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APPENDICES

1. Letter dated August 10th 1993 from the Minister of Development Cooperation inviting the Commission for environmental impact assessment to prepare advice.
2. Project information and composition of the working group.
3. Terms of reference (TOR) of the Environmental Impact Statement (EIS).
4. Review following the methodology of TOR-EIS.
5. Review framework for the EIA Kasur.
6. Environmental protection ordinance by the government of Pakistan.
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SUMMARY

The environmental conditions in the city and the district of Kasur, Punjab province, Pakistan, are seriously threatened by waste streams, originating from 162 tanneries located in three clusters in the city. The government of Pakistan, assisted by the governments of Norway and the Netherlands in cooperation with the United Nations Industrial Development Organisation, planned to address the problem by means of a project aiming at treatment of the waste streams. The project is described in a Final Report of the Joint Formulation Mission (JFMR).

In order to assess environmental hazards and effects of the proposed waste treatment facilities an Environmental Impact Statement (EIS) was compiled. The Dutch Minister for Development Cooperation invited the Dutch independent Commission for the Environmental Impact Assessment (the Commission) to advise him in the review of this EIS.

In her advice (chapter 2), the Commission performed a review of the EIS on the basis of its terms of reference (TOR). The scope of these TOR was limited. Therefore, on a recommendatory basis, the Commission also performed a review on the basis of international criteria (chapter 3).

Having reviewed the EIS on its TOR, the Commission has the opinion that, as a result of limited availability and reliability of base-line data and limited time afforded to the mission of the EIS-compiling team, the EIS offers insufficient information on the environmental effects of the proposed activities.

Review of the EIS on the basis of international criteria has resulted in observations on the social, institutional and physical sustainability of the proposed project, necessitating supplementation of the EIS. From the available information the Commission observes that support for project activities amongst local communities is doubtful. She also observes that the proposed institutional structures are rather heavy and that tanners interests seem insufficiently represented. The Commission thinks that, as a result of the least cost approach adopted by the project designers, a structural approach and possibly feasible technical alternatives were not considered. Although physical information is incomplete, the Commission concludes that operation of the works as proposed will lead to considerable environmental damage.

In her recommendations (chapter 4), the Commission suggests to adopt in the supplement a structural approach and to consider more alternatives, to solicit broad community support and involvement, to define a less heavy waste streams managing structure, in which tanners interests and interests of other parties are well balanced, and to anticipate additional technical facilities and mitigating measures. Suggestions for a monitoring programme are formulated.

1. INTRODUCTION

1.1 The initiative: Implementation of the Kasur Tannery Pollution Control Project

The intention exists to implement in the city of Kasur, south-west of Lahore in Pakistanis Punjab province, a project named 'Kasur Tannery Pollution Control Project'.

The main objective of the proposed project is to contain and reduce environmental degradation (mainly nuisance and health hazards) caused by tannery waste in the town of Kasur and in the Kasur-district. In Kasur town over 160 tanneries of various sizes drain their effluents in the local sewerage system and pile their solid waste on heaps in the streets. This practice has led to frequent obstructions of sewerage canals, to pollution of natural waterways, to establishment of three stagnant pools containing a mixture of tannery effluent and household sewerage and, in general, to perpetuation of an environmentally undesirable situation in the residential areas of the city and the outskirts of Kasur.

The project proposes to introduce low waste leather processing methods, to improve occupational health and safety for the tanners, to improve and complement the existing system of sewer lines, to evacuate the stagnant pools and reclaim the area, to establish a chrome recovery and by-products pilot plant, to realise a sound solid waste disposal system and a common tannery effluent primary treatment plant. Moreover, it foresees supporting technical and advisory assistance.

In order to assess possible negative environmental effects of certain project activities, more specifically of the proposed wastes treatment works, NORAD^{1]}^{2]} ordered an Environmental Impact Assessment (EIA). In the process of decision making the Dutch government will take into account the results of this EIA. Results of this assessment are laid down in an Environmental Impact Statement (EIS).

