Advisory Review of the Environmental Impact Assessment Studies of the Mavoco Hazardous Waste Facility, Beluluane, Mozambique

3 February 2003

050-051

ISBN 90-421-1126-7
Utrecht, Commissie voor de milieueffectrapportage

Advisory Review of the Environmental Impact Assessment Studies of the Mavoco Hazardous Waste Facility, Beluluane, Mozambique

Advice submitted to the Minister for Development Cooperation, by a working group of the Commission for Environmental Impact Assessment in the Netherlands.

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Utrecht, 3 February 2003

REPÚBLICA DE MOÇAMBIQUE
Ministério Para a Coordenação da Acção Ambiental
Direcção Nacional de Avaliação de Impacto Ambiental

SAEIA

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1. INTRODUCTION

1.1 Description of the initiative

The Ministry for the Co-ordination of Environmental Affairs in Mozambique (MICOA) has taken the initiative to establish a Hazardous Waste Handling Facility at Mavoco, Beluluane district in Mozambique. The facility will serve the total territory of Mozambique. It will include a weigh bridge, an unloading packaging bay, a treatment plant, land fill cells, a temporary storage facility for wastes that cannot be landfilled, offices, a laboratory and other service buildings. The initiative also includes the construction of an access road to the facility. A site selection procedure was carried prior to and separate from the Environmental Impact Assessment procedure. This procedure has taken into account the geology, hydrogeology and hydrology of the site, its proximity to main waste producers and socio-economic factors. Both the proponent (MICOA) and the EIA consultants have undertaken public participation campaigns in the context of this initiative.

MICOA informed the Commission that the hazardous waste collection and transport system is not part of this EIA procedure and that, due to time constraint, also the waste facility operational plan is not part of this EIA procedure.

Mozal S.A.R.L., a company that operates an aluminium smelter some 10 km from the selected site, is expected to be the main client of the facility. Mozal agreed to fund the first development phase of the facility, which, with a landfill capacity of 50.000 tonnes, provides for a 10 years disposal capacity. Mozal will also provide for the engineering and establishment of the facility, for which it uses contractors. Design of the facility is based on a disposal capacity of 20 years.

1.2 Rationale and mandate for this advisory review

Mozambican law (decree no 76/98) indicates that Environmental Impact Assessment (EIA) is applicable to the project. MICOA is the authority competent to grant the environmental licence. As the proponent, MICOA assigned to a consultant the task of preparing a draft EIA report (the draft Environmental Impact Study or draft EIS[1]). In addition, MICOA is also the authority in charge of the review of the EIS.

Being the proponent, competent authority for EIS review and licence granting, MICOA decided to commission an independent external review of the draft EIS. By letter dated 8 October 2002 (see appendix 1) MICOA asked the Netherlands Commission for EIA to review the EIS.

[1] referred to as EIS in this advisory review.

In order to respond to this request, the Commission composed a working group. Its composition is given in appendix 2. The working group represents the Commission and is therefore referred to as 'the Commission'. The working group includes the following disciplines: ecology, area rehabilitation, facility design, hazardous waste, hazardous waste collection and transport, hydrology, hydrogeology and geotechnics, EIA, environmental management plans and public participation.

The Commission visited Mozambique from 11 to 15 November 2002 inclusive. It visited the selected site and the Matola communal waste dumpsite, where Mozal disposes part of its hazardous at this moment (for the programme of the site visit see appendix 3.

1.3 Justification of the approach

1.3.1 Information gathering and information use

While present in Maputo, the working group found out that there is a lot of relevant information on the initiative contained in other documents than the EIS and that is not referenced in the EIS. In addition, the Commission noticed that relevant information is not yet available in writing, but that it is available by personal communication from the experts working on the project. MICOA allowed the Commission to take into consideration in its review all available information[2]. If, in this advice, the Commission refers to information that was given in personal communications, the Commission will expressively state so.

1.3.2 Focus of this advice

This advisory review first focuses on the main issues that are at stake in the decision-making on the project. Subsequently, it addresses some additional points of interest. The review takes into account the main environmental and social issues and issues related to the EIA process. On request, the Commission is prepared to provide more detailed observations.
The review took place on the hand of the ToR, Mozambican legislative framework, South African EIA practices and Commissions EIA practice.

