

UNITED NATIONS DEVELOPMENT PROGRAMME

PAKISTAN

THE TREATMENT OF KARACHI SEWAGE BY RECYCLING
AND CREATING A LIVESTOCK FARM IN DESERT LAND

PAK/84/018

Report of the Evaluation Mission

July 1991

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THE TREATMENT OF KARACHI SEWAGE BY RECYCLING
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PK/84/018

I. SUMMARY OF FINDINGS AND RECOMMENDATIONS

This summary is presented in the format required for Part A of the 4 part UNDP proforma entitled "SUMMARY OF IN-DEPTH PROJECT EVALUATION".

A. PART A

<u>Project Number and Title</u>	<u>Executing Agency</u>	<u>UNDP Budget</u>	<u>Prior Phase and Duration</u>	<u>Date Project Approved</u>
Treatment of Karachi Sewage by Recycling and Creating a Live- stock Farm in Desert Land	UNCHS (HABITAT)	US\$ 597,375	Nil	Sept. 6, 1988
	<u>Government Implemen- ting Agency</u>	<u>Government Budget</u>		<u>Date Project Begun</u>
	Karachi Water and Sewerage Board	Rs 624,000 (\$ 28,361)		May 15, 1989
PAK/84/018	(KWSB)			

1. Objectives and Outputs of the Project

The Development Objectives of the Project according to the Project Document were:

- a) improve public health in Karachi by removing sewage from large population centres to a lightly populated and well managed sewage farm;
- b) maximize utilization of water and nutrients contained in the Karachi sewage and convert them into valuable animal food by the creation of a livestock farm and other safe agricultural products;
- c) development of 10,000 - 20,000 hectares of desert land into fertile land for livestock farming to facilitate the supply of milk and other livestock products for Karachi city in particular, Pakistan in general and possible export to neighbouring countries;
- d) recovery of substantial areas of land in Karachi for industrial real estate development, and the reallocation of funds generated by sale and/or savings for reclamation of desert land.

The Immediate Objectives were defined as:

- a) to determine the detailed economic, financial, social and technical feasibility of both the sewage collection system and livestock farm development in the Hub river left bank;
- b) to prepare detailed investment programme for the treatment of sewage from Karachi by Recycling and Creating a Livestock Farm in desert land of the left bank of Hub river. The investment programme should be sub-divided into three phases: pilot stage, intermediate stage, full stage;
- c) to prepare an outline investment programme including economic, financial, social and technical data for the development of the Gadap area for Recycling of Karachi sewage at a later date;
- d) to provide training to the KWSB, the departments of health, agriculture and livestock of the provincial government of Sindh in various technical aspects of sewage recycling through land application.

The project outputs were:

- a) A full-fledged Feasibility Study of re-use of Karachi wastewater for agricultural purposes in the Hub river bank area, and, preparation of a phased project for implementation in sufficient detail for project appraisal.
- b) Assessment of the potential for wastewater re-use in lower

priority area of the Gadap Plain and preparation of an investment outline.

- c) Better awareness of senior KWSB and government officials of land use sewage treatment through study tour or participation in conferences on the subject.

2. Purpose of the Evaluation Mission

- a) To review the soundness and relevance of the Project design keeping in view the problems the Project was supposed to solve.
- b) To review the adequacy and timeliness of the government's inputs to the project (counterpart staff, equipment, etc.).
- c) To review the status of UNCHS/UNDP's inputs delivery to the Project in terms of provision of Sub-contract, technical and backstopping, supply of equipment, implementation of training etc.
- d) To review adequacy, timeliness and completeness of the Project's outputs produced as a result of project activities.
- e) To assess the degree the Project has achieved its objectives as a result of project activities and outputs.
- f) To assess the degree of acceptance by the government of the findings/recommendations of the Project and identify any constraints the government may face in following up on them.
- g) To assess the degree of institution building achieved.

3. Findings of the Evaluation Mission

- 1. The Project was relevant to the situation in Karachi as it pertains to improvement of public health by removing sewage from large population centres to a well managed sewage farm.
- 2. The matters arising from UNCHS comments on the pre-feasibility study should have been appropriately taken into consideration during project design. The change in project concept from one using largely raw sewage for fodder cropping to one using fully treated effluent for vegetable cropping could then have been written into the TOR thus eliminating the need for revision, additional expenditure, and delay of 2 years in completion.
- 3. There were some delays due to non-availability of base maps which were to be provided for by the government and by slow procurement of equipment (UNDP input) but overall the Project was completed expeditiously. The sub-contractor (OPCV) performed their functions diligently.

