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PROGRAMME ON PURIFICATION OF INDUSTRIAL WASTE WATER

COUNTRY PAPER: LESOTHO*

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*The views expressed in this document are those of the authors and do not necessarily reflect the views of the Secretariat of UNIDO. This document has not been edited.

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SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

1. The industrial sector in Lesotho has grown from a negligible contributor to the economy in 1967 to account for 7% of Gross Domestic Product and 9% of total formal sector employment by 1987. The composition of industry is diverse but textile and agro-industries provide the largest contribution to the economy.
2. Industrial development has to date taken place without treating the problem of the management of water use and wastewater disposal with the seriousness it deserves. Visits to various industries in the context of the subject programme has revealed that only the National Abattoir, the Lesotho Dairy Products and Lesotho Pharmaceutical Corporation have facilities for their wastewater treatment. The other industries do not provide for even basic effluent neutralization before disposal into the environment or public sewer. This situation has contributed to the overloading and malfunction of the Ratjomose Sewage Treatment Works in Maseru, where most of the industries are located.
3. There is observed poor operation and maintenance of industrial wastewater treatment plants, where provided, due to a general lack of appreciation of the importance of wastewater treatment by factory managers. Correction of the current situation would require a concerted effort by both the industries and the government in ensuring adequate and appropriate training of staff.
4. In the context of industrial wastewater management the following Acts are of current importance:
 - i) Water Resources Act, 1978
 - ii) Industrial Licensing Act, 1979
 - iii) Pioneer Industries Act, 1979

These pieces of legislation provide for control of pollution of national water resources and provision of incentives appropriate to industrial establishments. The law on pollution control is hardly applied or enforced mainly due to lack of appropriate guiding standards on effluent qualities, trained personnel and necessary equipment for monitoring and analysis of wastewaters.

To make the law effective in its present form it would be necessary to maintain close liaison between the agencies responsible for industrial promotion, sewage treatment and environmental protection.

5. The government commissioned a consultancy in 1989 for review, rationalization and consolidation of legislation for the management of the water and sanitation sector. The consultancy is presently at an advanced stage of preparation of the new draft legislation. The proposed legislation addresses adequately the weak areas of the existing Acts and incorporates guidelines for wastewater standards. Its implementation however may suffer the same fate as existing legislation unless supported by training and provision of adequate numbers of management and inspectorate staff.

6. CONCLUSIONS

- 6.1 There is low level of awareness on necessity of environmental protection among industrialists.
- 6.2 Prevention of environmental pollution has not and is not presently given its due share of attention at planning stage of industrial projects.
- 6.3 The managements of existing industries do not accord any level of priority on minimization of environmental impacts caused by industrial effluents.
- 6.4 No acceptable and legally binding industrial effluent discharge quality standards are available currently but draft proposed legislation is addressing the matter.
- 6.5 There are considerable opportunities in industry to save water by re-cycling, avoiding wasteful use and using appropriate water saving production process and thus reduce wastewater treatment costs and less problems in the environment.
- 6.6 Presently there are no links between the industrial development agencies and the water agencies. This results in opportunity not being taken at an early planning stage of development to agree on optimal siting and industrial processes, on appropriate wastewater treatment technology etc.
- 6.7 The existing water law is not enforced and there is no monitoring of industrial or other effluents.

7. RECOMMENDATIONS

- 7.1 Environmental protection education, wastewater treatment courses and environmental awareness training for staff in industry needs to be organized.
- 7.2 Pollution control inspectorate should be established and adequate numbers of staff employed.
- 7.3 The Water and Sewerage Branch and the Department of Water Affairs laboratories should be adequately equipped to enable regular analysis of wastewater samples.
- 7.4 Minimum standards of wastewater treatment and other measures for pollution abatement should be set and enforced.
- 7.5 Co-operation between industrial development promotion, water supply and pollution control agencies should be encouraged.

1.0 THE LESOTHO INDUSTRIAL SECTOR

- 1.1 The industrial sector activity in Lesotho was very negligible at the time of independence as measured by its contribution to the Gross Domestic Product (GDP). The situation however changed in the post-independence period with a high rate of growth of the sector's contribution from 0.5% to 7% of GDP within the period 1967-1974. Over the years the growth of industrial contribution in the performance of the economy has been affected by factor's external to Lesotho, status of institutional support and investment incentives availed by the government.
- 1.2 The Sector comprises of small to large-scale formal manufacturing and service industries, mining and quarrying operations and numerous informal small scale industrial activities. Textile and agriculture based industries tend to dominate the production scene of the sector. Annex 1 give the list of currently licensed industries.
- 1.3 The sector is provided with executive official guidance by the Ministry of Trade and Industry while functional implementation responsibilities for government policy on industrial development is vested in agencies like the Lesotho National Development Corporation (LNDC), the Basotho Enterprises Development Corporation (BEDCO) and private sector institutions. Generally the sector institutional framework is sound except for severe lack of adequate professional staff to man the various sub-activities essential to effective and timely realisation of set objectives in industrial development. Positive trend towards correction of this adverse situation has been observed in the past two years.
- 1.4 Industrial development is mainly controlled and promoted under two existing Acts viz Pioneer Industries Act, 1969 and Industrial Licensing Act, 1969. Under these Acts a Board is empowered to decide on incentives to be awarded to an industrialist who intends setting up in Lesotho after studying the details in the application for an industrial licence.