1.2 Motive for and objectives of this review report

By letter dated August 10th 1993^{3]} the Minister for Development Cooperation in the Netherlands has invited the Dutch independent Commission for Environmental Impact Assessment to perform an advisory review of this EIS.

1 Norwegian Agency for Development Cooperation

2 in conjunction with Netherlands aid and United Nations Industrial Development Organisation (UNIDO)

3 see appendix 1

Objectives of this advice are:

- ! review of the EIS on the basis of international review standards;
- ! appreciation of proposed mitigating measures and the evaluation programme;
- ! formulation of recommendations regarding alternatives to be considered, the mitigating measures and the evaluation programme.

This advice, that must be regarded as an independent vision on the quality of the EIS in question, has been prepared by a working group of the Commission. The composition of this working group is presented in appendix 2. The group represents the Commission and will therefore be referred to as 'the Commission'. In the Commission the following disciplines are represented: General and Occupational Medicine, Tannery Wastes Treatment Technology, Institutional Development, Agricultural and Fisheries Toxicology and Socio-economy.

1.3 Limitations encountered and approach adopted

In preparing the present advice the Commission has encountered certain limitations. The main **limitations**, in order of importance, are:

- ! **Limited availability of documents**
The Commission has not had the opportunity to consult all relevant base-line documents and review the findings of the EIA-team.
- ! **No site reconnaissance**
The Commission did not visit the site and had no opportunity to discuss with parties involved.

1.4 Justification of the approach

The Commission studied the Terms of Reference^{4]}, as they were established by NORAD^{5]} and as they are quoted in annex 1 of the EIS. As a first step in the review process, the Commission has performed a review on these Terms of Reference. The findings are presented in chapter 2.

Review of the EIS alone would result in a series of remarks and observations. The report of the joint formulation mission (JFMR) provides the Commission with clues on at least a part of these remarks and observations. The Commission will therefore consider this report as essential information in which the intended activity is depicted.

4 referred to as TOR-EIS, see appendix 3

5 in conjunction with Netherlands Aid and UNIDO

It was found that the scope of the terms of reference of the EIS is limited, a more extended framework was elaborated. The Commission did so in the intention to have at its disposal a comprehensive checklist of aspects of the project that may influence environmental quality. The proposed framework of criteria is based on international criteria with reference to Pakistan's Environmental Protection Ordinance^{6]} and criteria of the Asian Development Bank.

On a recommendatory basis the Commission will use this framework to review the EIS on headlines. Since no definite criteria are available, selection of these headlines is the result of a joint "best professional judgement".

Observations regarding this review are presented in chapter 3. Chapter 4 presents conclusions and recommendations.

2. REVIEW OF THE EIS ON THE BASIS OF ITS TERMS OF REFERENCE (TOR-EIS)

2.1 General remarks

The EIS was compiled within one month. The hydrologist, the agronomist and the community health specialist formulated their contributions within a period of two weeks. The public health specialist and the fisheries/wildlife expert produced their contributions in one week. The combination of limited availability of base-line data and limited expertise input must have preconditioned the comprehensibility of the EIS.

The EIS for Kasur Tanneries Effluent Treatment Plant contains a great deal of information, not explicitly asked for by the terms of reference (TOR-EIS). Points of departure, problem analysis, the intended activity, expected positive effects and institutional aspects are described in the EIS.

Scoping of the possible environmental effects of the individual parts of the intended activity^{7]} led to selection of 3 project activities, of which environmental effects should be assessed in the EIS^{8]}: the pre-treatment plant, the sludge treatment and disposal and the drainage of stagnant lagoons. The TOR-EIS^{9]} prescribes the methodology that should be adopted in assessing the environmental effects.