4. The draft Feasibility Study outputs meet the extended objectives that it had defined. The work on the project, study visits and training have created a better awareness of sewage recycling concept in KWSB and provided their staff with the relevant training.
5. The concept of sewage recycling has been accepted by KWSB as is indicated by inclusion of a recycling pilot project in KWSB's rolling programme of sanitation improvements.
6. The short training courses for KWSB operational engineer level staff and their close working relationship with the OPCV team will contribute to institutional development within KWSB.
7. The completion (by December 1991) of additional inputs approved in July 1991 would be an essential follow-up.
8. UNDP should support KWSB efforts in obtaining finance for the pilot project it is putting up for World Bank finance under SUDP.
9. The high capital costs of the Project (Rs 2,000 million to Rs 3,500 million) and annual operational costs of between Rs 80 to 100 million for various options, raise serious questions regarding its feasibility and sustainability which the Project has not tried to address. In Addition, before the Project can be implemented, a sewerage network for the areas that it will serve has to be put in place. By the looks of it, this may easily take upto 10 years.

4. Recommendations of the Evaluation Mission

1. Considerable care is needed in project design. Views, opinions and comments on the project proposal need to be considered seriously. It is desirable to associate local experts in the subject and other persons knowledgeable on developmental, social, cultural and micro-level aspects.
2. The additional inputs approved in July 1991 for the Feasibility Study should be completed by December 1991 as scheduled.
3. KWSB approach of testing out all aspects of the concept on a pilot scale should be endorsed. KWSB efforts to obtain finance for the pilot project should be supported by UNDP.
4. Alternatives to the proposed technology (perhaps further decentralisation) should be considered so as to reduce capital and recurring costs so as to make the Project feasible.

5. Lessons Learnt

1. Considerable care and attention is needed in project design. Expert comments as well as views and opinions should be widely sought and seriously considered. Local expertise and knowledge is invaluable in this regard and should be called upon.
2. Other city level programmes which have a bearing on the Project should be critically studied so as to relate the project design to them. In addition, economic realities must be taken into account when determining the scale of the Project and the possibility of incremental development and/or alternative technology looked into if the Project is economically not feasible or acquires extensive O and M capabilities which are difficult to develop.

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II. PROJECT CONCEPT AND DESIGN

A. CONCEPT OF THE PROJECT

The Project Document was signed by the Government of Pakistan, UNCHS (the executing agency) and UNDP on September 6, 1988. The recipient of the technical assistance and the government implementing agency was Karachi Water & Sewerage Board (KWSB). The contract for the feasibility study was awarded to Overseas Project Corporation of Victoria (OPCV), as a consortium of a

Pakistani public sector consulting firm, 2 Australian private firms, and 2 Australian public agencies. Work was commenced by a joint OPCV and KWSB team on May 15, 1989. The terms of reference for the feasibility study were drawn up in December 1986 and were incorporated in the Project Document signed in 1988.

Karachi, Pakistan's largest city and the main sea and air port, has a population of about 7.5 million (1991) which is projected to grow to 11.8 million by the year 2000. Nearly one-third of the present population lives in unofficial settlements, only about one half of Karachi households are directly connected to the water distribution system and about one quarter to piped sewerage system. The Karachi Water and Sewerage Board (KWSB) is responsible for the water supply and waste management system in Karachi. Presently there are 3 wastewater treatment facilities which have a capacity to serve a population of 1.5 million and two of these require extensive rehabilitation along with the sewerage system. The effluent from these plants is discharged into the Lyari and Malir rivers. KWSB is committed to promotion of systems of wastewater disposal which are safe on public health and environmental considerations. In their various water supply and sewerage projects, KWSB is receiving assistance from the World Bank (water supply) and the Asian Development Bank (sewerage).

The Project is a follow-up on the pre-feasibility study conducted by MacDonald & Partners (submitted in August 1986) under UNDP/ UNCHS assistance. The terms of reference for the pre-feasibility stated the following specific objectives:

- a) "To provide low cost, low technology treatment of sewerage by recycling through desert land application, fertilisation and reclamation."
- b) "To create a commercially viable agricultural farm for intensive fodder and/or cane production supporting livestock and sugar cane industries." (Pre-feasibility Study, p. 1-1, MacDonald & Partners, Aug. 1986)

A similar method has been tested at the Werribee Farm, Melbourne (Australia) since the turn of the century and now 70 percent of that city's wastewater is disposed off through the Werribee Farm. The pre-feasibility was to assess whether this system could be applied in Karachi and more particularly to assess whether fodder for livestock could be safely grown under irrigation with wastewater which had received only very limited pre-treatment (grit removal, screening and limited settlement in small reservoirs).