2.0 NOTES ON SELECTED INDUSTRIES

2.0.1 The industries of particular interest in the context of UNIDO Industrial Wastewater Purification Programme in Lesotho are:

1. Brewery
2. Abattoir
3. Dairy
4. Food Canning
5. Textiles
6. Pharmaceutical
7. Tannery and Leather
8. Meat Processing
9. Wool and Mohair Scour
10. Oil Mill

2.0.2 The above industries are either existing and in operation or are proposed for establishment. Two breweries were operating in Maseru but the second one, producing traditional oriented brews, closed down about two years ago. The remaining brewery operates at its maximum capacity and it is expected that equipment renewal may increase production capacity.

2.0.3 There are numerous textile industries in Lesotho which are mainly located in Maseru and Maputsoe. The majority of these industries are mainly in finished garment production. Recently, a fabric processing plant has been installed in Maseru with principal aim of serving local garment manufacturers and also for export Market. The fabric processing plant and jeans production and washing plants require special attention with respect to wastewater disposal.

2.0.4 The Pharmaceutical Industry attracts consideration due to the potential for pollution of major township water source.

2.0.5 The only tannery existing in Maseru is not operational and as such no detail on operations could be obtained. However there are proposals to establish another tannery. Leather Industries exist in small scale enterprises. These however do not generate much wastewater.

2.0.6 A major meat processing plant exist in Maseru which handles 400-500 kilogrammes of meat per day in sausage production. The plant generally discharges wastewater through a grease and oil trap into the public sewerage system without any other form of treatment.

- 2.0.7 There are a number of small scale wool and mohair cleaning plants in Maseru. The industry of concern is principally a proposed major wool and mohair scour industry.
- 2.0.8 The above are but indicative notes on status of various sub-industrial Sectors. The following sections provide amplified notes on industrial capacity, water use and wastewater treatment and disposal for selected industries.

2.1 MALUTI MOUNTAIN BREWERY (PTY) LTD

- 2.1.1 The Maluti Mountain Brewery started operations in 1983. It is located in the Maseru Industrial Sites adjoining the Lesotho Flour Mills and the Labour Construction Unit depot opposite the Water Supply offices. The facility has two principal production lines viz soft drinks and beer production. Each line has related potable water treatment facility.
- 2.1.2 The brewery draws water from the Maseru public supply system. The potable water is passed through carbon filter and ozonator to ensure appropriate characteristics suitable for beer production.
- The beer production process uses malt, maize flour, water, hops and caramel the quantities of which, with the exception of water, is dependent on the beer brand being brewed. Approximately 30 tonnes of maize flour and 90 tonnes of malt are used every week when the plant is in full production.
- 2.1.3 Wastewater emanating from the brewing process principally comprise of water for cleaning and rinsing brewery pipework and vessels in addition to water use for housekeeping within the premises. Some spent grain and spent yeast finds its way into wastewater although reasonable facilities are provided within the plant for maximum recovery of same. In addition spent silica based filter aids at the final beer filtration plant is water washed into wastewater disposal system.
- 2.1.4 Water supplied to the soft drinks production line is initially passed through a pressure filtration process to improve on its quality as required by the industrial use. The presently installed treatment facility is very much inefficient wasting a substantial amount of backwash water.

- The water then undergoes a sterilization process before being mixed with appropriate concentrates for the various brands of soft drinks in production. The plant uses imported concentrates.
- 2.1.5 The wastewater produced in the soft drinks process mainly derive from cleaning and rinsing of pipework and process tanks as well as general cleaning of the premises. All wastewater is directed to public sewer for disposal.
- 2.1.6 All wastewater from the Maluti Mountain Brewery premises is discharged directly into the public sewerage system without any form of treatment. The wastewater has all the characteristics of beer and beverage production wastes. Primary treatment of the wastewater is achieved at the Maseru Industrial Sites Waste Stabilization Ponds before disposal for final treatment at the main Sewage Treatment Works located at Ratjomose. The Industrial Waste Stabilization Ponds do not seem to function properly presently and discharge effluent for further treatment to the grossly overloaded Ratjomose Sewage Works.
- 2.1.7 No wastewater quality and quantity monitoring is practised at the brewery nor are there facilities for its appropriate sampling.

2.2 NATIONAL ABATTOIR AND FEEDLOT COMPLEX

- 2.2.1 The National Abattoir and Feedlot Complex is a government owned company. It is an importer and exporter of beef, mutton, live cattle and sheep and also specializes in feedlot farming, deboning of carcasses, vacuum packing of commercial cuts, hides and skin processing. The company feedlot has a present capacity of 3000 cattle and 5000 sheep and land is being cultivated with the aim of achieving self sufficiency in the supply of fodder. Additionally blood, bone and meat meal are produced.
- 2.2.2 The abattoir's present daily production capacity is 75 cattle, 250 sheep and 20 goats. This production is far below the designed maximum capacity of 200 cattle per day. Most of the products from the abattoir are mainly for the local market but it is envisaged that in future a reasonable percentage of production will be for export.

