalas*. This decision was conveyed to Balfours in a meeting that was held after the OPP-RTI had signed a formal agreement with the KMC. At this meeting, the Balfours representative was very concerned and pointed out that "Her Majesty's" government had invested UK£ 1 million in the preparation of these designs. However, these considerations were set aside and the OPP-RTI was asked to prepare designs for the trunks in keeping with its concept.

The final OPP-RTI designs consisted of trunk sewers on either side of the *nalas*, because it was established that two trunks of a smaller diameter would not involve any of the problems associated with having to cross the *nalas*, and would not only be much cheaper but also much easier to construct. The cost of these trunks worked out at Rs 120 million (US\$ 3 million) at contractors' rates, a sum that the government of Pakistan could afford. The mayor was sure that he could obtain this amount from the prime minister's fund.

Finally, an agreement was drawn up to determine the role of the KMC, NESPAK and that of the OPP-RTI in implementing the project. The OPP-RTI was to document all existing infrastructure (including road and water lines), review sanitation designs prepared by NESPAK and modify them if necessary, coordinate the design and implementation of "external" development for sanitation so as to relate it to the "internal" development that was to follow, and monitor implementation with the help of the community. The OPP-RTI was to submit a monthly monitoring report on sanitation development to the KAD, identifying problems and proposing actions to solve them. The OPP-RTI was to be paid a lump sum of Rs 700,000 (US\$ 17,500) as fees and direct costs for the services it rendered for the duration of the project.

NESPAK was to design, tender and supervise the construction of roads, the water supply system and sanitation for the SPAs. However, after the OPP-RTI signed the agreement with the KMC, NESPAK's role in sanitation became limited to the design and supervision of "external" work only. In addition, it was to avoid duplication of all work that had been done in the SPAs. This duplication was to be identified by OPP-RTI surveys.

The KMC was to finance, design and maintain "external" development, while the work was to be tendered out to contractors by the KMC's subsidiary, the KWSB, which was also given the responsibility of supervising construction. The community, meanwhile, was to finance and build "internal" development.

The OPP-RTI identified activists in the SPAs, and supplied them with a simplified version of NESPAC maps and design details and specifications. It also trained them to read these maps and supervise the work that the contractors were doing on external sanitation. As a result, after some conflict between the KMC engineers, contractors and local activists, relatively good quality work was achieved in the Orangi SPAs. Another spin-off was that in one of the SPAs, Ghaziabad settlement, the OPP-RTI was able to identify activists who later played an important role in the development of their area, where they have applied the “internal-external” model to security, electricity, solid waste management and parks. Furthermore, in the 2001 local elections, their candidates won – defeating representatives of powerful commercial and political interest groups.

As a result of the OPP-RTI’s involvement with the KMC’s upgrading work in Orangi, the cost of the ADB-funded project decreased from Rs 1,300 million (US\$ 21.6 million) to Rs 36.2 million (US\$ 0.6 million). With technical and managerial support from the OPP-RTI, local people

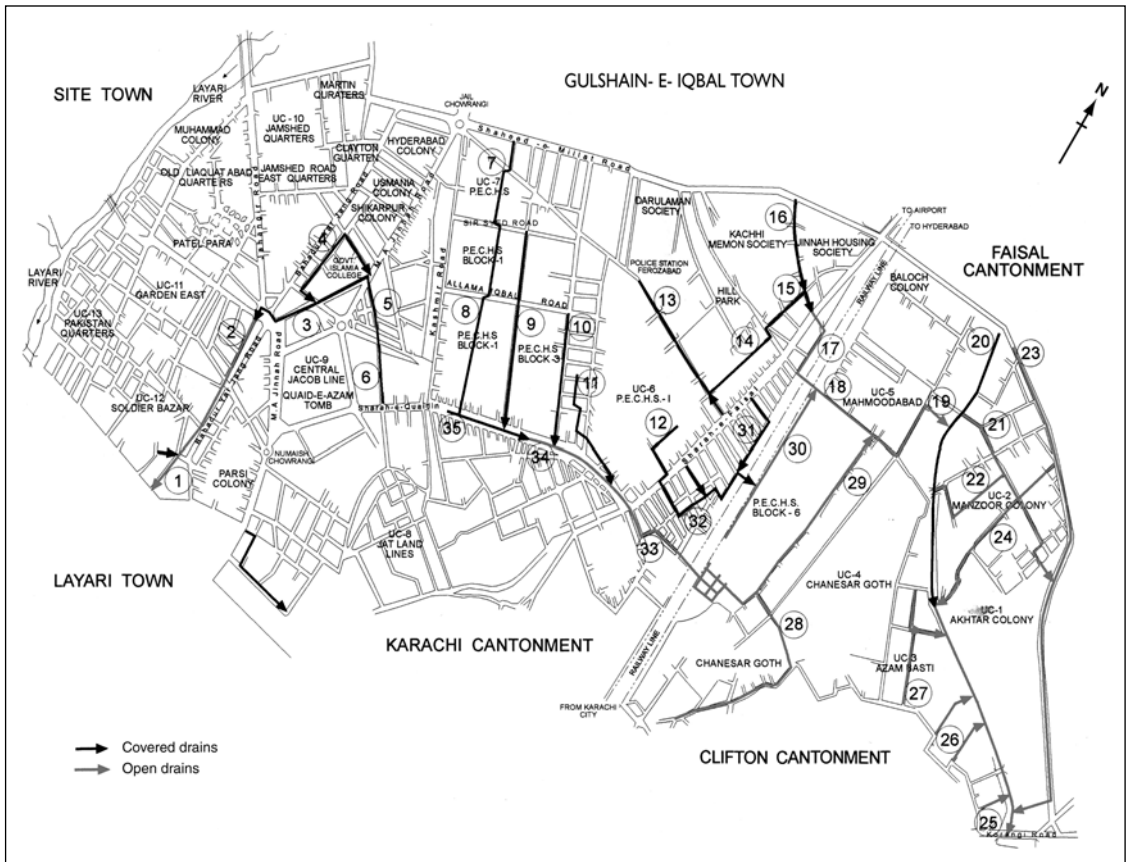


FIGURE 3
Mapping the covered drains and open drains in Jamshed Town, Karachi

SOURCE: Orangi Pilot Project–Research and Training Institute.

