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MAIN POINTS OF THE ADVICE

The Commission for Environmental Impact Assessment considers the following points in its advice as crucial in the Environmental Impact Statement (EIS) for the land reclamation and drainage project in Guayaquil, Ecuador:

- The analysis of the sediment used for the hydraulic filling in relation to possible contamination, indicating place, date and depth of sampling, accompanied by laboratory analysis.
- The outline of the Guasmo Masterplan, which includes:
  a) the relation with the existing and developing plans for drainage, sewerage, water supply and solid waste for the city of Guayaquil;
  b) the involvement of municipality agencies and the public in the development of the design and the mechanism, describing how the municipality agencies and the public can play an active role in the realisation of the project;
  c) the follow-up and execution of the Guasmo Masterplan and completion of the drainage and related infrastructure;
  d) the environmental policy on the protection of the mangrove areas, which form the natural protection of the delta of the river Guayas and consequently of the city of Guayaquil and the role of the proposed activity in this policy.
- A description of the stakeholders in the project and how their opinions and interests did influence the contents of the EIS.

1. INTRODUCTION

A request for an ORET grant (Ontwikkelingsrelevante Export Transacties, Export Transactions relevant for Development) has been made by a Dutch dredging contractors company (Hollandsche Aannemers Maatschappij, HAM) for an export transaction involving a land reclamation and drainage project in the Central and South Guasmo area of the city of Guayaquil, Ecuador.

The entire Guasmo area consists of about 1000 hectares, where most of the 244.000 inhabitants (1990 censuses) live in cottages built from bamboo stems. The cottages stand on stilts in frequently inundated areas next to the river Guayas and the Estero Salado.
The project covers an area of about 170 hectares with about 60.000 inhabitants. By means of raising the ground level by an average of about 1.5 metres and establishing a basis drainage system for rain water, the project aims at improving the poor living conditions in the area, including enhanced access to the houses and a better health environment.

The project consists of dredging sediment from a borrow area in the river Guayas with a trailing suction hopper dredger, transporting the sand, and hydraulic filling of the areas to be reclaimed. During the operation the houses can remain in place. In addition the project will comprise the design and implementation of a primary drainage system.

The dredging part of the project will be undertaken by the HAM, while a Dutch consulting engineers and architects company (HASKONING) will carry out the elaboration of a Masterplan and the design and supervision of the implementation of the drainage system. A local subcontractor will execute the construction of the drainage works.

In Ecuador, the 'Dirección General de Intereses Marítimos' (DIGEIM) is the responsible authority for the implementation and management of the project. The daily counterpart of the Dutch suppliers will be 'Servicio de Dragas' (SERDRA), DIGEIM's executive agency for dredging and land reclamation projects.

Land reclamation is an activity which, according to OECD-standards (Organisation for Economic Cooperation and Development) and international loan agreement conditions, is subject to Environmental Impact Assessment (EIA). Objective of the EIA in support of this project is to provide both competent authorities in Ecuador and the Netherlands with relevant information on the environmental effects of the activity in order to foster an environmentally-sound, socially acceptable, economically feasible and well-informed decision making process.

In a letter dated 9th March 1995 (see appendix 1), the Netherlands Minister for Development Cooperation has requested the Commission for Environmental Impact Assessment (EIA) in the Netherlands to advise on Terms of Reference for the preparation of an Environmental Impact Statement (EIS) for the project involved.

The advice has been prepared and will be submitted to the Netherlands Minister for Development Cooperation by a working group of the Commission for EIA. The working group consists of independent experts of Ecuadorean and Dutch nationality. The composition of this working group is presented in appendix 2 together with project information.
During the preparation of the advice, the working group visited the project area and discussed with several governmental and non governmen- tal authorities and agencies in Guayaquil and Quito in the period 21-28 March 1995. The programme of the site visit is presented in appendix 3. Purpose of this visit was to collect information on the project in order to enable formulation of project and site specific Terms of Reference for the EIS.
In this advice, the Commission has taken into account as far as possible the opinions of affected people and relevant stakeholders involved (appendix 4).

