TABLE OF CONTENTS

Appendices

MAIN POINTS OF THE ADVICE

The Commission for Environmental Impact Assessment considers the following points in this advice as crucial in the Environmental Impact Statement for the Tannery Sector Development Strategy for Multan:

- In order to achieve sustainable results from project interventions they should be based on an approach that analyses the situation in the individual tannery and addresses its activities to and coordinates them with future developments in the individual tannery. In the EIS realistic assessment of pollution abatement can only be achieved if it is based on this approach.
- Five or, if relevant, more strategies must be described and compared for their environmental performance and impacts, their socioeconomic impacts, their institutional and organisational feasibility and their financial and economic consequences and sustainability.
- Pollution and nuisance abatement is the main objective of the strategies. Pollution and nuisance are the result of in-house activities. Therefore, tannery in-house activities must be addressed with priority.
- From the EIS it must become clear if environmental legislation can play a role in pollution abatement in the tannery industry and if so, how it will play this role.

With regard to the economic study related to the EIS for the Tannery Sector Development Strategy for Multan, the main points of advice are the following:

- Alternative strategies as described in the EIS for Multan, must be tested on their cost effectiveness. This is essential as the selection of the most optimal strategy is to be based – next to a technical, environmental and institutional rating – on the rating of its cost effectiveness.
- In order to determine the degree of financial sustainability, *the ability* and willingness of the beneficiaries to pay for the operation and maintenance costs (O&M) of the proposed alternatives, should be clearly indicated.
- Risks must be identified and classified as low, medium and high, with regard to non recovery of O&M costs and investment costs of proposed alternative strategies. Qualification and quantification of these risks are to be based on results of sensitivity analyses.

1. INTRODUCTION

In the framework of the environmental rehabilitation of the Tannery Sector in Multan, the Pakistan Tanners Association (PTA) has foreseen the formulation of a Tannery Sector Development Strategy for Multan (further referenced as TSDSM).

The TSDSM must cover the environmental performance of in-house processes and working routines – including options for application of high exhaust tanning techniques, chrome recovery and chrome reuse – options for relocation of tanneries, solid waste management, effluent collection and treatment, public and occupational health improvement activities, monitoring and evaluation.
The overall objective of the TSDSM is to control environmental pollution caused by tanneries and in this way to comply with National Environmental Quality Standards (NEQS) that will be in force by the first of July 1996 and with future international requirements for leather production.

In order to cover the costs of formulation of the EIS an application for MILIEV[1]] funding will be submitted.

In his letter of 16 January 1996 (see appendix 1) the Minister for Development Cooperation requested the Commission for EIA[2]] to advise on Terms of Reference for an environmental impact statement (EIS), including socioeconomic, financial and institutional aspects, for the Multan Tannery Sector Development Strategy. The Environmental Impact Statement (EIS) will be written to support decision-making on the TSDSM.

This advice is the fourth advice of the Commission for EIA relating to the tannery industry in Pakistan and is formulated in line with the philosophy of the previous advices. A working group of the Commission (see appendix 2), composed of four experts (one of them of Pakistan nationality), visited Pakistan from 14 to 26 March 1996 (for the programme of this visit, see appendix 3).

The working group was assisted by the PTA and by the Director General of LIDO[3]] as resource person. The Commission expresses her gratitude for the excellent reception and the support experienced from the PTA and the Royal Netherlands Embassy in Islamabad.

---

1 Programma Milieu en Economische Verzelfstandiging, the Netherlands Industry and Environment Programme. This programme is established to co-finance initiatives that have a direct beneficial effect on the environment. Only Dutch commercial enterprises may apply for contributions of the MILIEV programme.

2 Further referenced as 'the Commission'.

3 Leather Industries Development Organisation

2. JUSTIFICATION OF THE APPROACH

EIA usually does not include financial and economic analysis. On the contrary, the specific objective of describing environmental aspects in a separate document (the EIS) is to emphasize the importance of environmental impacts in the decision-making process on economic activities.

The EIA for TSDSM has a strategic character. A number of alternative development strategies are worked out with regard to their environmental and socioeconomic impacts and their institutional and organisational consequences. According to the Commission it is not useful to describe alternative strategies if these strategies are not realistic from the financial point of view. Any strategy must be checked for its acceptability for the stakeholders. It must be conceded that this acceptability mainly depends on its financial consequences.

Moreover, it must be acknowledged that financial and economic parameters often play a decisive role in decision-making. Without adequate information on the financial consequences of the strategies as a whole, no decision will be made whatsoever.

Therefore, in this EIA procedure information is provided not only on environmental and socioeconomic impacts and institutional consequences of the strategies. Information on financial consequences for the individual tannery and on the overall financial viability of the strategies is also provided.