13. ADB (1999), *Project Performance Audit Report on the Karachi Urban Development Project in Pakistan*, December, PAA–PAK 19076.

14. SELAVIP is a private foundation that supports housing projects for low-income groups.

15. The longer Working Paper from which this paper is drawn contains more details of the development of this school.

have built and financed sewers in 1,093 lanes with 21,866 houses, and supervised external development work. An ADB report describes this project as the only successful sanitation project it has funded in Karachi in the KUDP.⁽¹³⁾

As a result of the project, excellent relations were built with local government engineers and administrators. Because of this, the OPP–RTI has been able to lobby successfully to convert the Orangi natural drains into box trunks.

e. The documentation of *katchi abadis*

In 1991, the OPP office shifted from Orangi to the neighbouring settlement of Qasba. It was felt by the OPP management that since it was located in Qasba, it should extend its programme to the settlement and, as a first step, it was decided to document it. Local high-school students and school-educated young people were recruited to work on the documentation, and this was done in 1992–93. The young people were given training through working with the OPP technical team both in the office and in the field, and they received a small daily stipend. Maps of Qasba were acquired from the local government and updated, and Rs 140,000 (US\$ 2,330) was provided by SELAVIP⁽¹⁴⁾ to document 10 *katchi abadis*. However, 50 *katchi abadis* were documented as a result of this support, and in the process a number of young men from these settlements became associated with the OPP–RTI programmes. Two of them independently promoted the sanitation programme in their settlement, and later established a school that has evolved to become a major Qasba institution.⁽¹⁵⁾

The documentation of the Qasba *katchi abadis* consisted of identifying existing infrastructure, schools, clinics, sewage disposal points, yards manufacturing building components, the slope of the land, a number of houses, and the approximate investment made by people and government in infrastructure development. This documentation showed the OPP–RTI management that even people outside Orangi and with no OPP–RTI support had made major investments in an attempt to improve the physical and social environment of their settlements.

f. The Youth Training Programme (YTP)

After the documentation of 50 *katchi abadis*, the OPP–RTI felt that there was a need for the documentation of *katchi abadis* all over the city. It felt that this could also establish its contacts with activists and CBOs outside Orangi, and give a larger base to its community and advocacy work. It would also train people in informal settlements to help in the replication of the OPP–RTI's programmes.

At about this time, the OPP–RTI had also become consultant to the Sindh *Katchi Abadi* Authority (SKAA), a government institution in charge of regularizing and improving *katchi abadis* in the province of Sindh, where Karachi is located. SKAA has accepted the OPP–RTI's "internal–external" concept, and the OPP–RTI under its agreement with SKAA was to train SKAA's staff in OPP–RTI methodology. Surveys of *katchi abadis* to document existing infrastructure were also required to facilitate the work of SKAA.

Consequently, a Youth Training Programme (YTP) was initiated in

1994. The students on the programme have “matric” and/or intermediate qualifications (10th and 12th grades), and most of them are also studying in schools and colleges; in addition, training is provided to community activists. The students receive training on sanitation provision, and the main focus is on surveying, draughting, documentation, levelling, design and estimation. For the activists, the focus is on estimation, construction, on-site supervision and community mobilization. Training has also been provided in housing, in order to produce para-architects, and includes survey, design, estimation, construction technology and on-site supervision.

The students are taught both through theory and by mapping and documenting *katchi abadis*. Initially, they went to the field with an OPP-RTI technical staff member but over time, the older students started to guide the new ones. Teams now consist of one senior and one junior member. They go out and document physical and social infrastructure in the *katchi abadis* and identify the slope of the land. They have also documented the *nalas* of Karachi into which sewage discharges, covering slopes, widths, encroachments and major sewage and stormwater inlets.

The YTP has evolved over time. Initially, anyone who applied for training was given a three-month probationary period during which time they received a daily stipend but not a regular salary. As a result, there was a high drop-out rate. The Technical Training Resource Centre (TTRC) now runs a 26-day training programme for applicants, and those who are successful become students at the YTP. The training for housing has also been taken over by the TTRC. Box 3 gives details of the TTRC and its various courses.

Fifty per cent of the trainees are full-time and they receive a salary of Rs 2,200–2,500 (US\$ 37–42) per month. The other 50 per cent are part-time because they are either studying or working elsewhere. They work after 2pm and are paid Rs 1,750 (US\$ 29) per month. Almost all of those who are studying say that they have been able to continue to study because of the income from their work with the OPP-RTI.