Herewith the Commission wishes to express its gratitude for the excellent support and courtesy extended to the Commission by the various organisations in Guayaquil and Quito during this visit. The Commission would like to express special thanks to Mrs Coolman and Mr van Aggelen of the Netherlands Embassy in Quito and to Mr Wattel of Haskoning and Mr Schakel of the HAM in Guayaquil.

2. PROBLEM ANALYSIS AND PROJECT OBJECTIVES

2.1 Problem analysis

Guayaquil is Ecuador's main commercial city and seaport. With a population of 1.5 million (1990 census) it is the largest city in the country. The city has urbanized rapidly since 1950. Rural migrants have occupied in an unorganized way the mangrove and swamp areas bordering the city. One of the southern settlements of Guayaquil is Guasmo.

The Guasmo area can be characterized as one of the poorer urban areas of Guayaquil. Most inhabitants in Guasmo live in cottages on stilts in flood-prone areas adjacent to the river Guayas and the Estero Salado. Inadequate basic infrastructure (accessibility, drainage and sanitation) gives rise to marginal living conditions and a poor health environment in the area.

The above section summarizes briefly the problems in the area. The EIS however, must state in clear terms the problems which are assumed to be solved by realisation of the project.

In the problem analysis at least the following aspects should be addressed:
- description of living conditions (public health situation, safety aspects, accessibility);
- impact on the environment by (the inhabitants of) the settlements. e.g. contamination of water and soil underneath the houses and destruction of the mangrove areas (see also appendix 6);
- origin and development of the proposed activity: relationship to already realized hydraulic filling activities (small scale Ecuadorean initiatives and large scale activities by Dredging International) and 'lessons learned' relevantly for the proposed activity.

2.2 Project objectives

According to the project documents the main objective is to improve the living conditions (health, safety and well-being) in both the Central and the South Guasmo area by:
- converting low lying areas prone to regular inundation into land suitable for habitation through sand filling in these two neighbourhoods;
- design and implementation of a primary drainage system;
- design of a Masterplan of the Guasmo area.

The EIS must contain a clear definition of the objectives of the proposed activity to enable identification and formulation of alternatives and to furnish criteria for monitoring and evaluation. These objectives should logically ensue from the problem analysis, mentioned in the preceding paragraph.
Objectives should be formulated in such a way that identification of alternative initiatives – meeting the same objectives – remains possible.
Finally the objectives should be as specific as possible and where possible quantified (e.g. number of beneficiaries, percentage reduction of diseases, transport benefits, increase of employment opportunities, improvement of water and soil quality).

3. PROJECT SETTING

3.1 Legislative and regulatory considerations and policies

The EIS must describe national laws, rules, regulations and policies concerning the proposed activity. These include the following:

- policies, legislation, regulations and standards governing environmental quality (water, soil, air, noise and solid waste), health and safety, protection of sensitive areas (at regional and/or local level) and land control or land administration;
- an assessment of the probability of compliance with above-mentioned agreements and of law-enforcement;
- EIA laws and regulations of the Ecuadorean government related to the proposed activity;
- a description of policies on the development of the coastal zone and the river watershed;
- a description of existing and proposed programmes for urban spatial planning and management (e.g. the existing and developing plans for the city of Guayaquil, such as plans for drainage, sewerage, water supply and solid waste, as well as the General Plan for Urban Development conducted by the Habitat-programme of the United Nations for the city of Guayaquil).

3.2 Institutional capacity

The EIS must give a clear description of the institutional framework on the national and local level, including competent authorities directly involved in the execution of the project and the control of the executed works. The authorities charged with the responsibility of the watershed management of the Guayas river and of the management of the coastal zone have to be described in the EIS as well.

The EIS has to describe the organisation of the administrative machinery of the municipality and must give a general appraisal of its capacity and more specific in relation to the development and execution of the city plans on basic services.