6 see appendix 6 of this advice

7 see chapter 'Identification of Environmental Issues' of the EIS

8 see chapter 4 of the EIS: Terms of Reference

9 see appendix 3 of this advice

In order to underpin the recommendations formulated in chapter 4 of this advice, the Commission has reviewed the EIS following this methodology. Her findings are presented in appendix 4.

In the next paragraph the Commission presents a summary conclusion with regard to the question whether a complete and correct description was given of the environmental effects of these activities, as asked for by the TOR-EIS.

2.2 Completeness and correctness of the EIS on the basis of the TOR-EIS

With regard to the reliability, correctness and completeness of the EIS the Commission comments as follows:

The Commission observes that the absence of reliable base-line data and the limited time-span, afforded to the mission of the EIA-team, probably forced this team into a strategy of use of non-verifiable assumptions in some essential fields. These include health aspects, groundwater contamination at the landfill site and the stagnant pools and the possibility to reclaim the land now occupied by the stagnant pools.

In other fields adoption of assumptions was even not feasible. These subjects were not addressed at all. They include demographic developments, housing, employment, socio-economic issues, hydrological data on groundwater quality and quantity, up and downstream water uses and water functions, ecological matters and hazards of use and safest use of reclaimed land.

An other weakness of the EIS is that the environmental effects of zero flow rates in the Pandoki outfall and Sutley river were not fully elaborated. Also the frequency of occurrence and effect of extreme climatic circumstances and other stress factors on the efficiency of the treatment plant and effluent parameters were addressed insufficiently.

The intention of the terms of reference, as the Commission reads them, is to get grip on the environmental risks of the pre-treatment plant, the sludge disposal site and reclamation of stagnant lagoons. The Commission has the opinion that the present EIS offers insufficient reliable information on these risks. *Nevertheless the emerging picture on both the actual environmental situation and environmental effects of the activities is so alarming that the Commission dissuades all parties concerned from accepting the no-action alternative and the continued uncontrolled development of the present situation.*

3. RECOMMENDATORY REVIEW OF THE PROJECT ON HEADLINES

3.1 General

Detailed review of the project on the basis of the international criteria¹⁰] resulted in a series of observations made the Commission. These observations relate essentially to three fundamental topics, which, if not effectively addressed by the project, may lead to failure or malfunctioning of the proposed activities and, as a result, to serious irreversible environmental damage. Two of these topics have already been addressed in the project documents. These topics relate to:

- ! 'institutional embedding' (including financial security), that will be discussed under the heading 'Institutional sustainability';
- ! 'Technical feasibility', that will be discussed under the heading 'Physical sustainability'.

The other observations relate essentially to social aspects and to involvement of the population in project preparation and implementation. As these aspects received little attention in the EIS and in the JFMR, they will be discussed first under the heading 'Social sustainability'. This is done because the Commission feels that without adequate attention for the social aspects, in spite of technical and institutional achievements the project's implementation still cannot yield a sustainable result.

3.2 Social sustainability

Recognition of the problem

In the EIS and the JFMR comprehensive attention has been paid to the sanitary and health situation in the town of Kasur, especially in those quarters of the town, where the clusters of tanneries can be found. Equal attention has been paid to the sanitary situation in the outskirts of Kasur, the district, where the circumstances in the vicinity of the three stagnant pools, along the Pandoki outfall and the Rohi Nullah received justified attention. By necessity, in view of the dearth of reliable statistics, the description of the situation is essentially qualitative. This does, however, not imply that the Commission feels the need of collection of more quantitative evidence before anything can be done. Some members of the Commission are acquainted with the sanitary situation in Kasur from their own experience and fully agree with the felt necessity to act.

With regard to the project the following interest groups can be distinguished:

10 see appendix 5 of this advice

Citizens in the tannery clusters

In order to assess the environmental and sanitary situation in and around Kasur and to probe citizens opinion on the treatment plant, the EIA-team consulted citizens in several quarters of the city. This rapid appraisal^{11]} confirmed the findings of a previous UNICEF^{12]} study^{13]}, indicating water, general sanitation in and around the homes, sewerage and drainage, removal of garbage and reduction of emissions of chemical dusts and fume from tanneries as the citizens priorities.