So far, the OPP-RTI, through the YTP, has completed the documentation of sanitation, water supply, clinics, schools and *thallas* (yards manufacturing building components) in 334 *katchi abadis*, which comprise just over 60 per cent of the total *katchi abadi* population. The documentation of these *katchi abadis* has been digitized, and the results along with detailed maps of 100 *katchi abadis* have been published. The documentation of an additional 100 *katchi abadis* is in press. The digitization was done by OPP-RTI technical staff who had some knowledge of computer graphic programmes. They were encouraged to use this knowledge and, in the process, they have become efficient in computer graphics and digitization. As a result, a computerized mapping unit is now functioning, and two trained persons from the YTP are part of the unit. The documentation format is shown in Box 4.

The documentation of the *nalas* has been presented in two different ways. An A to Z guide of Karachi was acquired and all the pages pasted together to form a map on a scale of 1:10,000, which covers the entire wall of an OPP-RTI classroom. Karachi's natural drainage system and sewage trunks are marked on this map and thus far, documentation of 83 *nalas* measuring 718,208 running feet has been completed, as has a detailed catchment area survey of 43 *nalas*. The map shows a clear picture of Karachi's sewage disposal system, and more information is added as it

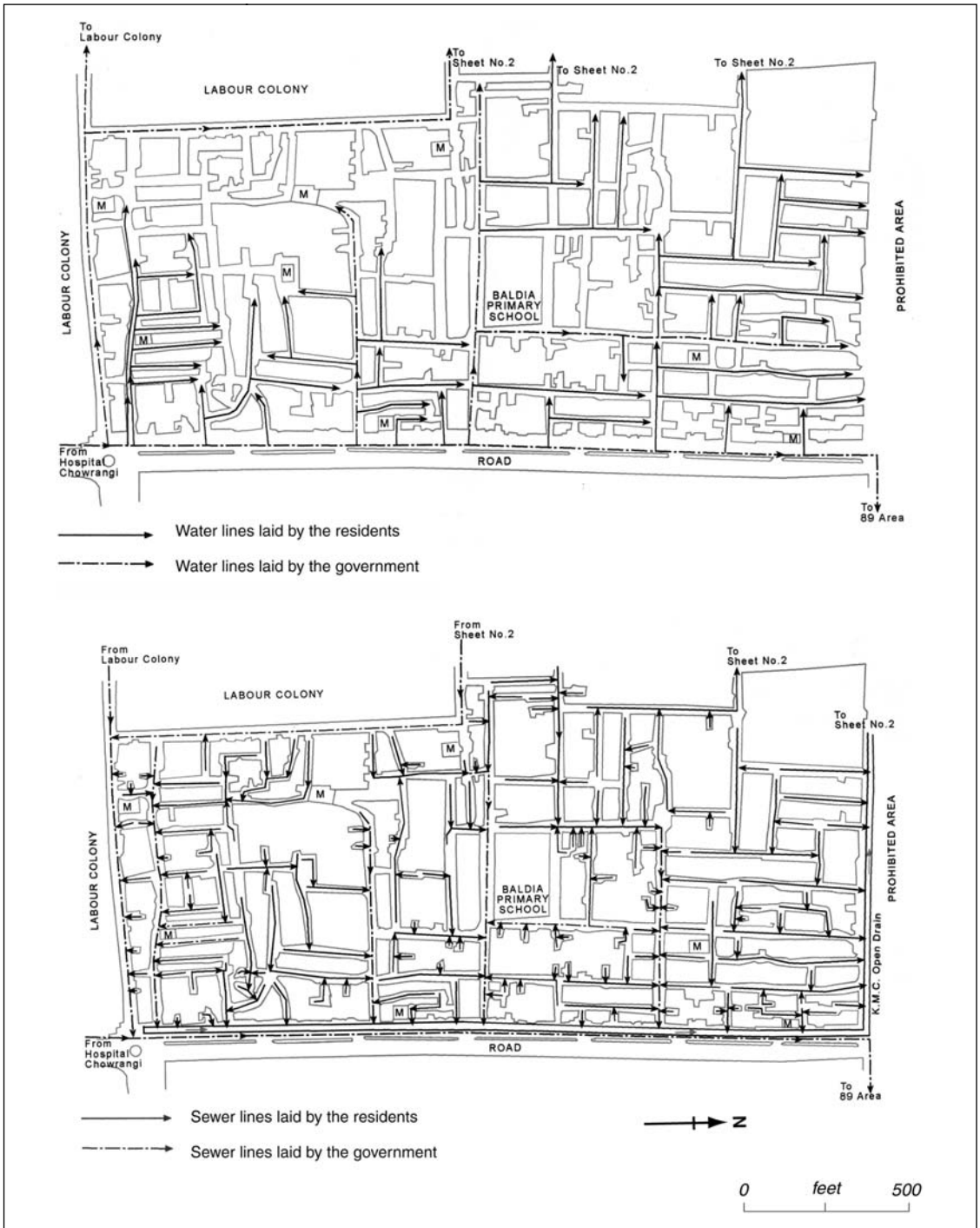


FIGURE 4
Mapping the water lines and the sewer lines in Sherpao Colony, Karachi

SOURCE: Orangi Pilot Project–Research and Training Institute.

BOX 3**The Technical Training Resource Centre and its courses**

The Youth Training Programme (YTP) was set up by the OPP-RTI in 1994, and towards the end of 1995, a 21-year-old man, Mohammad Sirajuddin, joined. He completed the 90-day theory and practical housing course, and on-the-job training on surveying, designing, estimating and site supervision. After completing the course, he stayed on with the OPP-RTI to polish his skills. In mid-1997, Sirajuddin motivated a diploma engineer, Shahid Malik, to join the OPP-RTI as a trainee. On completion of Shahid's training, the OPP-RTI advised the two to set up a consultancy in Orangi for architectural design and surveying to serve low-income communities, and in the process earn a living as well. In late 1997, they set up SS Consultants. The firm operated from the OPP-RTI offices.