2.2.3 The abattoir is located approximately 5 kilometers upstream of existing raw water intake for Maseru. It draws water from the Maseru water reticulation which is used principally for cleaning. Wastewater from the slaughter house gravitates to a treatment plant designed for a maximum influent of 40m³/h (11 litres/second). Influent to the plant is considered to have a BOD₅ of 1500mg/l ~ 300kg BOD/day and pH range of 6-9.5.

2.2.4 The waste treatment plant as designed is expected to produce an effluent of the following quality:

BOD ₅ , 20° C	:	<20mg/l
Suspended solids	:	25mg/l
Coli	:	100mg/l
Temperature	:	35° C
Soap, Oil or Grease	:	2.5mg/l
Dissolved oxygen	:	75%
pH	:	6-9.5

2.2.5 The effluent is wholly used for fodder farm irrigation while resultant sludge is dried and sold to farmers for soil conditioning.

2.2.6 Visual inspection of the treatment plant indicated maintenance problems resulting in apparent overloading despite the current low production capacity. It is reported that occasional smell does occur. Wastewater quality and quantity into the treatment plant is not monitored.

2.2.7 The following is actual annual production of the abattoir from commissioning to 1989:

<u>Year</u>	<u>Cattle</u>	<u>Sheep/Goats</u>
1985	166	742
1986	5704	18837
1987	6819	21070
1988	6553	22319
1989	4882	14913

2.2.8 Proper records of water used for above production are not maintained to enable determination of specific water use per unit of production.

2.3 BASOTHO FRUIT AND VEGETABLE CANNERS (PTY) LTD

- 2.3.1 The Basotho Fruit and Vegetable Canners started off as the Lesotho Canners in 1976 as part of the Thaba-Bosiu Rural Development Project. The factory is located at Masianokeng on the main south road and close to the left bank of Phuthiatsana ea Thaba-Bosiu River. The cannery has four product lines viz white asparagus, green beans, baked beans in tomato sauce and peaches.
- 2.3.2 The water used in the cannery is drawn from 4 boreholes with no abstraction metering. It is reported that approximately 50m³ and 25m³ per day is used when canning asparagus and other product lines respectively. Water is mainly used for raw product washing, boiler for sterilising steam production, cooling water, final product brine preparation and general cleaning of the cannery. Wastewater from the cannery is only passed through screens located at various points in the discharge channels before disposal into the river without any further treatment.
- 2.3.3 The cannery normally starts canning white asparagus during the first week of September each year and closes this line at the end of season by the end of December. During the 1989/90 fiscal year 765 tonnes of asparagus were canned and it is estimated that 900 tonnes will be the production for 1990/91. A 460g can contains 270g beans and 210g brine.
- 2.3.4 Green beans are canned in the period January to mid April. A 460g can of product generally contains 250g beans and 210 brine.
- 2.3.5 Baked beans in tomato sauce are mainly canned between May and July and requires 5 to 10m³ of water per day. The added tomato concentrate is imported but the cannery is promoting production of appropriate tomatoes locally. Approximately 22 tonnes are produced over the applicable period.
- 2.3.6 Peach canning starts in February up to the end of March. Caustic soda is used in the industrial process for fruit skin removal. An 800g can of product generally contains 500g peaches and 300g of syrup.

- 2.3.7 The cannery also has recently started canning sweet corn. This facility is only carried out during summer when corn is in production. There are proposals to introduce other products for canning, depending on availability of the agricultural produce and identification of relevant markets.
- 2.3.8 The following are indicative production figures for the last product seasons:
- Asparagus - 765 tonnes
 - green beans - 110 tonnes
 - baked beans - 20 tonnes
 - peach halves.
 - peach jam:- 50 tonnes
 - peach nectar.
 - sweet corn - 27 tonnes
- 2.3.9 No records are maintained on quantities of water used in the production processes and neither is wastewater quality and quantity monitored.

2.4 LESOTHO DAIRY PRODUCTS (PTY) LTD

- 2.4.1 The Lesotho Dairy Products factory is located at Botsabelo in Maseru next to the Maluti Maid Dairy Farm. The factory pasteurizes milk from local dairy farmers who jointly own the company. Apart from pasteurization of milk, the factory also produces sour milk, guava and orange juices. The fruit juices are prepared from imported concentrate.
- 2.4.2 The plant started operating in 1986 and supplies the local market only. It has an installed capacity of 10 kilolitres of milk per day but currently handles approximately 7.5 kilolitres per day.
- Additionally the factory produces 500 litres and 1000 litres of guava and orange juice respectively. In the realization of the afore mentioned production level the plant draws 20 to 25 kilolitres of water per day from the public water system.

2.4.3 Most of the water drawn is used for cleaning and rinsing of dairy pipework, storage tanks and equipment. Caustic soda, phosphoric acid and chlorine are used in the cleaning process to which minor industrial washing detergents are also employed. The effluent from the factory is largely composed of diluted milk with an admixture of spent detergents and organic matter washed off the floors, loading bay and off the outsides of the mild churns.