The EIS must indicate which competent authority is committed to the further elaboration and execution of the designed Guasmo Masterplan and how the maintenance of the drainage system and subsequent sanitation provisions will be secured (either by means of local (residential) organisations or by means of privatization or by maintenance through governmental agencies).

3.3 Agency and public involvement and the role of non governmental organisations

The EIS must contain a description of the stakeholders in the project and how their opinions and interests did influence the contents of the EIS.

The Commission recommends that the views of affected groups and local NGOs are fully taken into account in the preparation of the EIS. Community involvement is important in order to:

- understand the nature and extent of potential (direct and indirect) impacts;
- assess the suitability and acceptability of various measures that might be proposed to prevent or mitigate impacts:
- compensate affected groups for unavoidable serious impacts (e.g. inhabitants who have to move because of the construction of the primary drainage system).

The EIS must also indicate in which way the inhabitants are involved in the project design and the development of alternatives as well as project execution (e.g. publication in local newspapers announcing project activities, informing neighbourhoods through information sessions in local community centres etcetera). Possibly, lessons can be learned from the already reclaimed Trinitaria area.

4. DESCRIPTION OF THE PROJECT AND ALTERNATIVES

4.1 General

In early 1992 the government completely financed a land reclamation contract of about 530 ha. in the Guasmo area (with the Belgian firm Dredging International as supplier). Due to budget deficits and technical reasons, however, the size of this project had to be reduced to 365 ha.

The proposed project concentrates on the remaining 170 ha in the Guasmo area and consists of:

- land reclamation by dredging sand from the river Guayas with a trailing suction hopper dredger, transporting the sand and filling the land to be reclaimed. The reclamation will raise the ground level by an average of about 1,5 metres, therefor a dredging volume of some 3 million cubic metres is required;
- preparing a master plan for the Guasmo Sur and Central and designing and implementing a primary drainage system.

The first group of activities will take up about one year, while the second group of activities will start at the same time as the first group and will be completed after a period of 20 months.

4.2 Project activities and alternatives

4.2.1 General

The EIS has to describe the arguments which form the basis for choosing this technical alternative. Special attention has to be paid to the technical feasibility of the proposed activity in terms of hazard assessment: the land reclamation is planned in an area prone to coastal flooding due to heavy rainfall and/or springtide (see also appendix 5).
In this section (4.2) will be indicated which aspects of the proposed activity have to be described in the EIS as well as possible alternatives for different parts of the activity (implementation alternatives, section 4.2.2 to 4.2.4). Another alternative which has to be considered in the EIS is the alternative most friendly to the environment (4.4).

Mitigating measures to prevent or reduce negative environmental effects during the implementation of the project must be described as well. These mitigating measures may include e.g. the prevention of nuisance (e.g. through seepage of joints of pipelines, planning of road crossing, accessibility and outlet of pipelines), measures to diminish risks (e.g. by means of a control and operation plan, including safety precautions – e.g. in relation to the danger of quick- sand –) and measures to prevent disturbance or pollution of valuable ecosystems.
The EIS must also indicate which provisions will be taken in case houses have to be moved or will be damaged during the hydraulic filling activity and for the construction of the drainage system.

4.2.2 Dredging

Proposed activity
The EIS must describe the following aspects of the dredging activity:

- method and equipment used for dredging, including description of positioning system and depth control system;
- location of sand borrow area in the river Guayas on a map (scale 1:10.000);
- motivation for the selection of this location;
- indication of guarantees for sufficient availability of sand, including measures to be taken if it turns out that the quantity of sand is not enough;

- quality of fill material (indicating place, date and depth of sampling, accompanied by laboratory analysis, – with the signature of an authorized supervision official – e.g. granular, chemical, Atterberg limits, analysis according to the Dutch guidelines 'Interventiewaarden Bodemsanering', see appendix 7[1]): the Commission recommends taking about 15 samples equally distributed over the borrow area, covering the depth of the layer that will be dredged;
- duration of the dredging activity (continuous or divided in periods);
- monitoring plan of excavated riverbed.