In the beginning, clients were not willing to pay for the services of SS Consultants. They expected a free service, as was being provided by the OPP-RTI housing programme. However, the new firm slowly started to receive requests for the design of houses, mosques, shops and schools, and started receiving fees as well. Simultaneously, Sirajuddin started to train young Orangi residents to assist in his work. In May 2000, he set up an office in a rented room in Ghaziabad, the Orangi settlement where he lives. SS Consultants now provides services to a variety of clients, including NGOs such as the Urban Resource Centre (URC), Faran Education Society, Bright Education Society, Reformers and the OPP-RTI, for settlement surveys, designing schools, shops, mosques and homes, providing estimates and supervising construction.

In 1999, Sirajuddin enrolled on a diploma course at a polytechnic, and realized that students studying with him would be unable to do practical work once they graduated. He felt that they needed a practical training course, so he linked up with Ashraf Sagar who had also been trained at the OPP-RTI and had set up his consultancy unit, A-I Surveyors, in 1998. A-I Surveyors has completed the survey of six settlements, independently, for community organizations to help them in the regularization process.

The two young men set about organizing a training course. It was decided that the course would last three months and would include draughting, quantity surveying, level and plan-table surveys, construction and supervision. The fee for the course was set at Rs 1,500 (US\$ 25). Abdul Hakeem, one of Sirajuddin's teachers, agreed to run the course on construction, supervision and estimation. The OPP-RTI provided guidance when required. So far, 12 courses have been held and 56 students have been trained.

TTRC has been requested by the OPP-RTI to conduct a 26-day training course on mapping and documentation surveys for students wishing to work with the YTP. Students who are successful on the course then receive training at the OPP-RTI through the YTP. So far, TTRC has conducted 19 such training courses in which 59 students have participated.

The TTRC has received an endowment of Rs 500,000 (US\$ 8,340) from Homeless International, a UK-based charity. An additional Rs 220,000 (US\$ 3,660) has been provided by Homeless International for replicating the TTRC, by setting up the Housing Resource Centre. The TTRC has also been acting as a technical adviser to UC-6 in Orangi Town.

SOURCE: OPP-RTI literature and interview with Muhammad Sirajuddin.

BOX 4
***Katchi abadi* documentation format**

1. Overall statistics of surveyed *katchi abadis*
 - Abstract
 - Analysis
 - Detailed statistics:
 - sewage lines
 - water supply lines
 - clinics, schools and *thallas*
2. Photographs
3. Location
 - Map of Karachi showing location of *katchi abadis*
 - List of *katchi abadis* surveyed
4. Individual *katchi abadi* information and maps
 - Map showing location of Karachi
 - Map showing the immediate neighbourhood of the *katchi abadi*
 - Statistics of “internal” and “external” development:
 - people’s efforts (sewage and water)
 - government’s efforts (sewage and water)
 - number of government and private schools, clinics and *thallas*
 - Maps (separate for each item) showing:
 - people- and government-laid sewage lines and their direction and disposal points
 - people- and government-laid water lines and their direction and source
 - private and government-built clinics, schools, *thallas* and mosques

comes in. In addition, digitized maps on a smaller scale and showing the same details have also been prepared.

The survey of the 334 *katchi abadis* has shown the extent of people’s work. There are 224,299 houses in 19,463 lanes in the surveyed settlements. Sixty-two per cent of these lanes have sewage disposal facilities and 50 per cent have water lines, all laid on a self-help basis. Approximately Rs 334.48 million (US\$ 5.6 million) has been invested by the people in this work. There has also been government investment in sanitation and water supply, but mostly for main sewers, drains and water mains. The survey results show that the OPP–RTI “internal–external” concept has been unwittingly followed in an unplanned manner by the government and the communities. Furthermore, 1,041 clinics and 773 schools have been set up by entrepreneurs and/or charities in these settlements, compared to 12 government clinics and 143 government schools.⁽¹⁶⁾

IV. REPERCUSSIONS OF THE OPP–RTI MAPPING PROCESS

Setting up the YTP and the mapping process had a number of important repercussions on policy issues related to infrastructure and *katchi abadi* upgrading, planning concepts in local government, and community-managed development work:

16. Rahman, Perween (2004), *Katchi Abadis of Karachi: A Survey of 334 Katchi Abadis*, OPP–RTI, Karachi.

- Documenting *katchi abadis* showed people's involvement and investment in development in clear terms. As a result, planning agencies and local government have realized the need to support this work rather than duplicate it or simply go out and build schools (often without teachers), clinics (often without paramedics) and water and sanitation systems that are not properly designed, maintained and operated.
- Community members were trained in skills and knowledge that communities require in order to establish a more equitable relationship with government agencies, improve their settlements and build local institutions.
- The documentation laid the basis for questioning government and IFI planning policies and development projects, and for promoting viable alternatives that were based on a sound knowledge of on-the-ground realities that government agencies and their foreign consultants do not have – and do not possess the skills to develop.
- As a result of the documentation, the OPP–RTI's concepts were reinforced by statistics and maps for all Karachi, not just Orangi. This has increased the OPP–RTI's standing and credibility to the extent that its advice is now sought at the national, provincial and city levels in all matters related to sewage and *katchi abadi* upgrading.