Realisation of these priority goals will depend to a large extent on successful introduction of in-house arrangements and initiatives to improve the system of sewer lines in the clusters.

The Commission recognises that introduction of such in-house arrangements and sewer line improving initiatives are foreseen in the project. In the opinion of the Commission, however, the probability of realisation of these arrangements and initiatives is doubtful.

Tanners

In discussions with the Commission, representatives of the Tanners Association Dingarh (TAD) indicated that existing tanneries will be forced by environmental law to adopt Environmental Protection Agency standards by 1996. New tanneries will be forced to do so by 1994.

Adoption of these standards would imply heavy cost in the shape of penalties or investment and O&M costs for their own treatment plants. As a consequence the Tanners Association prefers that the project takes care of the investment and tanners contribution would be limited to O&M and replacement costs only.

Unfortunately no socio-economic analysis on the tannery sector in Kasur is available to check the capability of the tanneries to support financial costs of environmental measures. On this point, however, the joint formulation mission formulated the following statements:

- ! "The 162 tannery owners will benefit directly in the sense that the project will enable the continuation of their activities, which otherwise might have been curtailed for environmental reasons; they will also benefit, because they only have to pay part of the costs of pollution abatement, with the remainder being financed by various government agencies'.
- ! 'It is the mission's understanding to achieve that 100 % of O&M and depreciation costs financing from the tanners within a time span of 8 years from now does not impose an unreasonable burden on the tanners in Kasur'.

11 see EIS page 26

12 United Nations Children's Fund

13 Base line Studies of Kasur, Final Report, Lahore 1989

! 'Small tanners will benefit from the project's in-house activities: reduced waste, reduced and more controlled use of water and other resources. On the other hand extra costs are imposed for in-house improvements and for O&M and depreciation of the project. In the long run the project will thereby accelerate the process whereby the number of small tanneries will be reduced and the number of larger tanneries will be increased. It cannot be concluded that the project is of particular benefit for small tanneries compared to large tanneries'.

! 'The project will likely contribute to strengthening of the tannery sector in Kasur, and thereby increasing income opportunities and employment (also for the poor) in this sector'.

The majority of the tanneries in Kasur is small, employing up to 10 workers¹⁴]. Interpretation of the above statements brings the Commission to the conclusion that, according to the joint formulation mission the majority of the tanneries will have to end operations on the long term, giving way to a reduced number of larger tanneries.

Although the Commission is not competent to address questions about poverty alleviation and the need of empowerment of the poor, it feels hesitation to believe that the individual tanner will give fullhearted voluntary support to project activities, that in the long run will result in bankruptcy of his enterprise. Particularly it is feared that those non-obligatory investments like in-house arrangements, addressing the inorganic pollution of the environment and the sanitary situation in the clusters, will materialize with difficulty.

The Commission is not in the position to judge the project's contribution to the strengthening of the tannery sector in Kasur. Nevertheless she questions the statement that an increase in scale of the tanneries will lead to increased employment in the sector.

Fishermen

The fishing industry is an important sector of the economy in the Kasur district. Some 13.000 fishermen depend completely or partly on the productivity of the river Sutlej. Under all imaginable circumstances toxic and other environmentally harmful components will have adverse effects on the quality¹⁵] of the waters of the river Sutlej and thus on fish quantity and/or quality. In worst case scenarios fish kills are to be expected. It is not expected that fishermen will support the project, in its current design.

14 see JFMR page 6

15 by organic and inorganic contamination

Farmers

Possibly the project may have positive effects for the farmers around the stagnant pools and along the Rohi Nullah. The Commission is convinced that elimination of the stagnant pools in the long run might readjust an undeserved situation and that full support will be obtained from these farmers. The result however will be strongly dependent on the extent to which rehabilitation will be possible or the price that can be realised in selling the land.