2.4.4 The dairy operation is endowed with an appropriate wastewater treatment plant comprising of an oxidation (Pasveer) ditch with a design capacity of 20 kilolitres of wastewater per day. A settling tank is provided for further clarification of effluent before final disposal into French drains. No maintenance attendance seems to be provided to the treatment plant but however, it has been operating without problems. Only the French drains to which the plant disposes of effluent have been reported as having failed soon after commissioning of the works.

2.5 LESOTHO FABRIC PROCESSORS (PTY) LTD

2.5.1 The Lesotho Fabric Processors factory is located in Thetsane industrial site in Maseru. The industry imports cotton from which fabric is knitted, dyed and finished for local and export market.

2.5.6 The factory started operation in September 1989 and draws water on average at 45m³. Water is mainly used for dyeing and bleaching processes as well as in industrial steam production. Most of the water drawn from the public water supply is disposed of as wastewater into the public sewerage system. Wastewater discharges through 4 screens for fabric fibre removal into a waste mixing and temperature correction chamber before disposal into public sewer. The factory regularly samples the wastewater for pH control being also an indicator of the industrial performance.

2.5.7 The plant presently has a capacity of 20 tonnes of cloth per month and generally uses 6-10 litres of water per kilogramme of finished cloth. However, a theoretical capacity of 36 tonnes per month is possible but would require additional dyeing and kneading capacity. The factory management aim initially to enhance fabric quality through on the job training of workers before increasing the production capacity.

2.5.8 The principal reagents in the industrial processes are:

1. Reactive dyes - Remazol, Hochste and Procion (ICF)
2. Caustic soda - 6% kilo of cloth
3. Hydrogen peroxide - 6% " " "
4. Sodium sulphate - 20g to 50g per litre of water
5. Detergents - for cleaning fabric

A facility is provided for wastewater sampling by the Water and Sewerage Branch.

2.6 CGM INDUSTRIAL (PTY) LTD

- 2.6.1 The CGM Industrial's two factories are located in the Thetsane Industrial area in Maseru. The industry imports denim jeans materials, sews jeans and washes the jeans with industrial washstone before drying, pressing, packing and dispatch.
- 2.6.2 CGMI commenced operation around mid 1989 and uses approximately 350m³ of water per day with 80% being discharged into the public sewer system as wastewater. The water is mainly used in the washing process with small quantities being used for steaming in the pressing operation. The CGMI factory disposes of wastewater through a settlement and screening chamber, built in accordance with Water and Sewerage specifications, into the public sewer. The wastewater contains traces of sulphur and indigo dye plus fine particles of industrial washstone.
- 2.6.3 CGM2 factory uses approximately 500m³ of water per working day most of which is disposed of through an open channel to the environment as wastewater. The industrial process is the same as for CGMI and as such the wastewater characteristics are the same.
- 2.6.4 The above two jeans washing factories jointly produce 10000-10500 dozen jeans per month. Approximately 48 tonnes of washstone are used every month this ending up as suspended solids in wastewater discharged to the environment by CGMI. Bleaching and industrial washing powders are also used in the washing processes and these add to the chemical characteristics of the wastewater.

2.7 LESOTHO PHARMACEUTICAL CORPORATION

- 2.7.1 The Lesotho Pharmaceutical Corporation was established in 1978 in response to a need to make quality essential drugs more easily available and affordable to all the people of Lesotho. The factory is located in Mafeteng just upstream of the tail waters of Scot Vlei Reservoir the main water source for the town. The plant principally mixes, formulates and prepares drugs in final form such as tablets, capsules and solutions. The production processes include mixing of liquids or solids, pelletization, encapsulating and packaging. The processes are generally free of liquid wastes.
- 2.7.2 However, water for cleaning various utensils and equipment comes out as a strong effluent. This effluent is discharge into an evaporation pond within the factory premises. The ponds for both control laboratory and production seem to be adequate for the current production of the plant. The location of the ponds, however, is water logged and subject to risk of flooding. Although no incident of flooding and overflow of the evaporation ponds has so far occurred there is a possibility for same to happen.
- 2.7.3 The location of the plant is such that should the evaporation ponds overflow serious pollution of the principal water source for Mafeteng would occur. The pharmaceutical factory already satisfies the local demand for drugs and has already started producing for export. Production for export will demand expansion of the plant. Any plant expansion will also necessitate increase in treatment capacity of the industrial wastewater to avoid pollution of public water source.