Some of the more important developments that have taken place as a result of this documentation are detailed below.

a. Sindh *Katchi Abadi* Authority (SKAA) becomes solvent

In 1994, SKAA decided to follow the OPP–RTI proposed methodology for upgrading *katchi abadis*. This consisted of documenting and integrating infrastructure funded both by communities and by KMC councillors into an overall plan for each *katchi abadi*. It was also decided that SKAA would only build “external development” and leave the building of the “internal development” to communities.

The OPP–RTI's work as consultant to SKAA has consisted of:

- documenting existing sanitation and water supply in the settlements, and identifying external sanitation and water supply projects – community activists assist the OPP–RTI and SKAA teams in both these activities;
- reviewing the preparation by SKAA engineers of detailed designs and estimates;
- facilitating approval of the project by community members before finalization;
- supervising work by SKAA engineers and monitoring this in conjunction with community activists (guided by the OPP–RTI); and
- on completion, checking the infrastructure through tests and, if approved by the community, the issue of a “no-objection” certificate (by the community and the OPP–RTI) before final payment to the contractors.

The financing and contracting of external development is arranged by SKAA, either through conventional contracting or through departmental work.⁽¹⁷⁾

The most important aspect of all this work is the documentation of

17. In departmental work, a people's committee of the neighbourhood where the project is to be implemented is formed to manage and construct the project. The OPP–RTI becomes its adviser, and local government funds and designs the project with the involvement of the OPP–RTI and the community.

the *katchi abadis*, leading to the identification of priorities for external development and an overall plan that integrates existing infrastructure. All of this has been undertaken by the YTP under OPP–RTI supervision. SKAA was formerly completely dependent on ADB funding but, as a result of the work with the OPP–RTI, has become solvent and now has considerable surplus funds derived from lease charges from the communities it has partnered.⁽¹⁸⁾

18. Sindh Katchi Abadi Authority (SKAA) quarterly reports. For details, see SKAA (2004), *41st Quarterly Report*, March, SKAA.

b. OPP–RTI alternatives for the Greater Karachi Sewerage Plan

The results of the documentation of the *katchi abadis* by the YTP clearly showed that the OPP–RTI concept of “internal” sanitation being built by communities, and “external” sanitation being built by the government, was valid and workable. In addition, SKAA’s work along these lines, supported by the OPP–RTI, has also been very successful. However, the KWSB’s Greater Karachi Sewerage Plan (GKSP), which tries to provide both “internal” and “external” development and take the sewage to its treatment plants, has been unsuccessful and its investments, provided through international loans, have not even begun to be recovered, putting considerable strain on the economy of the city and the province. KWSB owes Rs 42 billion (US\$ 700 million) to the ADB.

OPP–RTI mapping established the reasons for the failure of the GKSP. The GKSP ignores the existing reality that sewerage systems are already in place and are discharging into the natural *nalas* of the city. This is because documentation for much of this work is not available and even if it is accepted that the sewerage system exists, it is considered “sub-standard” by IFI consultants. The GKSP tries to take sewage to the three treatment plants it has built by constructing trunks along the main roads. In the process, it does not pick up the existing sewerage systems that discharge into the *nalas*, and so the trunks remain dry and the treatment plants function at no more than 25 per cent capacity.⁽¹⁹⁾ To link Karachi’s existing infrastructure with the treatment plants and the KWSB trunks, the sewerage infrastructure of entire neighbourhoods would have to be dug up and re-laid. This is simply not possible. To support its view, the OPP–RTI made a case study of the ADB-financed Baldia project, in which the KWSB methodology was followed and only 1,744 houses out of 25,000 could connect to the system. The old system of discharging into the natural *nala* of Baldia continues to function. As such, more than Rs 700 million (US\$ 11.66 million) spent on the project has been wasted.⁽²⁰⁾ These facts have been brought to light by the OPP–RTI documentation of *katchi abadis* through the YTP.

After studying its documentation, the OPP–RTI proposed that the existing sewerage systems, laid formally or informally, should be documented and accepted, and that the natural *nalas* of Karachi should be converted into box trunks, with treatment plants to be placed at locations where the trunks meet the sea or other natural water bodies. A comprehensive report, *Proposal for a Sewage Disposal System for Karachi*⁽²¹⁾ was prepared and published in 1998. Research also showed that in 1998–99, the KMC subsidy to the KWSB was Rs 329 million (US\$ 5.5 million). With this kind of finance, 35 kilometres of *nalas* could have been converted into box trunks, and in six years all of Karachi’s 200 kilometres of *nalas* could be developed except for the Lyari and Malir rivers and the Korangi Creek. Funds for treatment plants would be extra to these costs.

19. OPP–RTI (1998), *Proposal for a Sewage Disposal System for Karachi*, City Press, Karachi, 37 pages.

20. See reference 19.

21. See reference 19.

The KWSB planners and engineers objected to this proposal because they felt that sewage and rainwater flowing together was against good engineering practice. However, through its contacts with academics in Japan, the OPP-RTI was able to obtain information that in Japan, this practice has been followed.

On the basis of its proposals for Karachi, the OPP-RTI also proposed alternatives for the proposed Korangi Waste Water Management Project (KWWMP), which was being financed by a loan of US\$ 70 million from the ADB, with counterpart funds of US\$ 30 million from the Sindh government. Korangi is an extensive industrial and low-income residential area of Karachi. The OPP-RTI proposal for the KWWMP was simply to accept the present sewerage system built by the community and by the KMC, and to convert the *nalas*, which act as its disposal facility, into box trunks, placing a treatment plant just before the point where the sewage enters the Korangi Creek. This brought down the cost of the project to within what the Sindh government was to invest in it, and so made the ADB loan unnecessary. The documentation of the existing Korangi infrastructure was carried out by the OPP-RTI through the YTP, and with the help of community activists.