Alternatives
- The EIS has to describe if alternative borrow-locations have been considered and give arguments why these alternative locations were not selected.
- Phasing (season, time span) of the dredging activities may give rise to alternatives. Alternatives might be considered taking into account the preferred season in relation to fish migration, waterfowl or in relation to the availability of sediment in the river (relationship with rain season).

4.2.3 Hydraulic filling

Proposed activity

In the EIS the following aspects have to be described:
- method and equipment for transport of sand and hydraulic filling, including floating and land-based pipelines, and tractors and bulldozers used for the spreading of the fill material;
- distance of transport (by ship and pipe lines);
- location of the reclamation areas (on a map with a scale of 1:5.000), indicating as well the areas where other invasion settlements exist or will probably take place in the near future;
- need for and location of temporary stockpile(s);
- measures to be taken at the stockpile site(s), preparation of the area and the clearing of the site;
- anticipated use and related finishing of the stockpile area after the construction period;
- location and design of the external bunds (dikes) for the containment of the sand, together with a description of the stability of slopes and their protection [2];
- measures to be taken for the maintenance of the dikes;
- estimates of soil subsidence in the reclamation areas due to the overburden of soil (apart from the calculation, based on practical experiences from the previous contract executed by Dredging International);
- indication of the compensation for the subsidence as well as a description of a work construction plan to implement this type of maintenance;
- description of safety measures during the construction phase.

Alternatives
- In the EIS the choice of the dredging method and the selection of equipment must be substantiated. It must be indicated which local facilities on dredging equipment are available and which activities can be executed with local equipment. HAM has chosen a trailing suction hopper dredger with pump ashore facility. Two other technical alternatives have been considered. In the EIS these alternatives must be described regarding their environmental effects, including an overview of arguments why these alternatives were put aside.
- The EIS must provide a description of the site selection for the temporary stockpile.
- The location, routing and design of the pipelines must be motivated in the EIS.

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1 The Commission recommends to give special attention to this point because of complaints of the inhabitants of the Trinitaria area, which was reclaimed earlier, concerning e.g. skin irritations and flees which possibly could have been caused by the quality of the fill material.

2 In which provisions might be taken for future use as green areas (for recreation, community facilities).

4.2.4 Drainage

Proposed activity

- ! relevant data concerning the system design, including (geo)hydrological and hydraulical data;
- ! the EIS must indicate whether a combined or separated drainage system will be constructed with respect to the rain water and sewage discharge and must give a description of the chosen system;
- ! actions to prevent or reduce to a minimum the following phenomena:
  - due to the unsurfaced roads the sand (sediment) will be washed into an open drainage system; huge quantities have to be excavated from the drains and loss of soil of the road system has to be compensated
  - the sediment in the drains will cause vegetation to grow inside the drain, resulting in even more obstruction;
  - clogging by garbage disposal;
- ! description of the materials to be applied in the open/closed drainage system, in relation to possible contamination and sustainability of material;
- ! description of the outfall structure to discharge the drainage water/sewage;
- ! description of the operation and maintenance of the drainage system as well as training requirements on these matters.

Alternatives

- ! In the EIS the alternatives of an open versus a closed drainage system have to be described.
- ! The system will be constructed in a low lying area. The drainage system has to be emptied through gravity. The EIS has to describe the capacity of the drainage system to overcome a high water level induced by the river and/or by the sea.
- ! Several kinds of materials can be applied as lining of the open drains. In the EIS a comparison of alternatives has to be made in relation to the operation and maintenance costs.
- ! In the EIS various alternatives for the configuration of the drainage system have to be elaborated, in relation to future developments, e.g. the location of a possible treatment plant.