The salient findings of the pre-feasibility study were that:

- a) Two areas of largely un-used land in the Hub river valley and the Gadap Plain have potential as re-use areas with Hub river left bank having the most potential for short term development as it could utilise wastewater already collected

at the site of the existing treatment works, TP1.

- b) Agricultural re-use of virtually untreated wastewater in these 2 areas could be an economic and safe proposition subject to further feasibility level studies.
- c) The factors that would be particularly important to further assess are: social acceptability, which is fundamental to the success of a re-use scheme; the need for control of natural run-off in the Gadap Plain, which would be environmentally important since the nullahs pass through Karachi; basic land and wastewater resources; and, the agricultural and health aspects.

The pre-feasibility recommended that a full-fledged feasibility study be carried out with the following objectives:

- a) To carry out further studies of wastewater re-use potential in the Hub river left bank and Gadap Plain areas in order to confirm the findings of the pre-feasibility study.
- b) To prepare priority wastewater re-use projects for the Hub river left bank and for the Gadap Plain areas in sufficient detail for the projects to be reviewed by the government and funding agencies concerned with the improvement of Karachi's wastewater disposal system and with water resources and agricultural development in the Karachi region.
- c) To further assess the longer term potential for wastewater re-use in the other lower priority areas of the Hub river left bank and Gadap Plain so that land can be allocated for future re-use projects.

The terms of reference for the recommended feasibility study were detailed in the report (Appendix, Main Report, McDonald & Partners, 1986).

In October 1986, UNCHS commented on the pre-feasibility, raising two types of issues:

- a) The health and social impacts of the use of wastewater in agriculture, in the light of the findings and recommendations of the Engelberg Report (WHO, IRCWD News, Dec. 1985); and
- b) The critical assumption on which this proposal for recycling of sewerage was based:
 - the full development of augmented water supply;
 - the extensive rehabilitation of the existing sewerage system of Karachi;
 - the development of a master plan for sewerage and wastewater development and its early implementation;

- rapid development of the extensive KDA areas now earmarked for urbanisation;
- a satisfactory and stable power situation.

The first three of these were particularly crucial because the availability of wastewater (even for Phase I of the Project) depended on the validity of these assumptions. UNCHS also pointed to the need for a more careful assessment of likely environmental impacts of discharging wastewater into the Hub river. (UNCHS Comments, 17 Oct. 1986).

The UNCHS comments were annexed to the terms of reference for the feasibility study (Dec. 1986) which remained the same as given in the pre-feasibility study.

In the context of Karachi, the concept of recycling appears to be an appropriate response. In defining the parameters of the Project, however, the UNCHS comments on technical aspects, social acceptability, health risks and environmental concerns as well as the institutional realities of Karachi needed to be seriously considered. (See also B below).

The project design by not considering these aspects led to a situation where an amendment to the Project Document had to be authorised (July 1991) after submission of the Draft Feasibility Study in December 1989. This amendment will enable additional vital aspects to be considered which were not covered earlier.

B. PROJECT DOCUMENT

1. The Problem and the Technical Approach

The problem the Project was designed to solve as stated in the Project Document (II. D, p. 2-3) is the same as defined for the feasibility study (already discussed in A above).

The project design approach was based on the recommended TOR of the pre-feasibility study, without adequate consideration being given to UNCHS comments, particularly as the critical assumptions made in the pre-feasibility needed to be seriously evaluated.

Although the study contractor (OPCV) did amend their approach and methodology, within the parameters of the TOR, to reflect developments on site as detailed in their Inception Report of May 1989 (Section 7, p. 38-65), OPCV refer to the need for change in the recycling approach:

- a) the concept of growing fodder crops irrigated by sewage which had passed through preliminary treatment only may not be acceptable as experience at Werribee had shown (this necessitates the need for a treatment system);
- b) the availability of sufficient quantity of wastewater; and,

- c) the question of availability of land and the land uses in buffer areas (1.5 kms around the farm).

In their Monthly Progress Report No. 2 (dated 20 July 1989), they pointed to the inherent dangers from environmental and health aspects in discharging virtually unsafe but aesthetically clean effluents to the nullahs as there would temptation to use the nullahs for bathing, washing and even drinking. (p.5). The report states that examination of present farming practices and health risks to horticultural workers in Malir and TP1 (where untreated sewage is used for irrigation) leads to question the concept to the extent that full treatment of sewage to minimise illness from water-borne diseases is likely to be the only long term option for irrigation. This thus seriously changes the fundamental considerations of the project design approach.