After 1997, the OPP-RTI made a series of presentations of its proposals to the KWSB, various departments of the government of Sindh, the Planning Commission in Islamabad, the president of Pakistan, the governor of Sindh and the ADB. These presentations led to discussions and debates and consequently, in April 1999, the governor of Sindh decided to cancel the ADB loan of US\$ 70 million to the KWWMP. It was also decided that the project would be built with local resources and local expertise. The governor formed a committee to develop a conceptual plan for the project. The committee requested the OPP-RTI to prepare such a plan, which it did in March 2000. The cost of the project, according to the OPP-RTI plan, was US\$ 15.18 million.

The Korangi Waste Water Management Project generated a lot of discussion and debate in the press and among NGOs and CBOs. A meeting of these, which included several Korangi CBOs, was held at the premises of the Urban Resource Centre. The meeting decided to make efforts to get the low-cost alternative plan implemented. In December 1999, it also sent a petition to the ADB inspection committee, which was signed by hundreds of Korangi residents, upholding the rejection of the loan and requesting an independent review of the project. In the last quarter of 2000, 59 NGOs and CBOs (including the OPP-RTI) came together on a common agenda for the city's water and sanitation plans and proposals, and produced a position paper on this.⁽²²⁾ The paper was sent to the president of Pakistan, concerned provincial and federal ministers and departments, the governor of Sindh, external support agencies and their embassies, international agencies, and local and international universities. The group of NGOs and CBOs has now been formalized as a water and sanitation network, and is based at the Urban Resource Centre (Box 5).

The debate generated by the OPP-RTI's alternatives to the GKSP led to the Governor's Task Force on Municipal Services requesting that the OPP-RTI undertake a study on institutional issues related to the sewerage sector. A report entitled "Sewage, drainage and treatment plants: responsibilities, finances, issues and policy changes needed"⁽²³⁾ was prepared and its conclusions are given in Box 6. This study is of considerable

22. The longer Working Paper from which this paper is drawn has more details.

23. See OPP-RTI 84th Progress Report, October-December, OPP-RTI, Karachi.

BOX 5**People's Voice: water and sanitation network**

In recent years[NB1], there has been a growing interest among citizen's groups in Karachi on the issue of water and sanitation. This is because of the poor state of these services and also because of fora organized by the Urban Resource Centre on the subject. The process of opposing the ADB's KWWMP and of promoting the OPP-RTI alternative has been another reason for this interest. As a result, 23 groups, including the OPP-RTI, got together to form a network on water and sanitation and named it People's Voice. Many other groups support the network as and when needed.

The network has strongly advocated the use of local resources as opposed to foreign loans, and also the practice of building on what exists rather than investments in insensitive mega-projects. The network has presented citizen's concerns and detailed comments on the World Bank Pakistan Country Assistance Strategy Paper. Presentations of the network's concerns have been made periodically to the media and to city and town *naibs*, along with the OPP-RTI alternatives for sewage disposal for the city.

More recently, the network has taken up the issue of the proposed ADB-funded common effluent treatment plant for Karachi. The experts associated with the network have discovered a number of financial, technical and operational problems with the ADB proposal, and have raised these issues with the ADB. Members of the All-Pakistan Textile Manufacturer's Association (who came to know about the proposed plant only through the network) have also expressed concerns. The network's aim now is to present viable alternatives and initiate public hearings on the common effluent treatment plant and other planned ADB-funded projects.

The People's Voice is also involved in issues related to the disposal and transport of solid waste, in addition to sewage and water. Government plans for sewage disposal, water supply and transport have been influenced through fora, television programmes, meetings with government agencies and local government representatives.

SOURCE: OPP-RTI and Urban Resource Centre Quarterly Reports.

importance and has formed the basis of an ongoing debate within government circles, and is responsible for the conversion of *nalas* into box trunks, which has become an ongoing activity of Karachi towns.

c. Development of Orangi and other Karachi *nalas* into box trunks

As a result of the OPP-RTI's presentations of its documentation of *katchi abadis* and the alternative proposals to the KWSB's GKSP, the governor of Sindh issued the following directive in March 1999: "*KMC should develop and upgrade main nalas/drains as sewage and rainwater drainage channels, for which budget would be allocated annually.*" As a result of this directive, the KMC started work on converting tertiary *nalas* into box trunks on the basis of OPP-RTI surveys and designs. After devolution in 2001, the city government has continued with this process. The OPP-RTI has developed

BOX 6
Findings and recommendations on sewage, drainage and treatment plants

The following are the conclusions of an OPP–RTI study on institutional aspects of issues related to sewerage in Karachi:

- At present, the KWSB is servicing only about 20 per cent of the Karachi area. Servicing here means maintenance and renovation of the existing system. In these areas, most sewage is diverted to storm drains and natural *nalas*.
- The KWSB's role in the development of sewage disposal systems has been negligible. The only known development projects undertaken by the KWSB have been the upgrading of two treatment plants, TP–I and TP–II, and the construction of the Baldia sewerage project, Lyari trunks and TP–III, which are all components of the KWSB's Greater Karachi Sewerage Plan. The functioning of these projects, costing about Rs 42 billion (US\$ 700 million) in foreign loans, is questionable as already shown in the case of TP–I, TP–II and the Baldia project. In the remaining 80 per cent of the Karachi area not serviced by the KWSB, development has been undertaken by the KDA, other development authorities, the Cantonment Board, the KMC, cooperative housing societies, builders and the people themselves.
- Natural *nalas* and storm drains serve as disposal channels for 90 per cent of the sewage generated in Karachi. In the areas under KWSB jurisdiction (20 per cent of the Karachi area), *nalas* and drains are also being used for sewage disposal. In the remaining 80 per cent of the Karachi area (including *katchi abadis*) not under KWSB jurisdiction, the sewage disposal points are the storm drains and natural *nalas*.
- Neither the KWSB nor the KMC (now the city and town governments) accept responsibility for the maintenance/development of these natural *nalas* and storm drains. The result is overflowing and breakdowns in the sewerage system all over the city. The KWSB managing director and foreign projects office reject this reality and persist in imposing a master plan (the Greater Karachi Sewerage Plan), which bears no relation to the existing system in place. The KMC's opinion is that these storm drains and natural *nalas* are sewage disposal channels. Therefore, it is the KWSB's responsibility to maintain them.
- The KMC and the KWSB's sewerage wing (responsible for operation and maintenance) are responsive to accepting the reality of existing, informally built infrastructure. The KMC has already allocated budgets for *nala*/drain trunk development as per governor Sindh's directive of 3 March 1999. The KWSB sewerage wing accepts the reality but is helpless due to the KWSB policy.
- The KWSB is dependent on a KMC subsidy for financing the sewerage wing. The KWSB's revenue receipt for 1998–99 is Rs 120 million (US\$ 2 million) (a 50 per cent share of the conservancy charge) or sewerage maintenance and repair, while its expenditure budget is Rs 483.4 million (US\$ 8 million). The deficit is covered by a subsidy from the KMC of Rs 275 million (US\$ 4.6 million). This subsidy covers establishment, maintenance and repair costs.

Continued

- The KWSB sewerage wing budget for maintenance and repair is mostly wasted, which means that the KMC subsidy is wasted. The KWSB persists in revitalizing a collapsed system, while at the same time it negates the functional drain/*nala* disposal system. It spends huge sums on renovating and maintaining lane sewers, secondary sewers and trunk sewers, while the actual disposal is neglected.
- The KWSB's dependence on foreign loans for development projects is disastrous for the institution. At present, the KWSB has a loan liability of Rs 42 billion (US\$ 700 million), which it has not been able to service.
- The inability of KWSB to service the loans has a negative impact on the budget of the government of Sindh and its allied organizations. The KMC (now the city government) budget allocation due from the Sindh government has been deducted at source because of the KWSB loans and their servicing.
- Responsibility needs to be redefined. The KMC (now the city and town governments) is a viable organization able to take responsibility for sewage disposal in Karachi, is responsive to accepting the existing infrastructure, and is financially viable. It has the technical and administrative capacity to take responsibility for developing and maintaining sewage disposal systems. The maintenance and repair wing of the KWSB can function under the KMC, and the KWSB is better suited to function as a water board.

For the above suggestions to be implemented, no changes are needed in the Sindh Local Government Ordinance. However, a government directive is needed as per a clause in this Ordinance, which states: "*KMC to take up any other role assigned by government.*" For the KWSB to be converted into a water board, the KWSB Act needs to be amended.

SOURCE: OPP-RTI's *84th Progress Report*, October–December, OPP-RTI, Karachi.

designs and estimates of 17 tertiary and one main *nala* in Orangi, based on its surveys. The total length of these *nalas* is 33.7 kilometres. So far, work has been completed and/or is ongoing in the case of five *nalas*, which serve 2,000 lanes. Tenders for two additional *nalas* have been floated.

In 2004, due to its mapping of the Karachi drainage system, the OPP-RTI was invited by the executive district officer in charge of works and services to become part of the focal group on *nalas* and drains in Karachi. The group has used OPP-RTI documentation and designs for lobbying the governor of Sindh. As a result, Rs 2.02 billion (US\$ 34 million) has been set aside for the development of *nalas* and drains in Karachi under the Tamair-e-Karachi programme, a special programme for the development of Karachi. Of the Rs 2.02 billion, Rs 135 million (US\$ 2.25 million) will be spent on Orangi *nalas*, with designs developed by the OPP-RTI, and another Rs 650 million (US\$ 10.83 million) will be spent on designs developed by the OPP-RTI for other *nalas* in Karachi.

d. Preparation of the union council plan books and their spin-offs

After the devolution of 2001, 13 union councils (UCs) were created in Orangi Town. Each UC has a population of between 50,000–100,000. The UCs have no technical capacity or capability, nor do they have proper maps for planning, implementation and operation and maintenance of

development work. Therefore, the OPP-RTI decided to prepare UC plan books for the *nazims* of each UC. The plan books contain:

- maps of the entire UC and of individual settlements within each UC;
- documentation of existing social and physical infrastructure related to sewage disposal, water supply, health, education, parks and playgrounds and solid waste disposal; and
- identification of development needs on the basis of the documentation and the role of the community and governments in planning and delivering this development.

Several UCs have used this documentation effectively. Development in those that have not has been ineffective, inappropriate and sub-standard, leading to considerable misuse and waste of public money. UC-6 is a model UC, and has used the plan book in the following ways:

- External sewage and water supply has been developed, to include repairs to water mains and de-silting blocked sewers. The locations of leakages and blockages were identified by OPP-RTI surveys.
- The *nazim*, with the help of area activists, has organized the pick up of solid waste from the main bins. The UC plan book provided a map showing the disposal points, which helped in organizing this work. People are responsible for the disposal of solid waste from the houses and lanes to the main neighbourhood bin, from where a government van picks it up: 4,000 houses and 450 shops are organized to do this work, and they pay the sanitary workers employed for this purpose Rs 20–30 per month per shop or per house.
- Where people have laid lane sewers on a self-help basis, the *nazim* finances the paving of the lane.
- Tree plantation and electrification have been developed on the “internal-external” model.
- The mapping has been done by the YTP, and the UC has been assisted by the TTRC in its development planning and implementation work.