4.3 Masterplan Guasmo area

The proposed activities, dredging, hydraulic filling and drainage infrastructure, are not sufficient to fully meet the proposed level of living conditions in the project area. Therefore in the project proposal a Masterplan which includes the design of the secondary drainage system and recommendations on facilities for water supply, sanitation and solid waste collection in the Guasmo area is foreseen. In the EIS an outline for this Masterplan must be described as well as its relation to the existing and developing plans for drainage, sewerage, water works, water supply and solid waste for the city of Guayaquil (in which can be included the general plan for urban development which is actually being developed in coordination with the Habitat-programme of the United Nations).
Although this Masterplan primarily focuses on the project area, it should include the 'area of influence'. The borders of such an area are determined by legislative, administrative and technical conditions (roughly Guasmo Sur and Central).
The EIS must include a clear description how follow-up activities resulting from the Guasmo Masterplan are planned and phased. Next to this, the EIS must indicate in which way the plan will be discussed and developed with all competent authorities and persons concerned (see appendix 4).
The EIS must provide an indication about the probability of a timely implementation of the facilities as described in the Guasmo Masterplan.
In appendix 8 the Commission provides suggestions to be taken into account when designing the Guasmo Masterplan.

4.4 Alternative most friendly to the environment

The alternative most friendly to the environment must be described in the EIS as a full-fledge alternative. It may be a combination of the environmentally most favourable implementation and the environmentally most favourable management method. This alternative may include the way of operation which provides least hindrance for the inhabitants. Another element of this alternative could be in which way, during the filling activities, provisions can be made for future use as green areas (e.g. the construction of ditches which later on can be filled with organic soil material to create better conditions for the plantation of trees or other vegetation).
Another suggestion for the alternative most friendly to the environment could be the description of measures to avoid the construction of houses at the borders of the new reclaimed area in order to prevent collapse of these houses due to slope failures.

5. DESCRIPTION OF THE ENVIRONMENT AND ITS AUTONOMOUS DEVELOPMENT

5.1 General

The EIS must contain a description of the current situation of the environment and its development if no project will be established (the autonomous development or reference situation). This description serves as basis for comparison of the environmental effects of the various alternatives. The description must be limited to those aspects that may be influenced by the activity 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.

5.2 Natural environment

The following aspects must be addressed:

- the climate, especially the occurrence of extreme situations, e.g. el Niño;
- an analysis of the coastal (estuarine) geology and morphology;
- a description of the river discharge pattern in relation to the borrow area;
- stability of the river banks in relation to the borrow area;
- stability of estero banks before and after the filling activity;
- hydrography (currents, tides, river water levels, salinity);
- (geo)hydrology (ground water and surface water quantity and physical-chemical characteristics (quality));
- edaphical situation, especially the composition and quality of the river bed and the soil of the area to be reclaimed;
- discharge of waste water and rain water;
- flora and fauna:
  - ecosystems and their characteristic flora and fauna (terrestrial, tidal zone and marine environment, with special emphasis on the mangrove areas);
  - identification of vulnerable ecosystems and environmentally valuable areas (e.g. spawning sites for fish or rest sites for migratory birds, the Island Santay);
  - protected areas, protected or endangered species;
  - ecological requirements of main fishery resources.
- landscape (vulnerable elements and areas) and its development.

5.3 Socioeconomic environment

The EIS must contain a brief description of:

- total population in the area;
- population density, growth, pressure on land;
- employment situation;
- economic active population and kind of activities (e.g. fishery);
- formal and informal landownership in the area;
- living circumstances and health services;
- health indicators such as:
  - availability of freshwater;
  - current status of treatment and discharge of sewage;
  - current status of waste production of the area, solid waste treatment and disposal.
- financial costs per capita for the above mentioned sanitary facilities;
- institutional capacity and involvement and public participation in solving sanitary problems in the area;
- actual risk situation, related to transport and flooding;
- informal and formal organizations of the inhabitants (e.g. housing cooperatives);
- spatial structure, land use and physical planning of the area;
- accessibility and (public) transport;
- actual and potential roles of women in the area.

6. IMPACTS

6.1 General

The potential impacts must be described per alternative considered and must cover the complete affected area. This area may differ per aspect. Negative as well as positive impacts have to be described. A distinction can be made between the dredging part, the land reclamation itself and the drainage part. Also the impacts of the activity after finalization of the construction phase have to be described.