These concerns were expressed in subsequent OPCV submissions including that at the Tripartite Review on Oct. 26, 1989, where OPCV also pointed to the need to examine 2 additional sites which appeared promising. OPCV presented two major implications for the project: the opportunity to use effluent for fruit and vegetable cropping and industrial uses rather than fodder cropping as originally envisaged, and, the 2 new sites which would be more attractive for this. The changes and new sites would yield a superior economic and financial return. A proposal to amend/extend the scope of work was made in the Inception Report of May 1989 (Section 6, reproduced in Annex 2) and after the Tripartite Review a formal request was made by OPCV to authorise the additional inputs required to refine the study to incorporate a new approach and the 2 sites (given in Annex 3).

While the additional inputs requested by OPCV were not authorised during the course of their work and the Draft Feasibility Study submitted in December 1989 did not incorporate these aspects requiring further study, OPCV used the new approach they had presented at the Tripartite Review (26 Oct. 1989) and included the 2 new sites. Thus the project design approach was significantly changed. The additional inputs (and revisions in the scope of work to accommodate these) have been authorised by UNDP in July 1989 (see Annex 4 for proposal to revise scope of work and Annex 5 for revised scope of work to include additional activities).

2. Objectives, Indicators and Major Assumptions

The development objectives and immediate objectives have been defined in the Project Document. The first development objective is to improve public health in Karachi by removing sewage from large population centres to a lightly populated and well managed sewage farm. Development objectives 2, 3 and 4 relate to utilisation of the wastewater for fodder cropping, development of 10,000 to 20,000 hectares of desert land for livestock farming and reclamation of desert land, respectively. Of these development objectives, the output of the Draft Feasibility Study, after the adoption of the changed approach would

contribute only towards the first one.

The Project Document defines four immediate objectives pertaining to preparation of feasibility and investment programme for livestock farming in the Hub river left bank area, and an outline programme for Gadap area to be taken up at a later stage; and, providing training to KWSB and other government departments on various aspects of sewage recycling through land application. The immediate objectives were clearly defined in relation to the outputs expected. However, with the adoption of the changed approach, the draft feasibility considers vegetable cropping rather than fodder cropping and livestock farming and limited industrial use, introduces the concept of full treatment rather than preliminary treatment, and, considers 2 additional sites.

The changed approach adopted allowed the problem to be addressed more realistically; however, as explained in the earlier sections, this approach could have been incorporated in the original project design. Similarly, the need for amendment to the Project Document and additional inputs, approved in July 1991 could have been avoided, thus completing the Project in December 1989 instead of December 1991 as presently envisaged with the additional inputs now approved. Even if the original Project Document did not incorporate these concerns at project initiation, they could have been considered right after six weeks from the start of work by OPCV when OPCV raised these issues in their Inception Report and identified the need for additional inputs. Appropriate corrective action to overcome deficiencies in project design work were not taken on time.

The Project Document provided for the means of measuring progress towards production of the outputs through monthly progress reports and an Inception Report within six weeks of commencement of work by OPCV. These reports were submitted on time, but as already mentioned, appropriate response to issues raised could not be obtained by OPCV in time, resulting in their submitting the draft final report in December 1989 without the benefit of the additional inputs required to make their work more meaningful.

The Project Document clearly establishes the linkages between inputs, activities, outputs and objectives. The issues concerning the major assumptions in project design have already been discussed.

3. Work Plan

The preparation of a work plan, input plan and training schedule has been provided in the Project Document.

III. PROJECT IMPLEMENTATION

A. ACTIVITIES

The outputs of the projects and the activities related to those

outputs as described in the Project Document (in Section II E and F) are detailed in scope of services of the Feasibility Study (TOR Section 4).

All activities listed in the Project Document were completed by December 1989. The additional inputs for the amended project approved in July 1991 are scheduled for completion by December 1991 (see Annex - 4).

All activities listed in the Project Document, the scope of services as specified in the TOR, keeping in view the changed approach to the project, appear to have been undertaken satisfactorily, major reservations about project design notwithstanding.

An objective of the Project (Immediate Objective 4) was the provision of training to create better awareness of senior KWSB and Sindh government officials (Output 4) through a study tour. After considerable delays in nominations from KWSB/Government and 3 postponements at the behest of the KWSB/Government, 7 KWSB officials undertook study tours and short training courses to observe first hand the Werribee Farm and to study sewage treatment and recycling methods (Annex 7).

There were initial delays owing to lack of basic data as pointed out in the OPCV progress reports and the Project Performance Evaluation Report (PPER). This basic data pertained to contour maps, air photos, land tenure information etc. which was to be arranged by KWSB. Additional cost was incurred by the Project on map making which OPCV had to undertake. The latest project budget is given in Annex 9.