Public interest

In the Commission's opinion the public interest of the proposed project is beyond discussion. Protection of the groundwater from further pollution through infiltration of effluent and percolates is of eminent importance. Groundwater is the source of drinking water for the population of the town and the district. The same applies to protection of soil ecosystems and all other endangered ecosystems. Moreover it is essential that the productivity of agricultural lands and animal herds is compromised. The necessity of improvement of the sanitary and environmental situation in the town is not in doubt. However, it should be stressed likewise that protection of effluent receiving waters, as a direct or indirect source of income for many people and a source of drinking water for humans and cattle, is at least of equal public importance.

3.3

Institutional sustainability

It should be emphasized that the institutional sustainability of the proposed project setup, as formulated in the mission's report, can only be judged in the light of the present institutional status in pollution control in Pakistan.

It should also be emphasized, as stated in the JFMR, that 'the most significant project risk is the risk that proposed institutional and financial arrangements to implement and operate the project will not work'. In the EIS the institutional sustainability is not addressed. In the JFMR however, the institutional structures, entrusted to adequately address the pollution problem, are described. No alternatives are discussed, however. The mission states: 'the proposed set-up is the most viable operational solution, but it is essentially untried'.

In order to facilitate functioning and future replacement of the technical structures, the institutional structures, once they will be created by legal agreement, will receive the power to raise contributions at the level of the individual tannery. The height of the contribution of the individual tannery is related to its water consumption, as measured by water meters which will be installed. Non payment of the contributions due will expectedly lead to closure of the tannery.

The Commission questions the viability of the institutional structure.

1. As both costs of O&M and depreciation of the technical structures are charged to the tanners, the scheduled Kasur Tanneries Waste Management Board will have to manage sizeable amounts of money. The significance of the tanners control over these amounts seems to be in disharmony with the low number of 3 delegates as compared to the total number of 13 members. Moreover non-organised tanners are not represented.

The institutional framework, as it has been described, is essentially structured to enforce the 'polluter pays principle'. Although the Commission cherishes the merits of this principle, it doubts whether the proposed structure will have the perpetual confidence of the tanners and will lead to the pursued regular payment of the dues. This doubt is further enhanced by the fact that the individual tanner may exhibit an attitude of relative indifference towards at least part of the objectives of the project or may even oppose implementation of these objectives due to financial priorities¹⁶].

Therefore the Commission fears a low involvement of the leather industry and an undermining of the financial basis of both the institutional and the technical structure.

2. In the Commission's opinion the proposed institutional structure is rather heavy and complex for containment of pollution caused by the tanneries alone. It assumes the structure is also meant to manage the future Kasur Integrated Environmental Improvement Programme (KEIP). It is felt, that for attainment of the objectives of the KTPCP-project alone, regular and frequent activity of the proposed Kasur Tanneries Waste Management Board (KTWMB) can hardly be expected.
3. General aspects of the institutional structure Kasur Tanneries Waste Management Agency (KTWMA) are addressed in the project documents. Further elaboration of this structure, however, is lacking. E.g. information on the transfer of responsibilities at the end of the project has not been included. The Commission thinks that the proposed agency should function on a semi-commercial basis.

16 see chapter 3.2 on social sustainability

General

The technical orientation of the project design has been preconditioned by the felt necessity to act rapidly and to apply a least cost\ highest simplicity' approach. The Commission understands that the striking extent of the actual environmental degradation and the speed at which it proceeds asks for rapid action. The least cost/highest simplicity approach for the lagooning system was most probably chosen on the basis of maximizing the acceptability for the tanners. This reasoning becomes even more explicit after the conclusion that this cost/simplicity approach is non-existent at all for the chrome recovery technology, where a too expensive, complicated and unreliable technique is selected which probably will never reach the status of application in Kasur tanneries. This seems the reason why the cost and trouble of such technology is of no actual concern of the Kasur tanners. Much more seriously, however, is the fact that the selection of this chrome recovery technique instead of existing, well practicable, cost-effective methods forms a blockade to introduce economical viable in-plant measures and to make any start with the essential source-oriented environmental technology. The Commission observes that sufficient attention for effectiveness at short as well as long term is missing. For both types of technology a more adequate balance should be pursued between costs, effectiveness, reliability and simplicity in order to ascertain structural improvements to an acceptable level also at the long term.