This approach has the advantage that all possible strategies are compared on all relevant parameters at one time and no strategy is 'a priori' excluded from this comparison on the basis of an analysis using a limited number of criteria.
Moreover, it has the advantage that all information required for decision-making will be available at the same time and decision-making can readily take place.

In order to sustain the objective and format of EIA, the financial analysis of the strategies will be presented in a separate document. The summary results of this analysis will, however, be included in the table of comparison of the strategies in the EIS.

3. BACKGROUND, PROBLEM ANALYSIS AND OBJECTIVES

3.1 The situation as observed by the Commission

From the 59 tanneries in Multan registered at the Municipality, 50 tanneries are scattered over three residential areas in the city, housing 2.5 million inhabitants. It appears that some 40 more non registered tanneries exist within the city borders. The whole range of tannery processes is represented. From raw hide to wet blue[4]], from raw hide to finished leather [5], from wet blue to finished leather and bag-tanning. Part of the smaller tanneries work as a contractor for bigger tanneries. Related industries and activities (bark processing units, chemical depots and hide markets) are also found in residential areas.

In town 600 tons of solid waste are produced daily, of which 400 tons are removed by the Water And Sanitation Authority (WASA), a body that was funded in 1991. At a fixed levy of 1000 Rupees per month the tanneries in town drain their effluents in the municipal sewer system which was constructed in 1978. The system frequently chokes because of high solids content of the tannery effluent. Sewage then enters residences through toilets and floor drains. At several locations the effluent is pumped from the city borders to nullahs[6]] which drain on a river or directly to a river. Part of the effluent is used for irrigation purposes. The noise and nuisance caused by the scattered tanneries inflict growing resistance of residents, who want the tanneries to relocate.

Nine tanneries are located at an industrial area some kilometres outside the city. 26 more plots are reserved for or owned by tanners. This Industrial Estate was established in the 1980's on external funding. Approximately 250 industries are established on the Estate. Electricity is provided and a sewer system is present, be it in deplorable state. Between the Industrial Estate and the pumping station where the effluents are supposed to be pumped to a nullah or river (no treatment of effluent) the sewer system is choked. Effluents of the tanneries are drained in the fields surrounding the tanneries or on the sewer system. They then disappear to an unknown location. Solid waste is not collected and disposed of around the tanneries. Roads are in a deplorable condition. Irrigated crops grow close to the tanneries. Management of the Estate is virtually non existent because management interventions and spendings need approval of the industries.

The municipal and provincial authorities lack the technical and institutional infrastructure to enforce NEQS when it comes into force in July 1996.

The PTA organisation of tanners in Multan is poor. The PTA has three members and one associate member in Multan. Bag tanners are organised in the Multan Bag Tanners Association. Owners of tanneries located in the city expressed willingness to relocate to the industrial estate if the costs of relocation are compensated. It is understood that the PTA may provide management to the proposed tannery section of the industrial estate according to the Korangi, Karachi model.

Due to competitive environment, tanneries are reluctant to reveal their tanning processes and provide information on production output and target markets.

3.2 Problem statement and problem analysis

---

4 Including the soaking of hides, unhairing and liming, fleshing and trimming, deliming, degreasing, pickling and tanning.

5 Including splitting, shaving, dyeing and finishing steps. Dry and wet dyeing processes may be used.

6 Natural waterway

In June 1995 the study 'Introduction of cleaner technologies in tannery clusters of Punjab' has been published. This document proposes implementation of a general programme for promotion of a selected set of in-house measures to clean up tanning processes. This programme was meant to cover the whole of Punjab. In October 1995 a 'Techno-economic study of CETP for tannery clusters in Punjab' has been published. From these PTA studies it is clear that the importance of the environmental problem is directly related to the technology used in the tanneries and to the discipline with which these technologies are applied and partly to their location in the residential areas. Relocation of tanneries without in-house improvements will not solve the environmental problem but relocate it. This means that the control of environmental pollution must start in the tanneries by adopting improved technologies and better working routines. According to PTA and the Commission for EIA cleaner technologies and better working routines are presently available.

3.2.1 The in-house subproblem

The in-house subproblem may thus be redefined as possible reluctance to adopt cleaner technologies and reluctance to adopt more disciplined working routines. In the EIS this subproblem must be analysed as follows:

- **The scope of the problem**
  In the PTA studies substantial quantitative information on the problem is given. On the basis of this information and information to be collected in the framework of this EIS a quantification must be given of significance of the environmental problem, specified for type of waste stream generated/ emission caused and specified for each of the three residential areas and the industrial estate where tanneries are located.
- **Possibilities to reduce the problem**
  The EIS must assess the feasibility of introduction of cleaner technology and analyse (assess the reasons for) possible reluctance against adoption thereof.