3.0 INDUSTRIAL WASTEWATER PRODUCTION, PURIFICATION AND MONITORING

- 3.1 Lesotho has in the last twenty years experienced a measure of industrialization mainly in agro-industry and textile sub-sectors. Industries bring with them point intensification of water use in the production processes. Generally the more the water used in an industrial process the more wastewater is generated for discharge either into the environment or through appropriately designed infrastructure for safe disposal into natural watercourse. Some attention has been drawn to developers by Water and Sewerage Branch (WSB) on necessary quality standards for wastewater disposed into public sewer or onto natural ground.
- 3.2 Existing industries in the country generally practise indiscriminate use of water for production purposes resulting in large volumes of wastewater. Industrial visits revealed possibilities for recycling of part of process water in the cannery, brewery, jeans washing plant etc. Generally the management of the industrial establishments did not show appreciation for likely production cost saving should separation of various effluent streams be established. Clear identification of the characteristics of spent water from individual production processes is necessary for recovery of contents which can be recycled.
- 3.3 In-efficient production practices are generally being used in the industries sometimes resulting in double handling of waste which could only be disposed of at once. A case in point is the abattoir where stomach contents are flashed with water from the carcass only to be screened at the wastewater treatment plant. This entails use of energy in the screening process which could be saved if waste stomach solids are directly disposed of as solids.
- 3.4 Wastewater treatment/purification is only carried out by the abattoir, the dairy and the pharmaceutical plant in Mafeteng. All the other industries dispose of wastewater into either the environment or into public sewerage system without any form of treatment except screening of solid waste in certain cases. The cannery disposes wastewater into Phuthiatsana ea Thaba-Bosiu River without treatment while downstream villages draw water from the same river.
- 3.5 Non purification of wastewater has a long term effect of accumulated pollution of land to which

it is disposed of or an immediate effect on the performance of public sewage treatment plants which may not be designed to take shock loads of industrial waste. The existing situation in Maseru is that the sewage treatment plant for the city does not operate efficiently partly due to the presence of sludge digestion inhibitor elements in the effluents. The inhibitor compounds emanate from some of the industries within the city. No regular industrial wastewater quantity and quality monitoring is carried out generally in Lesotho.

3.6 In consideration of the unreliability of available data on industrial water use and wastewater quality it is not intended to quantify pollution strengths of effluent from existing industries. It is rather considered more appropriate to give a general indication of pollutants from various industrial processes (Table 3.1) and the likely range of effluent strength (Figure 3.1). Possible future wastewater production monitoring would provide firm indication of the quantity and quality of pollutants resulting from industrial processes adopted.

3.7 The current promotion and trend in industrial development indicate that within the next 10 years, pollution control awareness, would have to be imparted on managers and supervisors in both the public and private sectors of the economy.

This course of action would promote appreciation of benefits that would accrue from non degradation of the natural land and water resources environment through industrialization.

TABLE 3.1: POLLUTANTS RESULTING FROM INDUSTRIAL PROCESSES

POLLUTANTS	Type of Industry*						
	1	2	3	4	5	6	7
Organics							
Proteins	x	x	x	x	x	x	x
Carbohydrates	x	x	x		x	x	
Fats and Oils	x	x	x	x	x		x
Dyestuffs			x	x			
Organic Acids					x	x	
Phenols			x				
Detergents	x		x		x		x
Organo-pesticides		x			x		x
Inorganics							
Acids			x			x	
Alkalis			x			x	
Metals			x		x		
Metallic Salts				x	x		
Phosphates, Nitrates	x				x		
Other Salts	x		x	x			
Bleaches			x				
Suplhides			x	x			
Cyanadis, Cyanates							
Chromates				x			
Minerals (clay and soil)		x			x		x

* Types of Industry as follows:

1. Dairying
2. Food processing
3. Textiles
4. Tanning
5. Agriculture
6. Brewing
7. Wool Scouring

FIGURE 3.1 : THE STRENGTH OF SOME EFFLUENTS

PROCESS

Dairying

Bean Canning

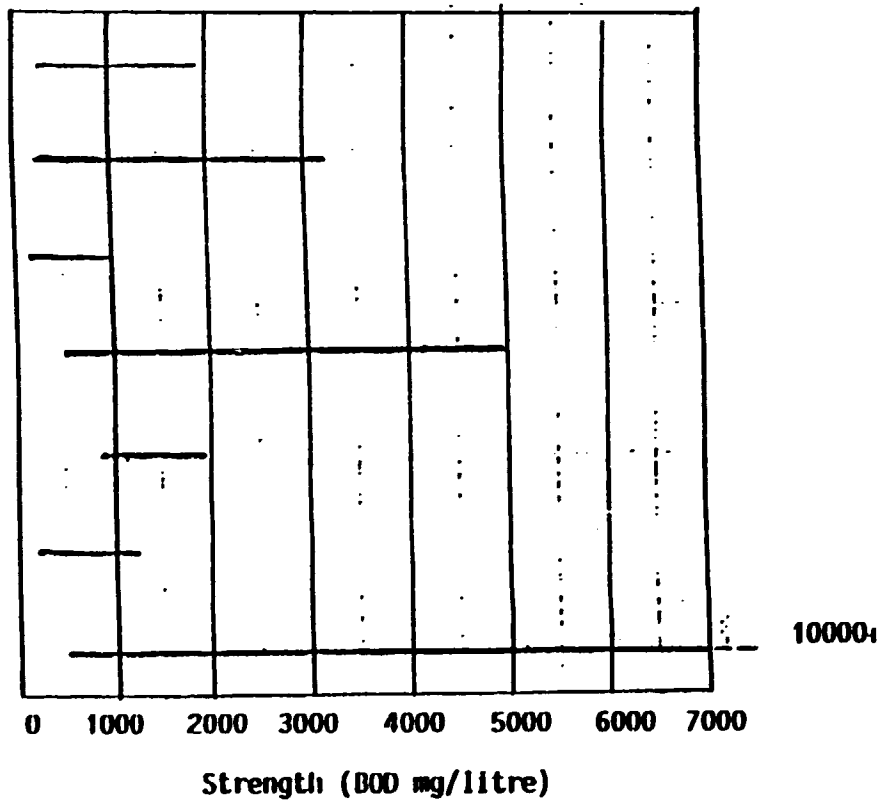
Textile(d+f)