The strong accent on 'End of Pipe' treatment has hindered consideration of adequate in-house pollution-reducing arrangements¹⁷]. As a consequence a substantial part of the pollution is not treated but only diverted. Moreover the Commission has the feeling that the present approach has hampered adoption of an integral comprehensive approach of all sanitary problems of Kasur at the time.

In-house arrangements

In the opinion of the Commission the most effective way of tackling the pollution problems is at the source. Successful introduction of cleaner technology could determine design, dimensions and costs of 'end of pipe' facilities to be installed. Therefore these technologies and their introduction should form an integrated part of the project.

The Commission thinks that their introduction combined with limited central waste water treatment facilities will lead to the most effective reduction of environmental pollution.

This implies much more emphasis on process-integrated environmental technologies, which can easily be implemented in industry.

17 see also chapters 3.2 and 3.3 on social and institutional sustainability

In this respect the chrome-recovery technology should be much more directed to existing low-cost and easy handling methodologies instead of the relatively sophisticated and expensive technology proposed in the documents.

Collection of sewage

The collection system for sewage is described as a system of open sewers. This system may be the best feasible option under the circumstances, but is certainly not the most hygienic solution. Coverage of the open sewer system in densely populated areas is recommendable. Corrosion due to high sulfide contents is a potential risk. Connections sensitive to corrosion should therefore be protected e.g. by lining or application of alternative materials.

Pre-treatment plant and effluent quality

In the actual project design, the pre-treatment plant will have to cope with the pollution caused by 162 tanneries handling some 180 tons of salted hides per day. These tanneries actually produce a daily emission of 9000 cubic meters of sewage water carrying 80 tons of sodium chloride, 80 tons of sodium sulfate, 5 tons of Chromium and a quantity of organic pollutants equivalent to 30 tons COD^{18]} and 15 tons BOD^{19]}.

Salt and sodium sulphate will not be removed by the pre-treatment plant. The daily maximum BOD-load in non-mechanically aerated lagoons is estimated at 300 kg/hectare^{20]}. As in Kasur the actual daily oxygen demand of both industry and households is roughly 30 tons, than in principle 100 hectares of lagoon surface would be needed for odour free operation. If for industrial sewage the "marginal" removal of 60% of the BOD is judged acceptable, 30 hectares of lagoons surface will be needed. Equal oxygen adding effect could be obtained from forced aeration demanding electrical power input of 750 kW in the case of total BOD removal and 250 kW in the case of 60% removal of industrial BOD.

The proposed retention time of 4 days can only be obtained when 9000 cubic meters of industrial sewage is processed. Any excess input will reduce retention time and result in reduced removal of BOD.

With the proposed 4.2 hectares lagoon surface less than 30 % of the industrial oxygen demand can be covered and effluent quality will be far from meeting the standards, as they were given in the project documents.

18 chemical oxygen demand

19 biological oxygen demand

20 see EIS page 66

In this case the plant will not remove sulfide but will probably produce sulfide, resulting in additional odour nuisance. This implies that in the proposed situation acceptability of discharge in the Pandoki outfall and the river Sutlej is disputable. An additional mitigating measure, in the form of a buffering basin, will be needed.

Therefore the Commission is of the opinion that normal operation of the plant, as designed within the framework of the project setup, will imply severe environmental hazard and that, in order to neutralise this hazard, the oxygen adding capacity of the facilities should be multiplied tenfold.