The project budget originally provided for \$ 573,100 which according to the latest revision (June 1991) had increased to \$ 597,375; the increase being due to additional cost of project personnel (one month for CTA), and, cost of preparation of base maps. Equipment (including expendable supplies) were originally budgeted at \$ 14,000 but \$ 10,540 were actually incurred.

A special consideration during preparation of the feasibility study was to be its close interlinkage with the on-going wastewater and sewage master plan financed by the World Bank. OPCV have accepted that Master Plan Phase One and have taken into account their recommendations as well as pointed out the implications of the Project on the work proposed in the master plan.

B. QUALITY OF MONITORING AND BACKSTOPPING

The Project was subject to Tripartite Review in October 1989 by which time substantial work had been completed by the sub-contractor, and, in November 1990. In addition, the sub-contractors monthly reports provided a mechanism for reporting and control.

The project did not provide for a CTA and the CTA for two other UNCHS projects in Karachi voluntarily undertook coordinating responsibilities. Subsequently, UNDP agreed to add one month to the project budget for the CTA.

The sub-contractor presented the changed approach to the Tripartite Review where it appears to have been agreed to by all parties concerned. However, no decisive action was taken on the sub-contractors request for additional inputs (Annex 3). If appropriate and timely action had been taken, this work could have been incorporated in the December 1989 draft report.

IV. PROJECT RESULTS

A. OBJECTIVES AND OUTPUTS

The outputs of the project recorded in the Project Document and TOR required to achieve the Immediate Objectives, and the assessment of the Evaluation Mission regarding objectives and outputs follow:

- Immediate Objective No. 1, 2 and 3 and Outputs 1, 2 and 3 of the Feasibility Study.

The TOR for the feasibility study required a further assessment of the wastewater re-use potential of the Hub valley and the Gadap Plain and include in its scope of work:

- Water Resources Studies
- Land Resource Studies
- Agricultural Studies
- Planning and Engineering Studies
- Wastewater Re-use Impact Studies
- Institutional Studies

A full feasibility level project for the Hub river left bank area and an investment outline for wastewater re-use in the Gadap Plain was to be prepared.

The Feasibility Study was anticipated to confirm the pre-feasibility study findings. The outcomes of the study are somewhat broader than originally considered by the TOR and there was a conceptual change in the approach from that indicated in the TOR (on the basis of the pre-feasibility study). These changes have already been discussed above and include: change in concept from one using raw sewage to irrigate fodder crops to one using comprehensively treated sewage to irrigate a variety of crops including vegetables and fruits; another change involved examination of two additional areas (Manghopir and Malir) as having potential for irrigation with treated wastewater.

The draft Feasibility Study outputs meet in a timely and appropriate manner the extended objectives that it had defined.

If a timely decision had been taken regarding additional inputs, these could have been addressed in the draft feasibility study.

- Immediate Objective No. 4 and Output 4: Training/Study Visits.

The purpose here was to provide training in various aspects of sewage recycling through land application to KWSB and provincial government departments through selected study tours. The study tour was aimed at senior management level to develop an understanding of the scope of the recycling projects and awareness of its implications. The short training was targetted at operational engineer level of KWSB to provide a background of all key issues relevant to wastewater recycling and develop capability to provide management inputs for project implementation.

After considerable delays and 3 postponements (referred to earlier) a group of 7 KWSB officials undertook a study tour, and 4 of them took part in a course on the subject (Annex 7). The course content of the training had been submitted by OPCV for discussion and approval of KWSB and UNDP/UNCHS and was examined in a progress review meeting on July 20, 1989. The course content is given in Annex of progress review minutes of meeting of July 20, 1989 included in Progress Review No. 3 dated August 18, 1989.

The work on the Project, study visits and training have created better awareness of the concept in KWSB and provided their professional staff with the relevant training.

B. DEVELOPMENT OBJECTIVE

The overall success of the Project can be seen by the fact that the concept of and need for recycling of wastewater has been accepted by KWSB and incorporated in their own thinking on sewage treatment and disposal. This is to the extent that they support the additional inputs requested by OPCV, and beyond that (and subject to the project being feasible) of a sewage recycling pilot project within their rolling programme of sanitation improvements for Karachi (see also Annex 10).

