Advisory review of the environmental impact assessment studies of the Colombo Katunayake Expressway and related offshore sand mining in Sri Lanka

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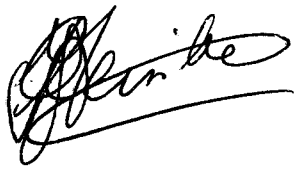
Advisory review of the Environmental Impact Assessment studies of the Colombo Katunayake Expressway and related offshore sand mining, Sri Lanka

Advice submitted to the Netherlands Embassy at Colombo, Sri Lanka, by a working group of the Commission for Environmental Impact Assessment in the Netherlands.

the technical secretary



Ms. I.A. Steinhauer

the chairman

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Utrecht, 23 July 2001

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APPENDICES

1. INTRODUCTION

1.1 The initiative: the Colombo Katunayake Expressway (CKE) and related off shore sand mining, Sri Lanka

The need for a high speed transport link between the city of Colombo and Katunayake has been long recognised. The proposal to build such a highway with a length of almost 25 kilometers between Katunayake international airport and the city of Colombo (see map in appendix 4) was approved by the Cabinet of Ministers in 1998.

The project proponent is the Road Development Authority (RDA). According to Srilankan law, and Environmental Impact Study (EIS) has to be conducted in accordance with Terms of Reference for the EIS. The EIS for the expressway, in which several traces (routes) have been studied and a final trace was selected, was approved by the Central Environmental Authority (CEA) in 1998. However, the EIS did not cover the exploration for and mining of offshore sand. Therefore, an EIS for this part of the project was prepared and finalised in December 2000. This EIS has been approved as well.

1.2 Rationale and mandate for this review advice

The Netherlands Government has been approached to become involved in the sand mining component through a request for ORET[1]-funding by a Netherlands firm. At the same time, the Netherlands Embassy in Sri Lanka has been involved financially for more than 10 years in biodiversity protection and sustainable management of natural resources of the Muthurajawela marshlands and Negombo lagoon. The proposed expressway will run across and along these wetland areas. Moreover, the Embassy contributes since the year 2000 to several components of the Coastal Resource Management Project (co-funding with the Asian Development Bank), which also aims at coastal and environmental resource protection of nine sites along the coast, amongst which Negombo lagoon.

In two letters dated 21 and 28 May 2001 (see appendix 1), the Netherlands Embassy in Sri Lanka invited the independent Netherlands Commission for Environmental Impact Assessment (EIA)[2] to review the Environmental Impact Studies and other relevant documents with the following specific questions:

- have potential negative impacts on Muthurajawela and Negombo wetlands been described sufficiently and correctly in the EISs and related studies?
- are mitigating measures addressed sufficiently?

Recommendations will be given for the provision of supplementary information, if shortcomings are found. These recommendations can be included in the decision-making on the request for ORET-funding with specific emphasis on the issue of how the construction of the expressway and related activities can be matched with the objectives of wetland conservation

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[1] Export Transactions relevant for Development

[2] The Commission for Environmental Impact Assessment in the Netherlands (henceforth referred to as the Commission)

of the areas that will be crossed. At the same time, the information can be useful for the Embassy to decide upon (the form of) continuation of support to the conservation objectives of Sri Lanka for the Muthurajawela marsh and Negombo lagoon.

It should be very clear that the trace, design and construction of the expressway have been decided upon as well as the sand mining and stockpiling part. Alternative solutions are therefore no longer subject to decision-making.

The Commission performed a site visit to Sri Lanka in the period of 9-16 July 2001 (see appendix 3 for the working programme) and reviewed the EISs and other relevant documentation. Purpose of the site visit was to:

- collect project and site specific information on the project enabling formulation of a review advice;
- study relevant project reports and data and discuss matters with several governmental and non-governmental authorities and organisations in Colombo and the project area;
- check whether environmental impacts have been described correctly and quantitatively and whether all relevant realistic mitigating measures have been included in the design of the expressway.

The members of the working group of the Commission are listed in appendix 2. The group represents the Commission and comprises expertise in the following disciplines: nature conservation, wetlands, marine biology, and environmental aspects of dredging.

1.3 Justification of the approach

The Sri Lankan EIA procedures apply to this project. Project and site specific Terms of Reference were drafted by the CEA, which were used as a review framework by the Commission. During review, the Commission also made use of advisory review reports of the Commission on similar projects[3]. Other relevant documents reviewed by the Commission are listed in appendix 5.

As construction works started already in October 2000, the Commission found reviewing the quality of the EISs less important, as licenses were granted already on basis of the EISs. Therefore the Commission decided to take the clearances and licences, which are all formulated with several terms and conditions as a review framework. The following clearances are relevant:

- approval by the CEA for the whole project, dating from 1998 and renewed in 2001;
- approval by the Coastal Conservation Department for the coastal area (300 m. inland, 3 km. seawards), 2001;
- approval by the Geological and Mines bureau (for the sand borrow area), 2001.

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[3] Advisory review of the environmental impact assessment report and feasibility study of the Coastal Resource Management Project, Sri Lanka, 17 March 2000.