6.2 Impacts on the physical and natural environment

- Impacts of the dredging activities on the Guayas river's environment:
  - changing of flow-patterns and in the erosion-sedimentation pattern;
  - impacts on delta and river morphology;
  - estimates of possible side effects on main river flow impacts on either river side bank;
  - impacts on – vulnerable – ecosystems and shrimp-breeding activities, fisheries;
  - impacts from dredging on flora and fauna and primary production (destruction of bottom habitat and turbidity).
- possible effects of increased river-erosion: therefor the subsoil of the reclaimed area has to be analysed in relation to resistance to riverbank erosion;
- impacts on subsoil and existing slopes due to elevation of the reclaimed area and consequences;
- impacts of the dredging and hydraulic filling in terms of noise hindrance and possibly water pollution;
- changes in the geohydrological situation and impacts;
- expected subsidence of soil layers and its effects;

- impacts of the release of drainage water on the river banks and estuary;
- impacts on the physical and natural environment by increasing population growth due to the improved situation (including possibility of new settlement areas and measurements to prevent further invasion of new settlers).

6.3 Impacts on the socioeconomic environment

- impacts on the health situation and basic living conditions (both in terms of an improvement due to the reclamation and drainage and in terms of possible negative impacts in that e.g. household waste will not be removed anymore by the tidal movement underneath the houses and will accumulate in the reclaimed areas lacking proper solid waste collection and sanitation facilities);
- effects of involuntary displacement of houses or damage to houses;
- effects on living conditions: noise, risks (accidents) in relation to the dredging and hydraulic filling activities;
- effects on safety and health in terms of quality of the sand fill;
- effects on landownership and land prices and social effects;
- impacts on employment and income levels;
- urban population pressure and possible urbanization of adjacent marshland areas (people selling their plots and invading new territories);
- increased demands on services: domestic water supply, waste water disposal and treatment systems, solid waste disposal systems, energy supply etcetera;
- impacts on organizational structures;
- impacts on the position of women (e.g. workload).

7. COMPARISON OF ALTERNATIVES

Environmental effects of alternatives must be mutually compared. It is recommended to present the comparison in the form of tables and diagrams. In the comparison the current environmental situation, including expected autonomous developments and the alternative most friendly to the environment must be given. All alternatives must be compared to international and commonly accepted standards as much as possible.
The comparison must yield the preferred alternative for implementation. The comparison must cover the proposed activity and the Masterplan for follow-up action.

8. GAPS IN KNOWLEDGE, MONITORING AND EVALUATION

In the EIS lacking information must be identified. The importance of this information for decision making must be evaluated. The EIS has to indicate in which way and through which means serious knowledge gaps can be filled in or alleviated.

In the EIS an environmental monitoring plan must be presented. This plan must include monitoring of:

- subsidence of the area involved;
- effectiveness of mitigation measures;
- impacts which are irreversible of unavoidable;
- functioning of primary drainage system;
- developing of secondary/tertiary drainage system.

The monitoring plan must indicate the institutions responsible for its implementation and the way implementation is funded. The monitoring plan must also include a description of where, how and when the sampling and monitoring should be conducted.

A project evaluation plan has to be included in the EIS, indicating which institution will be responsible for the evaluation. The main item of evaluation will be to which extent project objectives (improving the health situation and living conditions) have been fulfilled.

9. FORMAT AND PRESENTATION OF THE EIS

It is suggested that the EIS is written in the same format as this advice for Terms of Reference. The use of maps and tables may considerably increase comprehensiveness and is therefore recommended.

The EIS should be concise and emphasis must be laid upon significant environmental issues as mentioned in the 'main points of the advice'.

A nontechnical summary (in English and Spanish) must be included in the EIS. This summary must address the major subjects of the EIS and be written in such diction that it provides nontechnicians with a clear insight in the issues treated. This summary is important in the way that this will be the part of the document which will be read by most interested people.