C. SUSTAINABILITY

With the incorporation of the concept of wastewater recycling through land application in the thinking of KWSB (and the expression of interest by the World Bank in KWSB's proposal to build a closely monitored pilot plant together with the agricultural farm), the project can be considered sustainable. However, if (for instance) the project capital costs of the OPCV proposed Hub river project is considered, which on 1989 prices is between Rs 2,000 million to Rs 3,500 million (US\$ 95 - 170 million) for various options (40 percent are pipeline costs and

only 9 percent irrigation costs), and its annual operating cost of between Rs 80 to Rs 110 million for various options, then serious questions about its sustainability can be raised. In addition, logistic and operational problems would need to be overcome. KWSB approach of testing out the concept fully on a pilot scale under close monitoring before embarking on implementation of a project with large capital outlay can therefore be endorsed on this account.

D. FOLLOW-UP

The immediate follow-up is actually the completion of the additional inputs approved by UNDP in July 1991. These inputs would be completed by December 1991.

Follow-up in terms of an executable project depended on its feasibility being fully established and the ability of the government to obtain finance for the project. As mentioned earlier, the KWSB approach is to test out all aspects of the project through a closely monitored pilot project. KWSB has discussed this with a World Bank Mission for the Sindh Urban Development Project (SUDP) in July 1991 who have expressed their interest in it. KWSB efforts in this regard will be reinforced once the additional inputs are completed in December 1991.

This Evaluation Mission considers that UNDP should endorse KWSB's efforts in obtaining World Bank funds under SUDP for the pilot project.

V. FINDINGS

A. PROJECT RELEVANCE

In the background of the present size and projected growth of Karachi and the resultant increase of wastewater flows from 1,000 million l/d today to 3,000 million l/d by 2025; the fact there is no comprehensive treatment system; and, the cumulative effects of these on environmental degradation and health (with half a million recorded cases of water-borne diseases and over 1,000 deaths), there is little doubt about the relevance of the Project as far as it pertains to improvement of public health in Karachi by removing sewage from large population centres to a lightly populated and well managed sewage farm (Development Objective 1). With regard to the other Development Objectives 2,3, and 4, this Evaluation Mission finds that there are sufficient grounds to believe that these were not a fully considered response although they were based on a UNDP funded pre-feasibility study; but the assumptions on which it was based and the UNCHS comments on it were not fully taken on board in project design.

B. PROJECT DESIGN

The pre-feasibility study which recommended this feasibility study and its TOR was commented upon by UNCHS. These comments were annexed to the TOR of the study but were not taken on board

in the TOR itself. This left out serious considerations regarding matters of health risks and therefore the appropriateness of fodder cropping as well as of the assumptions made by the pre-feasibility study.

If these matters had been appropriately taken into consideration, the change in project concept from using largely raw sewage for fodder cropping to using fully treated effluent for vegetable cropping and the other changes that it entails could have been written into the TOR. The need for additional inputs requiring extension of the Project with the resultant additional expenditure and delay of 2 years in completion could have been avoided. (The draft Feasibility Study was submitted in December 1989 and the additional inputs are expected to be completed by December 1991).

C. PROJECT IMPLEMENTATION

Government Inputs: The base maps required were not available and had to be prepared at additional cost to the Project. This was an agreed government input, the absence of which led to delays and intensive communication between OPCV and UNCHS Nairobi. Similarly, there were delays in the study tour and training due to delays in nominations, changes in names of those nominated, in processing nominations through government channels, and 3 postponements. Staff from other government departments (agriculture, forestry, and animal husbandry) was not attached as counterparts, as required.

UNDP Inputs: The Project was not provided a CTA and the CTA for 2 other UNCHS projects in Karachi performed project coordination duties, for which one working month was added to the project budget later. There were some delays caused by slow procurement of equipment as recorded in the Tripartite Review Report (26 Oct. 1989). There were delays in approval of the additional inputs (finally approved in July 1991).

Sub-contractor's Inputs: The Sub-contractor (OPCV) performed their functions diligently. It is to their credit that in their Inception Report (submitted within 6 weeks of commencement of consultancy services) they highlighted the changes necessary in the project concept and adopted the changed approach in the work. If the additional inputs required for the extended work had been approved before the submission of their draft report, these could have been incorporated in it.

D. PROJECT OUTPUT

The draft Feasibility Study outputs meet the extended objectives that it had defined. The work on the project, study visits and training have created a better awareness of the concept in KWSB and provided their staff with the relevant training.

E. GOVERNMENT ACCEPTANCE

The acceptance of the concept of recycling is indicated in the fact that KWSB have included a sewage recycling pilot project within their rolling programme of sanitation improvements for Karachi.

F. INSTITUTIONAL BUILDING

The short training courses for operational engineer level staff at KWSB and their close working relationship with the OPCV team is expected to contribute to institutional development within the KWSB.