Tanning (Mixed Chrome)

Agriculture

Brewing

Wool Scouring



4.0 EXISTING REGULATORY MEASURES FOR WASTEWATER MONITORING AND PURIFICATION

- 4.1 Existing law in Lesotho does not provide for monitoring of the quality and quantity of wastewater emanating from industries or sewage treatment works effluent disposal into public water courses.
- 4.2 The Water Resources Act of 1978 provides for action to be taken if a person wilfully or through negligence fouls any water rendering it harmful to man, beast, fish or vegetation. The Act however does not provide necessary enabling instruments for continuous assessment of the quality of wastewater or effluent discharged into the environment. Under the present circumstances action can only be taken when a complaint is lodged by either a health officer, a person suffering nuisance due to wastewater or the water and sewerage agency which may suffer inadequate sewage treatment due to effects of objectionable constituents of certain industrial effluents.
- 4.3 The existing law obliges a domestic or industrial developer to comply with the Water Resources Act in as far as waste disposal into water sources is concerned. Compliance with the Act often requires provision of a waste treatment facility whose effluent should be of such quality and quantity as not to pollute the natural environment to which it discharged. For a developer to comply it is necessary that he be advised of the limitations imposed on waste disposal. No known guidelines on treatment of wastewater before disposal are presently available.

5.0 FUTURE MEASURES FOR ENVIRONMENTAL PROTECTION

- 5.1 The government is currently preparing relevant legal instruments for improving the level of control on building construction and on abstraction and disposal of water.
- 5.2 The proposed Building Order and related Rules and Regulations preparation are currently at the legal drafting stage. The enactment of the Building Order will provide the legal base for requesting full details of any proposed development by the Building Authority and other interested service agencies. At building permit stage all relevant agencies including that responsible for environmental pollution control would have a chance of scrutinizing a given project and thus impose whatever restrictions are found appropriate to the development.
- 5.3 During 1989 the government commissioned a consultancy to review legislation and propose rationalization and consolidation of the separate legislations on Water and Sewerage Management. The third draft of relevant draft legislation has recently been completed and is now subject to policy decision at higher level. The proposed legislation provide for more vigorous water abstraction and wastewater disposal regulations and clarifies on roles of various organizations that deal with the water and sanitation matters.

Appropriate quality standards for spent water disposed into the environment are being prepared and will in future be imposed on industries and other institutions which discharge same.

- 5.4 The above proposed legislations would impose certain conditions with cost implications to developers and especially industrial development. National economic development objectives may dictate waiver of certain requirements at the expense of some environmental degradation. To avoid such a situation the law relating to industrial development should also be reviewed with a view to ensuring progressive development while not compromising on environmental quality. It is understood that the Ministry of Trade and Industry is already addressing the matter with possible incentives to industrialists if their plans provide for safe disposal of waste.

Evidently there will, in future, be a need for regular consultation between Building Control, Water Abstraction/Supply and Wastewater Disposal Control and Industrial Development promotion and licensing agencies to ensure longterm protection of the environment.

6.0 PROPOSED INDUSTRIAL DEVELOPMENT

- 6.1 The government is presently committed to progressive small scale and large scale industrial development in the country to ensure the employment benefits accruing therefrom. To this end proposals by the Department of Industry of the Ministry of Trade and Industry are at hand for extension and development of new industrial estates in Maseru, Peka, Teyateyaneng, Morija/Matsieng, Mafeteng, Mohale's Hoek, Quthing, Qacha's Nek, Semonkong, Mants'enyane, Mokhotlong, Thaba Tseka, Mapoteng, and Butha-Buthe. Provision of civil infrastructure and industrial superstructures in Ha Nyenye at Maputsoe is already at implementation stage.
- 6.2 The type of industries that would be attracted to set-up at the proposed industrial estates will be principally dependent on incentives that may be availed to external investors by the government. It is however anticipated that most of the industries will be oriented towards servicing the implementation of the giant Highlands Water Project. Some industries will aim for the export market.
- 6.3 In the context of environmental pollution there are three proposed industries that require special attention in the near future. These are the proposed Wool and Mohair Scouring Plant, an Edible Oils Plant and a Blanket Manufacturing Factory. Additional to the above a major ceramics manufacturing industry is already approved for implementation.

7.0 ASSISTANCE REQUIREMENT IN INDUSTRIAL WASTEWATER PURIFICATION

- 7.1 The impression obtained from visits to industries is that there is little appreciation for the need to minimize the quantities and quality of industrial wastewaters with a view to ensuring adequate treatment of same before discharge into the natural land or water courses. Awareness of the adverse effects of in-efficient industrial process technologies needs to be promoted among the industrial process managers and supervisors and the appropriate technical personnel in the relevant industrial licensing agency. The foregoing can be achieved through concerted efforts by the government and the private sector to afford the staff training opportunities in the subject field.
- 7.2 The Water and Sewerage Branch and the Department of Water Affairs are presently the agencies that have an interest in monitoring effluent quality from industries. The two agencies do not have the capacity and appropriate ability to effectively monitor environmental pollution effects by existing industries. This situation is borne of lack of properly qualified staff for pollution inspectorate and laboratories for bio-chemical analysis. Both departments have recently put up adequate laboratory spaces but staff and equipment need to be availed before the laboratories can become fully operational.
- 7.3 The government would, in consideration of the above, appreciate any assistance afforded to the industrial sector in the form of staff training in industrial water use technologies, wastewater sampling (monitoring), wastewater analysis and related interpretation. Additionally equipment necessary for proper operation of analytical laboratories will be required in the short term.