Advisory review of the environmental impact assessment of Kerawalapitiya land reclamation project, Sri Lanka, 29 June 1994.

For the construction and operation of the road an Environmental and Social Mitigation and Monitoring Proposal has been prepared by the Project Proponent (RDA). At the moment, tendering of this proposal is ongoing. A provisional sum of 18 million Rs. (approx. 200,000 US$) is available for this plan, still to be developed by a consultant..

Also a Monitoring Committee, in which all relevant stakeholders are represented, has been appointed and is chaired by CEA. This committee meets monthly and oversees the implementation of mitigation measures and the monitoring plan. The committee works according to a monitoring schedule, in which parameters to be monitored with intervals/frequencies and the responsible agencies for monitoring are mentioned. The committee may impose additional conditions and mitigating measures, when new insights justify this.

Having these environmental and social provisions and guarantees in place, the Commission checked whether all possible impacts have been identified, whether necessary mitigation measures are included in the designs of the road and sand mining and –stockpiling and/or in the environmental/social conditions of the three clearances mentioned above. The Commission has not been available to check the quality and the Environmental and Social Mitigation and Monitoring Plan, as this was not yet available.

If, in the opinion of the Commission, major impacts remain unaddressed or in case mitigation measures are expected to be insufficient, these will be identified. As the EISs do not quantify the impacts on the environment, the Commission had to review the adequacy and necessity of mitigation measures based on best professional judgement. The Commission will give recommendations to overcome any potential omissions and, if applicable, give suggestions for additional mitigation measures or compensation.

The review findings are presented below. As the project consists essentially of two components, the comments of the Commission are presented in two chapters: comments related to the sand mining and stockpiling component (chapter 3) and comments related to the road construction and operation (chapter 4). The Commission also has some general comments (chapter 5).

2. GENERAL CONCLUSION AND OBSERVATIONS

The Commission is of the opinion that sufficient care has been taken, in terms of environmental conditions set in the approvals and monitoring structures currently in place, to warrant an environmentally sound construction and operation of the road and related sand borrowing and sand stockpiling. Mitigation measures already included in the designs are according to the conditions made by the CEA and are, in the opinion of the Commission, in some cases not even entirely necessary from an environmental point of view.

However, due attention has to be paid to the implementation of other required mitigation measures. As the Commission has not been able to review the Environmental and Social Mitigation and Monitoring Plan, it cannot judge whether the provisional sum will be adequate to implement each and every mitigation measure. Moreover, the Commission has some suggestions for additional measures (see 4.4) and recommends them to be incorporated in the Plan. In this respect, it should be noted that the Commission has been in the field for a short time only. The ideas should therefore be seen as suggestions to be evaluated by the local expertise for their practical merits.

3. SPECIFIC OBSERVATIONS ON SAND MINING AND STOCKPILING

3.1 General characteristics of the sand mining and sand stockpiling works

Summarising the project includes:

- Dredging of 4.7 million m3 of marine sand at an offshore borrow area using a trailing suction hopper dredge (TSHD).
- Transporting the dredged sand through a 5 kilometre long pipeline system using both the pumping power of the TSHD and a large floating booster station.
- Placing the sand in the designated 42 hectares large stockpile area in layers of 2.5 to 3 metres.
- Collection of the process water (seawater) used to transport the sand to the stockpile area and pumping this water back to the sea using a separate pump and pipeline system.
- The operational phase of the project will be carried out during the non-monsoon period (October - May).

The proposed dredging project is a rather simple sand supply project and is more or less identical to the 1993–1994 sand supply project carried out by Boskalis for the Kerawalapitiya reclamation project, at the same location. As the same dredging methodology, the same booster-pipeline configuration, the same stockpile area and the same process water return system will be used, the project will have no unknown technical aspects for the contractor. The chosen equipment and dredging methodology have proven to be successful in the past (also at many other locations around the world).

3.2 Environmental impacts

3.2.1 Sand mining

An area of 6 km² has been allocated for the offshore sand mining works. For these works a separate EIS was prepared by the RDA in December 2000. The EIS is of rather poor quality, mainly due to the non-availability of specific environmental data. The section on fisheries and marine biology, as carried out by NARA (the National Aquatic Resources Research and Development Agency) provided some good and useful information.

The Commission discussed several aspects of the sand mining works with the key experts of NARA and was informed that NARA had participated in the selection of the sand borrow area.

The environmental effects of the sand mining works are mainly related to:

- destruction of benthic life in the mining area;
- increased levels of turbidity and dispersion of resuspended sediments;
- possible effects on fisheries;
- possible effects on coastline stability.

Destruction of benthic life in the mining area

NARA confirmed that the proposed borrow area is a sand flat with only incidental sandstone outcrops in the most seaward part of the borrow area. According to local regulations sand mining is limited to the surface 2 m only. This has been an accepted methodology also in the Netherlands.

No seagrass beds, coral reef formations or other important habitats are present within the selected borrow area. As the borrow area is a part of a vast area with similar seabed characteristics, the environmental effects on benthic life are expected to be relatively small. The latter especially in relation to sand mining activities on land and in the river systems.