For the following reasons an individual approach is necessary:

- The EIS must describe the processes, the technologies used and the working routines practised, giving a description of their environmental performance. As stated above, the technology and processes, especially also chemical processes used are specific for a given tannery.
- Resistance against adoption of cleaner technology is also an individual feature of the tannery.

  Probably only cost-effective alternatives for processes, technologies and routines presently in use will be acceptable for the tanner. These cost-effective solutions must be designed for each individual tannery[7]] and fit in its planning. Realistic reduction figures for environmental pollution can only be obtained from an individual approach.

The problem must therefore be formulated and the problem analysis must therefore be done for every individual tannery. Only then impacts of strategies can be reliably assessed. Confidentiality and discretion in handling sensitive information are prerequisites. An industrial counselling team may collect this information in a separate activity, not linked to EIA writing.
The Commission thinks that for this individual problem analysis the following information is needed:

Base data:

- origin of raw material (cow, buffalo, sheep, goat, et cetera);
- type(s) of tanning processes (vegetable, chrome, et cetera);
- type of raw material (cow, buffalo, sheep, goat / raw, semi-finished);
- type of end product (wet blue or finish);
- installed capacity[8]] in (square metres of) hides or skins processed per day;
- unit processes applied;

and on the basis of installed capacity:

- chemicals (qualitative/quantitative) in unit processes used;
- water consumed (in liters/day, or litres/[hide or skin]/day);
- waste water produced (in liters/day, or litres/[hide or skin] /day and seasonal variations) (composition)[9]];
- mass of solid waste produced, differentiated to origin of solid waste[10]].

Overall process changes envisaged in next five years in terms of

- origin of raw material (cow, buffalo, sheep, goat, et cetera);
- type of raw material (raw skins, semi-finished, finish);
- type of end product (wet blue or finish);
- installed capacity in (square metres of) hides or skins processed per day;
- unit processes applied (including possibilities for high-exhaust tanning);

and on the basis of new installed capacity:

- chemicals (qualitative/quantitative) in unit processes used;
- water consumed (in liters/day, or litres/[hide or skin]/day);
- wastewater produced (in liters/day, or litres/[hide or skin] /day and seasonal variations) (composition)[9]];
- mass of solid waste produced, differentiated to origin of solid waste[10]].

Detailed process changes envisaged:

- application of cleaner unit processes and consequences of each in terms of impact on:

---

7 Related to type of raw material used and market segment served.

8 Installed capacity gives an indication of the maximum production capacity possible. Therefore, this is the capacity that will result in the maximum load to the effluent treatment plant.

9 The average waste water discharge and composition may best be estimated via conversion factors, for example based on data in the Kanpur project and/or from literature, and on the processing capacity for each type of process.

10 A similar approach as used for estimation of waste water production can be used to estimate solid waste components.

- water consumption;
- chemical usage;
- effluent quality (COD, inorganics, metals);
- solid waste produced;

! possibilities for segregation of liquors (salt stream, chromium stream, et cetera) and solid waste flows;

! availability of physical space for application of cleaner unit processes.

Miscellaneous

! financial feasibility of envisaged process changes.

Coupling of the in-house improvements as much as possible to ISO[11]] 9001/2 and ISO 14001 requirements would give the tanning industry in Pakistan a comparative advantage on international markets.

3.2.2 The cumulated problem

For the EIS only the information on actual emissions and on emissions after implementation of in-house improvements[12]] is of interest. This information may best be presented in tabular form. The cumulated figures for all tanneries may be presented in a similar table.

3.3 Objectives

The overall objective of TSDSM is to reduce environmental problems caused by tanneries. This objective must be made more specific by setting targets for reduction of specific waste streams and other emissions per individual tannery. This can for instance be done by assessing maximum reductions allowed for by available best technology and subsequent fixing of a target reduction percentage to be achieved by every individual tannery. With regard to reduction of effluent pollution loads, it is clear that for tanneries that are not willing to relocate and will not drain their effluent to a Central Effluent Treatment Plant (CETP) on the Industrial Estate, the target reduction percentage may be higher than for tanneries that drain to a CETP (and bear the O&M-costs of the CETP).
The law indicates that liquid industrial and municipal effluents will have to comply with NEQS from the first of July 1996. Important penalties are said to threaten sewage dischargers, whether private or government bodies, if NEQS are not met. Cost-effective realisation of this standard will thus have to be fixed as one of the objectives of any tannery sector development strategy for Multan.