G. FURTHER WORK AND FOLLOW-UP

The completion (by December 1991) of additional inputs approved in July 1991 would be an essential follow-up. Further, UNDP should support KWSB efforts in obtaining finance for the pilot project it is putting up for World Bank finance under SUDP to fully test out under close monitoring the concept on a pilot scale, which appears to be a sound approach.

VI. RECOMMENDATIONS

The following recommendations are made in relation to the findings of the Evaluation Mission:

1. Considerable care and attention is needed in the design of the project and the views, opinions and comments on the project proposal need to be considered seriously. It is desirable to associate local experts in the subject, and, other persons knowledgeable in the dynamics of development and on social, cultural and micro-level aspects for they can provide valuable insights regarding diverse issues which could have a significant bearing on the project.
2. The additional inputs approved in July 1991 for the Feasibility Study be completed by December 1991 as presently scheduled.
3. KWSB approach of testing out all aspects of the concept on a pilot scale be endorsed and KWSB efforts to obtain finance for the pilot project under World Bank financed SUDP be supported.
4. Alternatives to the proposed technology (perhaps further decentralisation) should be considered so as to reduce capital and recurring costs so as to make the project feasible.

VII. LESSONS LEARNT

1. Considerable care and attention is needed in project design. Expert comments as well as views and opinions should be

widely sought and seriously considered. Local expertise and knowledge is invaluable in this regard and should be called upon.

2. Other city level programmes which have a bearing on the Project should be critically studied so as to relate the Project design to them. In addition, economic realities must be taken into account when determining the scale of the Project and the possibility of incremental development and/or alternative technology looked into if the Project is economically not feasible or requires extensive O and M capabilities which are difficult to develop.

List of Annexures

1. Context, Purpose, Terms of Reference, Composition and Itenary of Evaluation Mission
2. Proposal to Amend TOR
(OPCV Inception Report May 1989, Section 6)
3. Additional Inputs
(Letter from OPCV dated Oct. 27, 1989)
4. Proposal to Revise TOR
5. Revised Scope of Work
6. Project Implementation
7. Training
8. Equipment
9. Project Budget June 1991 Revision
10. KWSB Proposed PC 1 Recycling Project
11. Documents Reviewed

TERMS OF REFERENCETerminal Evaluation Mission
(Cluster Evaluation)Projects: Titles:

- PAK/86/029: Karachi Master Plan 1986 - 2000
 Strengthening of Planning Process
- PAK/88/001: Karachi Coastal Zone Management & Planning
- PAK/84/018: Feasibility Study for the Treatment of
 Karachi Sewage by Recycling and Creating
 a Livestock Farm in Desert Land

CONTEXT

The three projects, financed by UNDP and jointly executed by UNCHS and various bodies/agencies of local government, are all based in Karachi, and started in 1987, 1988 and 1989 respectively. Karachi Water & Sewage Board (KWSB) is counterpart to the recycling feasibility study, while the Master Plan & Environmental Control Department of Karachi Development Authority (KDA) is counterpart to the other two projects. Substantive inputs to all 3 projects by UNDP/UNCHS are expected to finish during the first half of 1991, except for some foreign fellowships which will continue.

This 3-week Terminal Evaluation, identified in the respective Project Documents, will determine, as systematically and objectively as possible:

The relevance, effectiveness and impact of project activities in light of their objectives.

The evaluation will assess whether the institutional and administrative arrangements adopted to execute these 3 independent projects have been effective and conducive to project execution. It will also assess the extent to which the projects have succeeded in strengthening the institutional capability for implementation and follow-up of projects in the human settlements sector in Karachi. The findings of the mission should give positive guidance for the implementation of follow-up activities to the projects.

DUTIES

1. Review the soundness, quality and relevance of the project designs keeping in view the problem(s) the projects were supposed to solve and their objectives. Review the relevance and justification of project redesign if it was modified. The extent to which socio-economic factors were taken into account.
2. Assess the clarity of specification and realism of immediate

objectives and outputs and the logical consistency over time between provision of inputs, execution of activities, production of outputs and progress towards the achievements of stated objectives.

3. Review the adequacy and timeliness of the Government's inputs to the projects (counterpart staff; office support; procedural approvals, and information such as reports, maps and air photos).
4. Review the delivery of UNCHS' inputs to the projects including provision of sub-contracts, staffing and back-stopping, supply of equipment, implementation of training elements, and procedural factors.
5. Review the status, quality and timeliness of inputs delivered by subcontractors on the projects, including experts equipment and on-the-job training.