As the oxygen adding capacity of every hectare of lagoon surface corresponds with on average the oxygen adding capacity of 8 kW of electric power, establishment of an effective and save treatment plant becomes a compromise between the price of land and the price of O&M of forced aeration. As the Commission has no information on these prices it cannot formulate recommendations on the issue.

Sludge and solid waste disposal site

The Commission confirms the conclusions of the JFMR on the landfill. It is not expected that Chromium will pose a problem as long as acidity is kept between physiologically acceptable limits (for instance between pH 5 and pH 9). Monitoring of salt percolation can be considered but is, in relation to the hazards of other project activities, of minor importance. As precipitation is low, percolation of salt is probably very limited. Direct covering of the waste will be necessary to avoid odour nuisance and nuisance of drifting waste.

Elimination of stagnant pools and use of reclaimed land

The hazards and applicable technical procedures of reclamation of the land under the stagnant pools can only be judged from data concerning the level of contamination of the soil and the groundwater. These data are not available.

Nevertheless the Commission feels that with a precipitation deficit of 1000 mm per year natural removal of the undoubtedly enormous salt pollution is not easily feasible. It is feared that reclamation for agricultural or housing purposes can not be expected within a foreseeable time span. Further reliable conclusions about future use cannot be drawn. If percolation of water of the stagnant pool occurs, the necessity to avoid further pollution of groundwater, however, imposes elimination of the lagoons. This, however, carries the risk of inappropriate use of these lands following their reclamation.

A detailed study will be needed to assess the extent of the pollution, to determine the methodology to be used for an eventual clean-up in relation to its desired use in future and to estimate the costs thereof.

4. CONCLUSIONS AND RECOMMENDATIONS

The Commission has the opinion that those subjects that are insufficiently addressed in the EIS, should be addressed in a supplement to the EIS.

The Commission sees the problems this implicates and, therefore, comes to the following observations and recommendations:

4.1 Social aspects

Although public interest in the project is beyond discussion, the support for the project from social groups is clarified insufficiently. The EIA-team assessed the priorities of the community as: better environmental and sanitary conditions in and around the homes. In its proposed set-up the project hardly addresses this situation. The Commission feels that local communities should be actively involved in all stages of project. If this is not properly done the project will not gain her (crucial) support.

Although no socio-economic study on the tannery sector was available, the formulation mission concluded that the project accelerates the process of reduction of the number of smaller tanneries, as these might not be able to bear the costs of environmental measures. Under such circumstances it seems doubtful that the owners of the smaller tanneries will voluntarily cooperate in project activities. A socio-economic survey of the sector should be carried out.

4.2 Institutional set-up

The composition of the proposed board seems to be rather broad and heavy for the management of the pollution of the tanneries only. The interests of the tanners seem to be insufficiently represented in this board. In future the tanners will have to finance the structure. It is feared that in the proposed set-up tanners will seek ways to sidestep these financial obligations. As alternative a more flexible and lighter structure, in which public interest and tanners interest are well balanced, should be considered and discussed with parties involved.

4.3 Waste water treatment

The EIS contains too little information to support founded decision making on waste water treatment. The preset limits, induced by the least cost/highest simplicity approach, preclude consideration of valuable alternative solutions for the problems identified.

The Commission feels that these limits should not have been set. In the proposed setup a substantial part of the pollution problem is not solved but diverted to the river Sutlej.

Therefore the Commission advises consideration of alternative approaches, addressing the waste management problem in an integral way and giving precedence to pollution prevention arrangements²¹].

4.4 Sludge and solid waste disposal

The Commission concurs with the findings of the EIA-team and the joint formulation mission with regard to the realisation of the solid waste and sludge disposal site (landfill).

4.5 Elimination of pools, use of reclaimed land

In sufficient data is available to decide *if* the pools should be eliminated, *how* this should be done and *what* should be done with the land, once reclaimed. The Commission recommends a detailed study of the extent of the pollution and the modalities of an eventual clean-up operation.