4. SETTING OF THE TSDSM

4.1 Legal setting

The EIS must enumerate the laws and regulations that are applicable for the activities undertaken under the TSDSM and a concise description must be given of their implication. The EIS must also list the policy decisions that have been made in the past and will be made in the near future that may influence the implementation of the TSDSM.

---

11 International Organisation for Standardisation.

12 In kgs pollutants, nuisance and noise levels.

The EIS must describe voluntary and non voluntary requirements with regard to environmental performance of production processes for tannery as required by consumer countries (eg. Eco-label). The EIS must also indicate to what extent the TSDSM may assist tanneries to comply with ISO requirements, for example ISO 14001, referring to environmental management systems.

The EIS must describe how the TSDSM relates to and fits in development plans of the municipal authorities (the Municipal Council and the Municipal Development Authority) of Multan.

4.2 Institutional setting

The EIS must describe the institutional structure that is presently responsible for central services to the tanning industry. Responsibilities, tasks and available means must be specified for each contributing institution.
Special attention should be given to institutions for law enforcement and regulatory control. A description must be given of the mandate given by the government to these institutions.

4.3 Overview of donor assistance to the environmental sector

With special reference to the tanning sector in Pakistan the EIS must present an overview of assistance programmes in the field of industrial pollution control and cleaner production which have been or are being developed with international donor assistance (for example ETPI). Also those programmes that have not materialized must be mentioned (for example the World Banks project to assist Sialkot Industrial Estate).

4.4 Public involvement

Different groups are affected by the environmental consequences of the functioning of tanneries. Labourers in the tanneries, residents in and around the tanneries, residents downstream the sewers carrying effluents, farmers who have their land inundated with effluent or who have to irrigate with polluted water, fishermen, environmentalists representing affected ecosystems, et cetera.
In the EIS their opinions on the TSDSM and its objectives and activities must be reflected so that they may play their role in decision-making. This may be realized by organisation of public hearings and summarizing in the EIS the results of these hearings. Special attention must be paid to vulnerable groups in the society (eg. women, children labourers, who may not have direct possibilities to express their views and defend their interests).

5. STRATEGIES

5.1 Introduction

The EIS is meant to provide information on the environmental, social and economical effects and the institutional implications of a number of realistic strategies for the development of the tannery industry in the town of Multan and its surroundings. Realistic means that there is a fair chance that they are feasible and that they will materialize. Phasing of implementation is proposed if phasing adds to a rational and effective solution of the problem.

The PTA and the Multan municipal authorities strive after relocation of the tanneries to the industrial estate. On the basis of conception of the problems acquired during the site visit[13]] and discussions with parties involved, the Commission proposes five strategies to be worked out and compared to one another. During EIA-writing it is not unlikely that other strategies prove equally or more realistic than the proposed strategies. Additional strategies may therefore be included in the EIS.

One of the strategies or a combination of strategies must be developed as the strategy most friendly to the environment. In this strategy measures may be foreseen to improve its environmental quality to an optimum.

13 See chapter 3 on problem analysis.

5.2 Proposed strategies

5.2.1 The no action alternative

In this strategy no action is undertaken to intervene in the situation that is developing at this moment.

5.2.2 No relocation. In-house improvements and installation of CETPs in the city.

Relocation of the tanneries has already been discussed for many years. Yet the majority of the tanneries are still functioning within the city limits, although some of them possess plots in the industrial estate and for even more tanneries plots have been reserved.
There is a clear reluctance to move over to the estate and it is beyond the capacities of the municipal authorities, the PTA or other bodies to force the tanners to move. In this strategy tanners are allowed to remain operational within the city limits on the condition that they implement those in-house arrangements that are necessary to prevent nuisance to neighbouring residents and that allows uncompromised continuous and proper functioning of the city sewer system. Emissions of chromium are stopped. Moreover, emissions that may hamper the functioning of the city sewer system and the CETPs are stopped as well. The Government raises the necessary funds to rehabilitate, operate and maintain the sewer system and to operate and maintain a number of CETPs to be installed at the city limits. The Government imposes in-house improvements on those tanneries that have not adopted these improvements as a result of a PTA in-house improvement promotion programme. Funding for establishment of CETPs is sought and found.
EPA Punjab is strengthened by the Central Government and given the facilities to enforce NEQS for both the industrial estate and the city.