1.3.3 Transfer of knowledge

MICOA and the Commission, as co-reviewers of this EIS, decided to build into this particular review two elements of capacity building. The first capacity building element concerned the inclusion in the Commission's working group of experts from the South African region, making use of the services of the South African Institute for Environmental Assessment in Windhoek. In this way, regional experts and the Commission could mutually learn about approaches to independent review. The second element concerned the appointment by MICOA of national counterpart experts to each member of the working group. During one day, the working group and the counterpart team

[2] The Commission recommends to include relevant information received in personal communications in the final EIS and reference and summarise in the final EIS information that is contained in other documents.

worked together on the review. In this way, professional knowledge and experience could be transferred mutually. The third element concerned the inclusion in the review process of a number of institutions.

2. MAIN CONCLUSIONS AND RECOMMENDATIONS

Having reviewed the EIS, the additional information made available to the Commission and the information provided to the Commission by personal communications, the Commission observes a number of crucial deficiencies. The Commission is of the opinion that the proponent can address some of these deficiencies after having taken the final decision to establish the Hazardous Waste Treatment Facility at the selected site.

However, due to the risks involved, the Commission recommends that the following crucial information gaps be addressed **before taking the decision to establish the facility at the selected site:**

Hydrology:
The site selection report[3] states that the Movene River "joins with the Umbeluzi river before the water intake of Maputo water treatment plant". The report further states that "necessary care has to be paid to, while analysing the pathway of the contamination, any contamination reaching this stream".

In the light of the potential risks of contamination of the drinking water of Maputo, the associated health risks and the related potential for concern amongst the Maputo population[4], the Commission would have expected that the EIS provides clear qualitative and quantitative information on the issue. Specifically the Commission would have expected information on the hydrological system, the dispersion of contaminants through this hydrological system, the risk of contamination of the drinking water, the health impacts of such contamination and measures that can possibly be taken to prevent and mitigate contamination risks and impacts. The EIS, however, does not provide this information.

Geology:
Information in the EIS and additional information made available to the Commission indicates that the selected site's geological formation may include a fault[5] or a dyke[6]. A fault or a dyke under landfill cells increases the risk of liner failure and is a potential preferential path for pollution migration from the site. This risk further increases if the area is seismically active. The information indicates that this is indeed the case. Liner failure will cause leaking and dispersion of contaminants which, due to the location of the selected site (see previous bullet point), may develop into a threat to the health of Maputo's population.

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[3] SEED report page 82.
[4] The Maputo population is likely to strongly object to this risk.
[5] Fault – a fracture or a zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture
[6] Dyke – a vertical or subvertical intrusion of igneous rock, such as dolerite, through pre-existing formations. It can act as a barrier to groundwater flow or as a preferential flow path, depending on factors such as its orientation, size and weathering along the contact zone

The Commission recommends making available this information[7] as it is indispensable for properly assessing the risks related to establishment of the Hazardous Waste Facility at the selected site.

If the site is not rejected for establishment of the facility, the Commission advises to address the following points in the final EIS, **before making decisions on the environmental licence.**

Base line information

- Available documentation indicates that on the selected site only one set of background groundwater quality samples were taken. These samples show that groundwater quality varies widely over the site. Seasonal variations are unknown. In order to facilitate impact monitoring, it is crucial that a groundwater-monitoring programme is implemented immediately. The Commission therefore recommends to develop a detailed sampling protocol to ensure that sampling is done on a consistent basis with quality control/quality assurance controls and to set laboratory detection limits. The Commission also recommends monthly monitoring until natural groundwater quality fluctuations are established using an internationally accredited laboratory for the analyses, as this will allow the accumulation of a legally defensible database. The set-up and first results of the monitoring programme should be included in the final EIS.

- The EIS does not present crucial base line information on surface water quality and has not established the baseline chemistry of soils surrounding the selected site. This omission places the proponent and future operators of the site at risk as there is no baseline information to draw upon in defence of any future claims for contamination of the soil or surface hydrological environment. The Commission recommends the establishment of adequate programmes and protocols for monitoring of surface water and soil pollution, describe these in the final EIS, providing in that EIS the results of the first sets of analysis.

Actualised information

The time constraint is the cause of the EIS giving outdated information. During the review mission the HWD design process was still ongoing and alternative locations of the facility on the selected site, alternative liner design and alternative access road alignments preferences appeared being suggested, while not described in the EIS. The Commission recommends providing in the final EIS up-to-date information on the Hazardous Waste Facility design and preferred access road alignment and on their impacts.

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[7] The hydraulic properties of any fault or dyke will need to be determined and incorporated into the hydrogeological model.

3. FURTHER OBSERVATIONS AND RECOMMENDATIONS

In addition to the observations and recommendations contained in chapter 2, the Commission would like to make observations and recommendations for decision-making on licensing on the following issues.