List of Licenced Small-Scale Industries
as of March 1990

Scr. #	Licence Number	File Number	Name of Company	Location	Invest. (000)	Emp. Ownership	Capital (000)	Type	Raw Material	Product	Year of Rational	Remarks
1	18/11/89/6	12	Telonyana Candle Company	Basera Ind	32.3	34	BSA	Corp		Candles	90/ /	
2	18/11/89/7	13	Trentyre	Basera	40	11		Corp		Tyre	90/ /	
3	18/11/89/8	14	Telonyana Pottery (Pty) Ltd	Tolonyana	20	10		Corp		Pottery	10/12/29	Renamed to 'Trentyre'
4	18/11/89/9	15	Tona Products (Pty) Ltd	Tolonyana	30	45		Corp		Cosmetics	90/ /	
5	22/12/89/11	17	Selsolo Design (Pvt) Ltd	Repatepanang	1	60		Corp		Carotene		
6	17/01/72/13	23	Mohalutso Garumali	Letibe	40	20		Corp		School uniforms		
7	17/01/87/20	39	Basotho Sheepskin (Pty) Ltd	Basera Ind	75	140	Lesotho	Corp		Sheepskin Prod	18/12/05	closed down
8	17/02/72/22	30	Thokile Hand Weaving (Pty)	Basera Ind	75	15		Corp		hand woven prod	90/ /	
9	17/02/72/23	30	Royal Crown (Pty) Ltd	Basera Ind	15	20		Corp		jewellery	90/ /	
10	07/03/77/29	50	Caledon Industries	Basera Ind	4	30		Corp		cement blocks	90/ /	
11	26/04/77/32	35	Lesotho Mahrella Mfg (Pty)	Basera Ind	75	280	Foreign	Corp		umbrellas	90/ /	
12	07/07/78/36	57	Basera Roller Mills	Basera Ind	100	40		Corp		steel prod	19/11/10	
13	20/08/78/37	60	Lesotho Steel Products (Pty)	Basera Ind	90	30		Corp		steel prod	90/ /	
14	07/08/77/47	50	Chung Hwa Trading Enterprise	Basera Ind	100	40		Corp		tiger eye prod	10/12/28	
15	02/12/77/56	81	Gallant Clothing Mfg (Pty)	Basera Ind	50	500	Foreign	Corp		women's outfits	90/ /	
16	14/06/78/57	88	Thabelang Handicrafts	Botlaja	100	21		Corp		printed fabrics	17/12/10	
17	12/06/78/62	97	Yane Food Packing & Processing	BRDC	13	30		Corp		foodstuff	90/ /	
18	07/05/77/64	99	Lesotho Brushwear (Pty) Ltd	Basera Ind	30	40		Corp		grass brooms	90/ /	
19	06/05/77/65	100	Boteny Weavers (Pty) Ltd	Basera Ind	14	50		Corp		lapsetry	90/ /	
20	10/08/77/67	102	Parthenon Paints (Pty) Ltd	Basera Ind	17	5		Corp		paints	90/ /	
21	02/09/77/70	104	A.A. Abubakar Prepectors	Botlaja-Botlha	20	12		Corp	JF	beans, peas	90/ /	
22	02/11/77/72	107	Lites (Pty) Ltd	Letibe	40	30		Corp	JF	wooden prod	90/ /	
23	02/08/80/78	27	Galedon Pine	Basera Ind	30	36		Corp	JF	bed, lights	90/ /	
24	01/09/80/83	110	Lesotho Clothing Ind.	Basera Ind	60	50	Foreign	Corp		furniture	90/ /	
25	26/09/80/87	120	B.S. Bakery and Confectionery	Basera Ind	130	570	Foreign	Corp		jeans	90/ /	
26	29/08/81/93	126	Universal Plastics	Basera Ind	94	18		Corp		bread	90/ /	
27	30/09/81/95	129	Dear Enterprises (Pty) Ltd	Basera Ind	100	10		Corp		plastics	90/ /	
28	13/09/82/109	143	Foli Enterprises	Basera	200	15		Corp		plastics	90/ /	
29	18/05/83/116	152	Pol Products (Pty) Ltd	BRDC	14	10		Corp		plastics	90/ /	
30	18/11/83/120	174	Liabelo Cement Products (Pty)	Basera Ind	167.5	86		Corp		plastics	90/ /	
31	29/08/84/140	176	Universal Industrial Co. (Pty)	Thetsane Ind	44.8	19		Corp	JF	plastics	90/ /	
32	09/05/85/145	180	Basotho Lanning (Pty) Ltd	Lehbalanang	100	25		Corp		plastics	90/ /	
33	01/09/85/147	184	Basotho Lanning (Pty) Ltd	Basera Ind	20	60		Corp		plastics	90/ /	
34	20/10/85/152	189	Lesotho Furniture Mfg (Pty) Ltd	BRDC	150	20	Lesotho	Corp		plastics	90/ /	
35	30/10/85/153	199	Lesotho Furniture Mfg (Pty) Ltd	BRDC	200	23	Foreign	Corp		plastics	90/ /	
36	03/11/85/155	192	Basotho Wire Industries (Pty)	Basera Ind	30	30	Foreign	Corp		plastics	90/ /	
37	07/03/86/159	196	Basotho Wire Industries (Pty)	Basera Ind	250	40		Corp		plastics	90/ /	
38	17/06/86/160	197	Basotho Timber Building Materials	Basera Ind	100	35		Corp		plastics	90/ /	
39	23/06/86/161	198	Subyani Furniture Ind. (Pty)	Basera Ind	100	35		Corp		plastics	90/ /	
40	11/08/86/165	202	Jambec Enterprises (Pty) Ltd	Basera Ind	200	105		Corp		plastics	90/ /	
41	03/08/86/167	203	Trio Clothing Mfg (Pty) Ltd	Basera Ind	140	50	foreign	Corp		plastics	90/ /	
42	03/08/86/167	203	Blue Circle (Pty) Ltd	Basera Ind	50	120		Corp		plastics	90/ /	
43	15/06/87/176	216	Diamond Paper Steel Eng	Basera Ind	100	100		Corp		plastics	90/ /	
44	15/06/87/177	216	Lesotho Cashet Manufacturers	Basera Ind	146	100		Corp		plastics	90/ /	
45	15/06/87/178	215	Batch Metal Products	BRDC	64	25		Corp		plastics	90/ /	
46	22/05/87/179	210	Fobane Weavers (Pty) Ltd	Basera Ind	80	40		Corp		plastics	90/ /	
47	17/10/87/180	210	Lesotho Mohair Cottage (Pty)	Basera	128.5	15	Lesotho	Corp		plastics	90/ /	
48	12/15/88/220	265	O.S.S. Fashions (Lesotho)	Basera	100	95	Foreign	Corp		plastics	90/ /	
49	19/05/88/198	243	Tenleader	Thetsane Ind	200	50	Foreign	Corp		plastics	90/ /	
50	08/04/88/199	238	Lesotho Glass Industries (Pty)	Basera	100	50	Foreign	Corp		plastics	90/ /	
51	07/04/88/200	237	Michael Steel Engineering (Pty)	Basera Ind	100	50	Foreign	Corp		plastics	90/ /	
			Botlaja Concrete Ind (Pty)	Botlaja	200	50		Corp		plastics	90/ /	