5.2.3 Relocation in the long term. In-house improvements now.

Although in-house arrangements are gradually implemented in all tanneries, yet pressure from residents around the scattered tanneries to relocate them is raising. Moreover, space for further expansion of the tanneries is lacking. In this strategy the management of the industrial estate is strengthened and the management structure will raise the necessary funds to rehabilitate, operate and maintain the sewer and the road system at the industrial estate and to operate and maintain a CETP to be installed in the tanneries zone of the estate. A solid waste collection and disposal service is set up. The industrial estate authority imposes in-house improvements in those tanneries that have not already adopted these improvements as a result of a PTA in-house improvement promotion programme. (The authority will also impose in-house arrangements in other industries.) Funding for establishment of the CETP in the tannery zone of the estate is sought and found.
Government raises the necessary funds to operate a sound solid waste disposal service in the city, to rehabilitate, operate and maintain the city sewer system and to establish, operate and maintain a number of CETPs to be installed at the city limits.

Government imposes further in-house improvements in the scattered tanneries in the city. EPA Punjab is strengthened and given the facilities to enforce NEQS for both the industrial estate and the city. Establishment of new tanneries within the city-limits is not allowed. Relocation of especially those tanneries that use wet processes to the industrial estate is promoted. Major changes to/expansion of existing tanneries capacity in the city are not allowed as well. In the long run tanners will eventually disappear from the city by relocation or by changing business.

5.2.4 Relocation of all tanneries and installation of a CETP on Industrial Estate

In this strategy the Government imposes relocation. On the other hand relocation is promoted by giving some form of assistance to the individual tanner. Relocation is phased. In a first phase the

management of the industrial estate is strengthened and the management structure raises the necessary funds to rehabilitate, operate and maintain the sewer system at the industrial estate and to operate and maintain a CETP to be installed in the tanneries zone. In a second phase improvement of the collective physical facilities in the tannery zone of the industrial estate is carried out. Moreover, a solid waste collection and disposal service is set up. The site for a tannery sector CETP is selected and the treatment system is selected in an EIA. Funding for the CETP is raised. Once the industrial estate is providing adequate facilities, relocation starts. Also, the relocation is phased. First the tanneries that produce hides and skins into wet blue of finished leather and related industries (chemical depots and hide markets) are relocated. New tanneries will have to implement in-house arrangements to minimize emissions. In a second phase the remaining tanneries (finishing tanneries and bag tanneries) and related industries (bark processing) are relocated.

5.2.5 Relocation of tanneries with wet processes only

This strategy is equal to the strategy mentioned above but relocation of tanneries is limited to relocation of tanneries with wet processes only (dry processes cause little nuisances).

5.3 Description of the strategies

A description of each of the strategies must be given specifying the following points:

5.3.1 Phasing and time schedule

A description must be given of the phasing of implementation of the strategy (if any) and an estimation must be given of time period needed for every phase and the full implementation of the strategy.

5.3.2 **Technical aspects**

Four groups of technical aspects must be described for the five strategies. Conditions for the viability of each strategy must be defined.

1. Tanneries environmental performance

   This paragraph of the EIS must present a quantitative overview of the in-house technologies[14]] and processes that will be implemented at the various phases of implementation of the strategy. Development of related industrial activities (transport and storage of chemicals, bark grinding, sodium sulfite[15]] crushing, et cetera) in the city of Multan and/or at the industrial estate outside Multan must be included in the overview.
   The in-house performance must be characterized by describing:
   - in-house technologies and arrangements adopted;
   - water use (reductions realized and quantified);
   - material reuse;
   - emissions (reductions realized and quantified);
   - waste streams (reductions realized and quantified).

   Resulting overall reduction of environmental pollution and nuisance and remaining environmental pollution and nuisance must be quantified[16]].

2. Solid waste collection, treatment and disposal

   This section must present a qualitative and quantitative information on:
   - the systems for waste collection, treatment and disposal and its operational and maintenance requirements;
   - the systems for the reuse of waste streams;
   - the possibilities to streamline and consolidate the collection of both the domestic and the industrial solid wastes in the city of Multan and of industrial solid waste in the industrial area.

3. Effluent collection and conveyance

   This section must present a quantitative and qualitative (corrosiveness and toxicity) overview of the tannery effluent production points/locations inside Multan and at the industrial estate outside Multan. Moreover, an overview must be given of the development of the quantity of waste water produced (10 years), the existing sewer lines (type of system) and their capacity (dry weather flow and peak flows allowed for), the operational condition and operation and maintenance requirements, and their possible needs for repair/upgrading in Multan and the industrial area. Qualitative and quantitative information on the discharge of the effluents at the sewer outfalls must also be provided.