Apart from project management, the views of the ultimate users should be solicited. The focus should be the assessment of the appropriateness of training methodology and whether it allows counterpart staff to adequately follow up on the project's results. To evaluate the calibre of the trained counterpart staff and the over all impact of the training component. To assess the utilization of the fellowship training budget and the significance/utilization of on-the-job training.

6. Assess the relevance and practicality of technical recommendations of the sub-contractors and UN experts within the institutional and policy framework, and in respect of local capacities for implementation.
7. Assess the degree of acceptance by the Government of the findings and recommendations of the projects and, identify any constraints the Government may face in following up on them. In particular, examine the use of high level steering committees to guide project execution and recommend appropriate modifications in light of the apparent weakness of this approach.
8. With regard to institution building achieved, particularly assess the ability of; (i) KDA to update the Development Plan and monitor implementation; (ii) KDA to promote and control coastal recreation development, and; (iii) KW&SB to introduce sewage recycling into their overall strategies for waste treatment and water supply.
9. Assess the extent to which the various Terms of Reference of the projects were fulfilled, the degree to which the projects have achieved their immediate objectives in a sustainable manner as a result of project activities and outputs and the impact the projects were able to make. Moreover, assess whether any project(s) lend(s) itself to replication in other areas of Pakistan.

10. The extent to which the projects delivered were able to make a linkage to national/sectoral objectives and/or to other programmes of international agencies.
11. Assess the effectiveness of Project Management. Review the monitoring by all parties concerned, support by the UNDP Field Office. Review the manner in which the project implementation was done indirectly, as an assessment of the various work-plans, major findings/lessons from project management.
12. To assess the appropriateness of the equipment, its utilization and results related to it. To examine the available equipment, assess its maintenance and supply of spare parts. Point out shortcomings, if any, related to physical facilities and/or transportation facilities, and make recommendations for better use of this component.
13. Guide the UN and government agencies on the need for possible follow-up activities to the three projects (by all parties) and the extent to which National Execution could be applied wholly or partially. Also, point out the extent to which follow-up projects could initiate income generating activities.
14. Assess the need for revision or extension of the project to achieve specific objectives, in light of the above findings and other relevant factors.
15. Appraise the relative merits and demerits of independent project execution vis-a-vis collective execution. This should be done with a view to recommend whether projects in the sector (for Karachi) should be formulated and executed jointly as an 'Umbrella Project' or independently.
16. Prepare and submit an Evaluation Report responding to these requirements and according to the standard UNDP format within 5 working days after completion of field work, focussing on recommendations and lessons learned.

The members will be asked to address some specific issues including:

Justification of deviation in the full study from the approach and design suggested in the pre-feasibility study of PAK/84/018.

The extent to which the private sector could play a role in project follow-up activities. The suggested Investor's Round Table to be held as a follow-up to the Beach Development Plan, is a case in point.

Integration of environmental issues and investment programmes in all three projects with special reference to the National Conservation Strategy.

Integration of Women in Development components in training and

recruitment programmes in all three projects and the availability of gender specific information. The extent to which women may play a larger role in development activities.

Identification of the appropriate 'institutional home' for the Master Plan and its periodic updating.

The mission should consist of :

An Urban/Environment Planner with post graduate training and at least 8-10 years of experience on UN or similar projects of other international agencies to head the team, to be recruited by UNDP.

An international/national expert in Urban/Environment Planning to be recruited by UNCHS as a member of the mission.

A national expert in Development Planning to be recruited by UNDP/UNCHS. TOR of members are outlined as Annex I.

The government will nominate a representative on the mission who has not been directly associated with the execution of any of the projects.

DURATION

The duration of the mission should be approximately three weeks, May 1991 which may include briefing and debriefing of the mission leader at UNCHS Headquarters. Itinerary of the mission has been outlined as Annex II.

The mission should prepare a draft summary evaluation report while in Pakistan, for discussion with experts, Government authorities concerned, UNDP and UNCHS representatives.

The leader of the evaluation team will be responsible for final preparation of the mission's report in cooperation with other team members. The mission is fully responsible for its report which may not necessarily reflect the views of the Government of Pakistan, UNDP or UNCHS. The mission will however, seek to take the view of all parties into account.

The team leader will submit the report in final form to UNDP Headquarters with copy to UNCHS Nairobi within 14 days of the mission completion.

CONSULTATION IN THE FIELD

The mission should remain in touch with the UNDP office in Islamabad, UNCHS personnel in Karachi, the expert presently working with the project, the concerned government agency(ies) and the National Project Director(s).

The mission should feel free to discuss with the counterpart staff and the concerned authorities anything relevant to its assignment but should not make any commitments on behalf of UNDP and/or UNCHS.

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