List of Licensed Small-Scale Industries
as of March 1990

Ser #	License Number	File Number	Name Of Company	Location	Invest. (000)	Eq Ownership (%)	Capital (000)	Type	Material	Product	Year of Renewal	Remarks
52	06/04/00/210	239	Madaba Furnitures Works (Pty)	MBDCO	20	15				furniture	90/ /	
53	10/05/00/202	241	Eshi Leather Products (Pty)	MBDCO	81	18				leather prod	90/ /	
54	24/06/00/205	246	Ting Ling Chail (Pty) Ltd	Basera	50	30	77			gift articles		
55	02/00/00/209	240	Stocks & Stocks (Lesotho)	Basera	40	25				building prod		
56	23/00/00/211	252	Matso Brick Making	St. Jomica	20	12				blocks	90/ /	
57	24/00/00/212	256	Benjaco's Bakeries (Pty) Ltd	Kaputswe Ind	100	20				bread		
58	12/00/00/213	258	Quting Block & Paving	Quthing	4	10				blocks	90/ /	
59	20/12/00/214	261	Sea Gold	Basera	5	10				jewellery	00/12/20	
60	19/04/00/215		Basera Pumps & Plastics (Pty)	Basera	100	11			Comp iron sheet	band pumps	09/04/19	
61	03/11/00/217	262	Lesotho Fly Tyres Guild (Pty)	Kaputswe Ind	114	60	Foreign		Comp	fishing tackle	09/05/26	has not started
62	26/05/00/218		Boreco Paints (Pty) Ltd	Basera						paints		
63	00/05/00/219		Lesotho Paper & Pacing (Pty)	Kaputswe Ind						toilet paper		
64	09/06/00/220		Lesotho Nylon Weavers (Pty)	Basera Ind						weaving	90/ /	
65	09/12/00/180	227	Eleantina Coach & Bus Builders	Peka	60	11		4		bus, coach body	90/ /	
66	17/06/00/221		Universal (Pty) Ltd	Thesane Ind						small machine	90/ /	
67	10/00/00/222		Lancer's Inn Bakery	Basera						bread	90/ /	
68	10/10/00/223		Boboli's Brick	Botlha						bricks	90/ /	
69	11/12/00/225		Trendteller Windows								90/ /	
70	10/01/00/226		Basera Steel & Wood Work	Basera							90/ /	