4. Central effluent treatment

   If installation of CETPs is part of the strategy, the options for central effluent treatment systems in both Multan and the industrial estate must be looked at, for example in terms of
   - types of potentially suitable systems;
   - capacities;
   - operation and maintenance requirements;

---

14 Including pretreatment facilities, chrome recovery or high exhaust chrome tanning.

15 Sinters produced by burning a wild shrub locally known as Khar.

16 Cumulated emissions from tanneries and related industries in kgs solids in effluent and solid waste (specified), kgs polluting chemical substances (specified) in effluent and solid waste, direct emissions to soil and air including noise and dust, traffic intensity, et cetera.

- environmental impacts of the effluents in the receiving water bodies;
- impacts of rainwater flow on operational conditions of systems.

5.3.3 Institutional and organisational aspects

A thorough description must be given of management aspects of the facilities and the components of TSDSM.
The EIS must further describe:

- The institutional and organisational infrastructure required to implement the strategy for each of its components.
- The tasks and responsibilities that will be attributed to each body that will contribute to execution and management of the activities. Moreover, the educational and training requirements should be specified, including their costs and financing sources.

It is understood that on the short term the PTA may take up the responsibility for management and cost recovery of facilities in the three last mentioned strategies (Korangi model). The EIS must describe:

- the responsibilities for law enforcement, monitoring and pollution control under the various strategies;
- the relation between the responsibilities taken up by the proposed management structure for the TSDSM and the responsibilities taken up by the government agencies;
- the legal options available to the management structure to warrant cost recovery of central facilities.

The EIS must present an assessment of risks of failure of the managerial structure as proposed for the various strategies.

The next paragraph will address calculation of O&M costs of components of the TSDSM in each of the strategies. A description must be given as to how these costs will be recovered, on what basis and who will be the responsible party. Alternative recovery systems may be described.

5.3.4 Economic and financial aspects

Next to technical, environmental and institutional aspects, economic aspects play an important role in project decision-making. Alternatives described in the EIS are deemed unrealistic if they are financially not viable. In other words, any efforts made to improve the environmental situation involving the tannery sector in Multan, must be financially viable: individual tanners are unlikely to accept an alternative measure or technique, if its financial viability has not been clearly demonstrated.

For the alternatives as a whole (i.e. the complete set of measures to be taken in an alternative), the EIS for the Multan tannery sector must first give an indication of their financial effectiveness through a cost effectiveness analysis, and secondly, give an indication of the financial viability of the alternatives by way of a financial analysis at the tannery level.

A cost effectiveness analysis (CEA) is applied when costs can be monetarized but the benefits cannot – as is the case in selecting the best possible alternative for the Multan tannery sector. CEA is therefore to be used to select the alternative with the lowest monetary cost per unit of physical benefits. Briefly, the application of the CEA requires that expected outlays for investments, recurrent costs and any other cost element for each alternative, are available in monetary terms over a certain period of time. With respect to benefits of reduced waste water pollution for the economy as a whole, two possibilities need to be distinguished:

- Benefits are known in quantitative, physical terms for each individual alternative. For example: decrease and/or quality improvement in cubic metres of waste water according to alternative used by the tannery sector over time. In that case the discounted total costs per unit (cubic metres) of benefits – according to alternative used – can be calculated (average incremental cost method).

- Benefits are quantitatively and qualitatively similar for all alternatives. In that case CEA is confined to calculating the total discounted incremental costs for each alternative.

An important criterion in the selection of alternatives, next to the CEA, is that a financial analysis is to show that the alternative is financially viable. Results of the financial analysis are to be shown clearly per alternative and per tannery category: (i) the effect of an alternative on the financial performance of the business; (ii) the ability of the business to pay for the incremental costs during the entire economic lifetime of the alternative; and (iii) the risks of non compliance by the private sector of proposed activities to be undertaken to achieve the objectives as indicated per alternative.

In carrying out the financial analysis, the analysis is to be based on the with/ without situation: execute the proposed activity or do nothing. It is therefore important that the 'without' situation is properly defined and analysed. It is furthermore important to consider the 'without' situation during the economic lifetime of an alternative. This long term view is particularly relevant for the tannery sector because of changing market conditions, both for inputs and outputs (quantities, prices, taxation, legislation, et cetera). This means that no assumption can be made that the financial situation and the rate of disposal of effluents by the tannery sector, remains largely unchanged during the 'without' situation.

As there is a large number of tanneries in the target area, representative samples of different categories of tanneries will suffice to carry out the overall costs effectiveness analysis and financial analysis.

It is proposed that the analysis themselves are presented in detail in a separate study, complementary to the EIS. A summary of the results of the cost-effectiveness analysis and the financial analysis is to be presented in the EIS with reference to the economic study. Summary results should at least

show in impact matrix format: (i) total (discounted) incremental costs per unit of benefit or per alternative depending on the possibilities; (ii) degree of financial sustainability classified as high, medium and low.