Requests from UCs and towns from all over Karachi have been received for the preparation of similar documentation and advisory support. This is being provided to UCs in 11 of the 18 towns of Karachi. These towns are now in the process of converting their *nalas* into box trunks. However, the process of building treatment plants at the end of the *nalas* has not yet begun, although the OPP-RTI is in the process of researching low-cost options.

V. THE MAPPING PROCESS IN REPLICATION PROJECTS OUTSIDE KARACHI

OPP-RTI partner CBOs and NGOs outside Karachi have also developed expertise in mapping. This expertise is the result of the OPP-RTI strategy of supporting NGOs and CBOs wishing to replicate its programmes. This strategy has developed over time and after many modifications, and is outlined below:

- CBO/NGO or community activists contact the OPP-RTI for support;
- the OPP-RTI invites them for orientation to the OPP-RTI office in Karachi, or directs them to one of its partners;

- after orientation, the local organization or activists convince their community to adopt the programme;
- they create a team consisting of a social organizer and a technical person, who are trained at the OPP-RTI and/or on-site in their settlements through visits by OPP-RTI staff;
- the training is in surveying, mapping, estimating, construction supervision, documentation and keeping accounts;
- this training does not have a specific period. It continues throughout the life of the project; and
- the OPP-RTI arranges financial support for the team and meets related expenses through WaterAid. Initially, this is about Rs 200,000 (US\$ 3,500) per year.

Invariably, the CBO/NGO comes into contact with local government departments as its work expands. When this happens, local government representatives are invited to the OPP-RTI for orientation. If the local authorities are convinced, they send their staff for training. Neighbourhood settlements, and sometimes even villages and local government of neighbourhood towns, contact the CBO/NGO about replicating their programme. Some of the results of this strategy are given below.

- Anjuman Samaji Behbood is a Faisalabad CBO that has been replicating the OPP-RTI programmes.⁽²⁴⁾ It has collected all available maps of Faisalabad City and documentation of main disposals and main and secondary sewers. In addition, it has related its own mapping of neighbourhoods where it has worked to these maps. It has also acquired knowledge of GIS mapping and has supported Jaranwala Town in acquiring satellite imagery, digitizing it and establishing a GIS base. It has also provided similar support to Chiniot Town, and CBOs, NGOs and personnel from local government agencies visit it for training and orientation.
- The Lodhran Pilot Project (LPP) is an NGO working in partnership with the local government of Lodhran Town. With support from consultants, they have developed a complete plane-table survey of the town on the basis of which they have developed a sewage and water supply master plan. They have extended their services to five nearby towns, and completed sewage schemes in 12 neighbouring villages. They have, with the support of local communities, prepared maps for all these projects. They are flooded with requests and are attracting training groups from various governmental and non-governmental agencies.
- The Conservation and Rehabilitation Centre (CRC), Lahore, has a project to conserve historic monuments in Uch Sharif, a small but ancient town in southern Punjab. CRC was interested in providing the town with better infrastructure, and contacted the OPP-RTI for this purpose; a replication project was then established. The CRC team trained six young members from the community in plane-table survey and computer mapping. They have prepared sewage and drainage master plans and maps of the city on the basis of which the government is building external development and the people are building internal development. The CRC sanitation unit has now become consultant to the Uch local government and is guiding its external sanitation projects, road construction and lane paving, in

24. For more details of this CBO's work, see Alimuddin, Salim, Arif Hasan and Asiya Sadiq (2000), "Community-driven water and sanitation: the work of the Anjuman Samaji Behbood and the larger Faisalabad context", Working Paper 7 in the Poverty Reduction in Urban Areas Series, IIED, London, 84 pages; this can be downloaded at no charge from www.iied.org/pubs/display.php?o=9073IIED.

addition to conservation projects developed by the CRC in consultation with the communities and government.

- Plane-table expertise has also been established in seven other CBOs outside Karachi; in the case of Rawalpindi City it has led to collaboration between the ADB under-preparation environmental project and the local OPP–RTI partner, the Akhtar Hameed Khan Memorial Trust.
- The OPP–RTI mapping methodology has been transferred to the Punjab *Katchi Abadi* and Urban Improvement Directorate (a government of Punjab agency in charge of regularizing and improving *katchi abadis* in the Punjab province) and the NGOs and CBOs working in collaboration with it.

VI. FUTURE DIRECTIONS

The OPP–RTI now has an enormous number of maps of *katchi abadis* and of the catchment areas of the main Karachi *nalas*. Since 2004, it has started acquiring all maps of various sectors and schemes for Karachi that have been developed by federal, provincial and local governments. It also has maps of the other cities in which it and its partners have worked. For the future, the OPP–RTI plans to digitize all these maps (the process has begun) in two different arrangements: maps that are related to the OPP–RTI's work; and maps that are unrelated to its work but that can be of enormous use to CBOs, NGOs and government agencies. A very large volume of unrelated maps is available under the second arrangement, and this will continue to increase. The OPP–RTI wishes to set up an autonomous mapping unit to carry on this work under the second arrangement.

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