3.1 The public participation process and public understanding

From ad random interviews with some members of the local communities, the Commission concludes that those in the direct surroundings of the selected site had first hand information on the initiative. The potentially affected farmers interviewed at the opposite Movene riverbank, however, had second hand information. This might give rise to some doubts about the spread of the public participation process. However, the Commission has not gone beyond a limited number of interviews and does not make firm statements. Although not reflected in the EIS, the site selection report (SEED, 2001) makes clear that, specifically at the selected site, the public information process has started early. Both documents make clear that the process covered limited periods. It is not clear whether the process was limited to the provision of information, or whether it also included consultation of the public and participation in decision making.

The Commission recommends to double check public understanding of the initiative in all its aspects and amongst all potentially affected parties to make sure that the public participation process has totally excluded possible future resistance against the initiative.

Public involvement in monitoring
The EIS does not fully clarify task, powers and responsibilities of the general public in compliance monitoring. The Commission recommends to leave no doubts about these in the final EIS. To render accessible monitoring information, the Commission recommends to provide both technical and non-technical versions of the monitoring reports and include subjects of interest to the general public (e.g. health implications).

3.2 Base line information

In addition to what has been observed and recommended in the main conclusions and recommendations, the Commission recommends including the following base line information in the final EIA.

3.2.1 Information on waste management policies

The Commission recommends that the final EIS provides an overview of the current waste management strategy or policy, particularly the interface between hazardous and general waste, as well as the waste management hierarchy and initiatives to reduce, re-use, recycle etc. The hazardous waste collec-

tion and transportation system can be included in this strategy[8]. The overview must also clearly state what will happen to the waste that the Mavoco Hazardous Waste Facility refuses to accept.

3.2.2 Information on the wastes

The EIS does not provide information on crucial characteristics and properties of the wastes like toxicity, mutual compatibility, threat to liner integrity and leachability in immobilised or raw form under various pH levels (acidic, basic or neutral leach environments). The Commission recommends addressing this omission in the operational plan (see § 3.7).

3.2.3 Information on the selected site

The EIA has not presented a specialist ecological assessment of the site. The site visit has confirmed that the site does not appear to differ from surrounding regional habitat and therefore it is not deemed necessary that a specialist ecological baseline study be carried out to address this omission.

The Commission recommends including in the final EIS:
1. A regional and site geological map;
2. Information on the seismic risks;
3. Information on the 50 years flood line of the Movene river;

The Commission further recommends that the EIA responds to the following observations and provides appropriate revisions if necessary:

1. Permeability[9] testing of the unsaturated zone.
   Values obtained will probably be lower than actual because the zone was not presaturated before testing
2. Test pumping.
   Tests were only of three minutes duration. The Commission thinks that this is too low to allow calculation of reliable transmissivity[10] values or any other values. Duration and discharge rate of all the tests was identical according to the data sheets. The Commission assumes that this might be a typing error?
3. Soil moisture
   The soil profile in all 15 auger holes and test pits, apart from one, are described as moist to very moist. However, it is stated that there are no perched water tables in the Cretaceous sediments. The Commission recommends checking whether this is strictly true, especially after the rainy season.
4. Numerical modelling.
   The layers used for the model need to be re-examined.
   - The boundary between Cretaceous or younger sediments and the weathered bedrock was not included.
   - It is not clear whether the Movene River boundary is a constant head.

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[8] The Commission suggests to include in this strategy the requirement to immobilise hazardous waste as much as possible before transportation in order to reduce risks of accidental spillage and reduce the impacts if spillage occurs.

[9] Permeability – the property or capacity of a porous rock, sediment, or soil transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure

[10] Transmissitivity – the rate at which water of a prevailing density and viscosity is transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient. It is a function of the properties of the liquid, the porous media and the thickness of the porous media

- If a fault crosses the site the model will need to be re-calibrated.

The most probable sub-surface route of pollutant dispersion should be known.

5. Permeabilities
   Given the reservations stated above on the testing methodologies the permeabilities might need readjustment.
6. Hydrocensus
   The hydrocensus found no boreholes and wells within a 6 km radius of the site. During the site visit the Commission found, however, two wells located 1,5 km east of the site. The Commission recommends checking the reliability of the hydrocencus.

3.3 Site selection process

The site selection process was not included in the EIA process, hence, the Commission does not address this process in the present report. However, the Commission would like to suggest some recommendations that might be of help to improve site or alignment selection processes (for landfills, wastewater treatment works and linear infrastructure) in future cases. The Commission recommends:

- To define on a case by case basis clear positive selection criteria[11] and clear exclusion criteria prior to site selection;
- To use the method of exclusion-mapping to select site and alignment alternatives;
- To start up the public participation process as early as possible and continue this process throughout the activities lifetime.