In case alternatives are considered for financial assistance from the Netherlands MILIEV programme, the study must provide sufficient relevant data, following the criteria as used in the MILIEV programme (appendix 4). This means that the commercial, financial and economic viability of the (project) alternative must be indicated, including sensitivity analyses.

For strategies in which assistance to tanneries is foreseen, the kind of assistance and the form in which this assistance would best be given must be assessed.

5.3.5 **Realism of the strategy and preconditions for implementation**

For each of the strategies the EIS must present a motivated comment on its feasibility and sense of realism. Moreover, the EIS must present the preconditions for implementation of each strategy.

6. THE PRESENT SITUATION OF THE ENVIRONMENT AND ITS AUTONOMOUS DEVELOPMENT

6.1 General

The EIS must contain a description of the current situation of the environment and its development if no action will be undertaken (the autonomous development). This description serves as basis for comparison of the environmental and socioeconomical impacts of the various strategies. The description must be limited to those aspects that may be influenced by or that influence the strategy and must cover the complete affected area. This area may differ per aspect. The study areas must be indicated on maps. If on certain aspects adequate information is available in existing documents a synthesis of the information must be presented in the EIS and the document must be referenced.

In order to enhance the quality of the presentation of the EIS it is advisable to illustrate the existing situation (natural environment and the health situation) and the subsequent impacts of the strategies on this situation per aspect on transparent maps (overlays).

6.2 Natural environment

In this paragraph the following aspects must be addressed:

- climate;
- immissions related to tannery activities;
  - air quality (dust, pathogens, odour, chemical pollutants) and number of people affected;
  - noise and nuisance (rats, et cetera) and number of people affected;
- hydrology, geohydrology in relation to ground water extraction (ground water levels) and in relation to effluent discharges and solid waste deposits (pollution);
- drainage and road situation;
- degree and extent of pollution of aquifers and soil;
- degree and extent of pollution of receiving water bodies;
- relation between emissions of pollutants and agricultural production (including also residues of pollutants found in agricultural products);
- fish resources and the extent to which they are affected by actual pollution (residues found in fish and other water organisms);
- (rare) ecosystems and protected areas threatened.

6.3 Socioeconomic and economic environment

In this paragraph information must be provided with regard to the socioeconomic conditions prevailing in the tannery sector in Multan. The following aspects must be quantitatively and qualitatively addressed:

- macro-economic importance of leather sector;
- future economic development of the tannery sector;
- critical development bottlenecks (lack of raw material, import restrictions, foreign competition, et cetera);
- employment;
- social and economic situation of workers and their families;
- level of education and skill of workers;
- perception of workers with regard to current working conditions and possibilities to change conditions;
- degree of organisation of the tannery workers and bottlenecks for organisation;
- economic situation of affected groups (farmers, fishermen, neighbouring communities) and possible causal relations between tannery pollution and this situation;
- social and economic situation of vulnerable groups (women, children);
- perception within these groups of their position and possibilities to change this position;
- viability of small tannery enterprises (risk of having to close business).

6.4 Health and safety aspects

The following aspects must be quantitatively and, if data are available, qualitatively addressed:

- health situation of communities affected as compared to communities not affected (the health situation of vulnerable groups, children and women, should be addressed separately);
- preventive and curative in-tannery measures for occupational health and safety;
- the resulting occupational health situation (the health situation of vulnerable groups, children and women, should be addressed separately).

6.5 Institutional environment

An assessment must be presented of the capacity of the institutions that will be involved in the implementation of the strategies to assume the responsibilities and perform the tasks attributed to them in relation to this implementation. An assessment must also be made with regard to the capacity of law enforcing bodies and of the manner of law enforcement.

7. IMPACTS OF THE STRATEGIES

7.1 General

Both positive and negative impacts must be described. The impacts must be assessed and described for every specified strategy. The research methods applied to assess the impacts must be discussed and their reliability quantified.
Impacts must be qualified and quantified as much as possible.

7.2 Impacts on the natural environment

Impacts of the strategies on the following environmental aspects must be addressed:

- surface water and ground water quality (biological and chemical pollution);
- ground water level;
- air quality (dust, pathogens, odour, chemical pollutants);
- number of people affected by noise;
- number of people affected by dust;
- soil pollution from tanneries (chemical pollutants);
- drainage and road quality;
- ecosystems and protected areas;
- aesthetic values;
- agricultural production and the hygienic quality of agricultural products.