4.6 Environmental and health monitoring

Although the present health situation of the people living in Kasur could not be determined in detail, it seems obvious that working- and living conditions are poor. No doubt this has a great impact on the health status of the population and improvement of this situation is required urgently.

To achieve optimal results it is very important to carry out an overall strategy to improve labour and living conditions in Kasur. If only the activity (the tanneries effluent primary treatment plant) mentioned in the EIS will be implemented, this probably will not lead to a measurable improvement in health status.

The local sewerage system, the total waste disposal (households, tanneries, other industries) and other generally poor conditions (availability of health services, water supply etcetera) must also be considered.

To establish true severity of the health situation, a long term epidemiological study is recommended in the EIS. This study should include the following groups:

- ! those "receiving both occupational and environmental exposures"
- ! those "exposed only during occupation"
- ! those "exposed only through ambient environment"
- ! those "unexposed in the non-polluted areas"

21 see appendix 7

It is stated that this will help in identifying any morbidity and mortality differences between these sub-populations. In the JFMR it is proposed to carry out a feasibility study for health monitoring in Kasur. This would require a public health specialist for about one month. This consultant should select a health monitoring system which is easily operated and based on feasible and economically cheap methods. The idea of selecting one or several "indicator diseases" might be found more feasible than complex measures on many diseases and phenomena.

Generally speaking epidemiological studies can identify morbidity and mortality differences between different population groups. However at this stage it might prove to be quite a troublesome undertaking. Up to now there are no reliable statistics on mortality. Whatever a relative of the deceased reports as cause of death is written in the death register. A mere 1-2% of people who report deaths present a death certificate prepared by a doctor. As far as the morbidity data are concerned: the cause of many recorded symptoms is not registered. This implicates that at this moment it is almost impossible to compare different groups as mentioned above, because interpretation of results will be extremely difficult.

Perhaps one of the most important questions at this stage is "what are the benefits of performing an epidemiological study?" It is very likely that conclusions drawn from it do not differ from ones already drawn, namely that improvement of the general living and working conditions in Kasur is required.

It is wiser to invest time and money in a sort of overall "investigation/monitoring" programme in Kasur, instead of trying to accomplish an epidemiological study.

In the JFMR the following approaches are envisaged for adoption as part of the project:

- ! to develop baseline data, to control the impact of tanneries' operations on the environment and various health risks for the workers and the town population;
- ! to measure the micro-climate in line with WHO standards for maximum concentration of potentially harmful and toxic agents in tanneries;
- ! to promote strict adherence to safety at work regulations; to suggest improvement as required;
- ! to disseminate information on chemicals safety data²²], on maximal permissible concentrations of gaseous harmful substances;
- ! to promote appropriate safety measures for machine operators.

A practical approach could be:

1. To improve occupational health and safety for the workers in the tannery industry, first of all a thorough occupational hygiene analysis must be made of all processes involved in this industry. A list of potentially harmful and toxic agents (biological, physical, chemical) associated with the tannery industry should be developed (in very close cooperation with the technical engineers).
2. In order to assess tanneries' impact on the environment and general health, data on pollutant loads of the surface waters²³], samples of groundwater, air, soil and foodstuffs like fish, meat and agricultural products can be collected. Special attention should be given to estimate exposure to harmful/toxic agents in various population groups (for instance children).
3. Information on potentially toxic agents (and protection) should be provided to workers, for instance by means of meetings and clear safety data sheets (pictogram-style).
4. This information should also be given to physicians and health care workers. Ideally agreements on how to define symptoms and diseases could be made enabling future epidemiological studies (if there is a need). Setting up an adequate morbidity and mortality register is worth considering. Also special emphasis on preventive health care is important.
5. Attention should be given to the impact of infectious diseases, in particular the vector-borne diseases on the general health condition²⁴].

23 the Rohi Nullah, the Pandoki outfall and the river Sutlej, upstream and downstream of the discharge point

24 existing and possibly the development of new breeding places of mosquito's et cetera