3.4 Site suitability and risk assessment

Apart from the concerns voiced in chapter 2 and paragraph 3.3 of the present advice, the Commission observes the following:

- That the site is geotechnically suitable from a soil properties perspective, given the fact that in personal communication the designer has indicated that compaction is included in the liner design and that a geosynthetic liner will be applied.
- That the available documentation indicates that only minor aquifers[12] (or rather aquitards[13]) exist at the site, at least to the maximum depth drilled of about 40 m and that there is minimal groundwater resource potential at or in close proximity to the site.
- The main contaminant of concern, fluoride, is naturally present in groundwater at elevated levels of up to 8.37 mg/l. The maximum additional loading of F by leakage of leachate is modelled to be only 2 mg/l, and to only affect the site area itself. In view of the above, possible impacts to the groundwater system from fluoride is considered to be minimal.

The final EIS does not need to address these issues in more detail.

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[11] Including criteria based on waste policy considerations.

[12] Aquifer – rock or sediment in a formation, group of formations, or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to boreholes or springs

[13] Aquitard – a saturated, but poorly permeable bed, formation, or group of formations that does not yield water freely

3.5 Project description

3.5.1 General

- The EIS does not, but should include a compensation and resettlement plan and should state the financial coverage of that plan;
- The EIS does not provide information on financial guarantees for landfill closure, rehabilitation and eternal aftercare. The Commission recommends including such information in the final EIS.

3.5.2 Waste facility

The final EIS needs to provide the following information:

- As the EIS does not present a month to month and overall water balance of the site and assumed moisture content of the wastes, the Commission is unable to verify the field capacity of the waste and the adequacy of the design of the leachate system;
- Information on the stability of excavations and side slopes of cells. This is especially relevant in relation to the statement on dispersivity and erodability;
- The areas of excavatibility are not, but should be clearly mapped and their siting more clearly justified;
- It is not clear how waste will be transported from the mixing area to the cells;
- The EIS classifies the Health Services as weak in general but without any indication on the (in)ability to treat injuries, inhalation, poisoning etc. from the operation of the site;
- The EIS must provide information on the water supply borehole, i.e. how sited, depth and profile, yield, water quality and testing procedures;
- Information on borrow pits and quarries and possible environmental licensing procedures thereof.

3.5.3 Road alignment and design

- The benefits to the existing community of each routing alignment seems not to be considered, but only the negative impacts;
- Speed control and enforcement on the access road need to be highlighted. The preference for a straight road (expressed to the Commission in personal communications) may lead to speeding with associated risks;
- The EIS should state the type of loaders that Mozal and other waste transporters will or must use for transport of wastes in order to be able to judge the adequacy of the road design.

3.6 Waste site management

The EIS does not include an operational plan for the waste facility. MICOA informed the Commission that this plan was excluded from the EIA procedure. The Commission is of the opinion that the plan should have been included in the EIA and offers to review the operational plan and the ToR for the site management contractor, once these are available. The operational plan should include a list of wastes and their toxicities/properties and mu-

tual compatibility, emergency response procedures and a long term plan for 'temporary waste' stored on site.
The EIS should give clear indications on waste facility user costs.

3.7 Alternatives

With the exception of road alignments, the EIS does not present a comparative assessment of project, site or design alternatives. At the present stage in the decision-making process, consideration of project and site alternatives does not seem opportune. The Commission recommends considering the use of Strategic Impact Assessment[14] in future cases where decisions on project and site alternatives play a role.

The EIS does mention the possibility of co-disposal with general waste but does not further explore the option because it was ruled out on previous agreement. The Commission recommends motivating why this alternative is not considered acceptable.

3.8 Impact prediction and mitigation

In addition to what has been stated in Chapter 2, the Commission observes the following:

- The EIS does not clarify whether impact ratings include mitigation or not.
- The EIS bases its prediction of impacts on the assumption that chemically immobile waste products are disposed of to a cell. The EIS does, however, not provide information on leachability of the wastes. The Commission would have anticipated that the leachable fraction of the waste products from Mozal under raw, immobilised and acidic leach conditions would be used in impact prediction so as to better inform the impact assessment process.

The Commission recommends addressing these observations in the final EIS.

3.9 Environmental management plan

The Environmental Management Plan is comprehensive, though the EIS does not provide for its regular evaluation and updating and auditing processes remain unclear. In addition, it proposes many committees. The Commission recommends addressing these observations in the final EIS.
For recommendations on monitoring See § 3.1

[14] Strategic Environmental Assessment would place site selection and project design in a wider policy and/or spatial planning context.