7.3 Socioeconomic and economic impacts

Assessed must be the impact on:

- overall employment and poverty within the area of influence of the tanneries;
- small tannery enterprises;
- overall working conditions within the tannery sector (including occupational health);
- medium and long term economic development of the tannery sector;
- medium and long term effect on the country's economy as a whole (tax revenues, foreign exchange earnings, savings on foreign exchange, et cetera);
- income distribution;
- position of women and children labourers;
- level of education, skill and awareness of labourers and effects thereof;
- economic position of affected groups (farmers, fishermen, et cetera).

7.4 Health and safety aspects

Assessed must be the impact on:

- the health impacts on previously affected communities (if relevant the health situation of vulnerable groups, children and women, should be addressed separately);
- preventive and curative in-tannery measures for occupational health and safety;
- the resulting occupational health situation as compared with national and international standards (if relevant the health situation of vulnerable groups, children and women, should be addressed separately).

8. COMPARISON OF THE STRATEGIES

The impacts of the strategies must be mutually compared. The no action alternative is equal to the autonomous development and must be considered as the reference situation. The comparison must be presented in a diagram/ table. The criteria on which the strategies are compared are as much as possible quantified. The scores on the criteria must be motivated.
From public participation activities organized in the context of this EIA, the weight that is given to the criteria by the general public or interest groups may be derived. Other sets of weights may be given by other stakeholder groups. These sets must be presented in the EIS and sensibility analysis may be applied upon them.

In the comparison of the strategies the following criteria must be included:

Development tannery sector

- compliance with national targets
- compliance with international import requirements (Eco-label, et cetera)

Environmental performance

- % of (re)use of (raw) materials
  - chemicals per chemical
  - raw material
  - waste
- remaining emissions (quantified)
  - to the air (stench, dust)
  - to the soil and ground water per contaminant
  - solid waste per stream
  - number of affected people by noise and nuisance
- compliance with standards and regulations
  - solid waste disposal
  - CETPs (NEQS, international [CEE])
- environmental effects of:
  - calamities (worst case)
  - disfunction of institutional structures (worst case)

Health aspects

- resulting health environment/health hazard
  - in house
  - external
- compliance with standards on labour health and sanitary conditions
  - ILO, WHO, National legislation

Technological aspects

- risks of malfunctioning of the installations
- level of skilled labour required and training needs
- the extent to which the chosen technology can be incorporated in the existing system (frequent power cuts, choking of outfall lines, et cetera)

Economic aspects

Tanneries

- investments required
- physical environmental benefits (volume and quality of waste water)
- effect on O&M costs
- effect on revenues
- financial viability

Central facilities

- investments required and financial plan
- commercial viability
- financial sustainability
- economic analysis
- risks of non recovery of O&M costs and investment costs

Institutional and organisational feasibility

- complexity and cost of the required modifications of the institutional infrastructure
- complexity/manageability of collective technical and in-house technical infrastructure
- complexity/manageability of the organisational infrastructure
- complexity/manageability of in-house operational organisation
- risk of institutional mal- and disfunction. Adequate/inadequate powers; inefficient freedom of operation on commercial lines; inadequate cooperation with other organisations involved
- risk of non compliance with (national) legal requirements and standards
- risk of non compliance with international requirements for leather production
- risk of occurrence of cost run offs and of financial deficits on account of O&M in particular.

9. GAPS IN KNOWLEDGE, EVALUATION AND MONITORING

In the EIS gaps in knowledge and information must be identified. The importance of this information for decision-making must be evaluated.

An evaluation plan must be presented in the EIS. This plan must foresee evaluation at the end of each phase foreseen in the execution of a strategy.
The evaluation may concern the following points:

- development of legislation;
- institutional buildup, staffing and training;
- progress in adoption of in-house technology and working routine change;
- construction activities;
- government support.

The EIS must indicate the agencies responsible for these evaluations.

In the EIS an environmental monitoring plan must be presented, independent of the strategy that will be chosen. This plan must include monitoring of:

- emissions of tanneries and CETPs;
- recovery of O&M costs;
- management and functioning of CETPs;
- cost-effectiveness of introduced technologies;
- efficiency of facilities after implementation of the chosen strategy.

The monitoring plan must indicate the agencies responsible for its implementation and the way implementation is funded.

10. SUMMARY, FORMAT AND PRESENTATION OF THE EIS

A non technical summary must be included in the EIS. This summary must address the major subjects of the EIS, using comprehensive maps, tables and diagrams, and be written in such diction that it provides non technicians and decision makers with a clear insight in the issues treated. The summary must be translated into Sindhi and Urdu.

It is suggested that the EIS is written in the same format as this advice for Terms of Reference. Also in the EIS itself the use of maps, tables and diagrams may considerably increase comprehensiveness and is therefore recommended.
In the EIS descriptions must be concise and limited to the essentials.