Increased levels of turbidity and dispersion of resuspended sediments

Sand dredging will lead to increased levels of suspended sediments in the water column. These sediments will be dispersed by the currents and might affect organisms which are vulnerable to depositioning of excessive quantities of sediment, like seagrass beds and corals. It was confimed by NARA that no seagrass beds are present in the vicinity of the proposed borrow area. An important coral reef is present north of the proposed borrow area. The distance between this reef and the borrow area is not yet clear, but as it was not possible to pinpoint it at the available map it must be more than several kilometers from the borrow area. Some corals are also present at a distance of some 4 kilometers south of the borrow area (Ona Gala sandstone reef). In view of the long travel distances between the borrow site and the vulnerable areas, no significant effects of the increased local levels of suspended sediments are expected.

Possible effects on fisheries

The landward half of the total borrow area is important for the local fishermen (shrimp trawling), whereas in the seaward half no trawling fishing is carried out. This is mainly due to the fact that the sea becomes too deep for the small fishing boats.

Based on the recommendations made by NARA and in order to protect the interests of the fishermen, the exploitation licence, as signed by the CEA, states that only the seaward half of the selected borrow area can be used for sand dredging purposes. This means the effects of sand mining on fisheries have been mitigated by excluding the zone relevant to fisheries.

Possible effects on coastline stability

The proposed and investigated offshore borrow area is located in front of an area which is known to already have an eroding coast. This was confirmed during the site visit to this part of the coastline, which also showed that protecting measures in the form of placing stone walls are being carried out.

The approved borrow area starts at a distance of 4.5 kilometres offshore, where the minimum water depth is around 16 metres. Sand mining in this area is in accordance with the national legislation of Sri Lanka with respect to preventing coastal erosion.

Prior to the site visit of the Commission, in the Netherlands additional information was received from Boskalis regarding the location of the sand borrow area. Based on the investigations carried out for the 1993–1994 Kerawalapitiya reclamation works, it was known to the contractor, that the approved borrow area did not contain enough and/or suitable sand (too coarse). Consequently a request has been filed with the appropriate authorities to approve a newly selected borrow area located some 5 kilometres seaward of the approved borrow area. This could not be confirmed by the RDA, but was confirmed by the Sri Lanka Land Reclamation & Development Corporation, which organisation holds the exploration licence for this area. According to the nautical map this area comprises a rather flat sand area without any sandstone reefs. The proposed borrow area is located more than 10 kilometres from the coastline at a depth sloping from 25 to 35 metres.

If the authorities approve a shift in borrow area to a more offshore location, any remaining concerns with respect to the coastal erosion as well as the possible effects on the distant coral formations will be eliminated. It is to be noted however, that no environmental approvals have been granted yet by the local authorities with respect to this new borrow area.

3.2.2 Pipeline landing site

The pipeline required for pumping the sand to the designated stockpile area will be placed through the same opening in the nearshore sandstone reef like it was used during the Kerawalapitiya project. The environmental effects will be limited to the temporary effects of placing and removal of the pipeline system. These will be marginal, be it that the contractor must operate rather carefully in this area as also the Shell oil/gas pipeline is located in this reef opening.

3.2.3 Stockpile area

Location of the stockpile area

The original stockpile area planned for sand supply was located partly inside an area, which -according to the masterplan for the Muthurujawela marsh- was not to be used for industrial purposes (the so-called bufferzone). In close co-operation between the relevant parties and the local authorities it was decided to relocate the stockpile area to the area which has already been used by Boskalis during the previous 1993–1994 reclamation project. This solved the environmental concerns and local protests regarding the stockpiling of sand.

Salt effect

The saline seawater, which is used to pump the sand to the stockpile area, may lead to salt contamination of groundwater. Since the Old Dutch Canal transports brackish water during a prolonged period of the year, the additional increase in salinity is expected to cause little or no disturbance. Moreover, ample measures have been described by Boskalis in its method statement to prevent salt contamination of the groundwater to the maximum amount possible. This is done by collecting the saline process water and pumping it back to the sea. To prevent excessive seepage of saline water through the sandy stockpile materials, plastic foil will be used along the bund walls. Nevertheless, monitoring of the salt effects on groundwater is recommended to confirm that these measures are adequate.

During the monsoon period the rainwater will wash the remaining salts from the stockpiled sands. As the construction of the road will take several years to complete, the salt effect at the location of the expressway (sand road foundation) is expected to be marginal.

Dust-sand storms

The sandy sediments from the sea are rather coarse. This was confirmed during a site visit to the existing reclaimed area. As the strong winds mainly blow during the wet monsoon period, the risk of dust and/or sand displacement to neighbouring areas is rather small.

3.3 Mitigating measures

According to the Commission no additional mitigating measures are required in addition to the mitigating measures already included in the designs, the project methodology and the licences, for the sand mining works, the landing location as well as the stockpiling.

4. SPECIFIC OBSERVATIONS ON ROAD CONSTRUCTION AND OPERATION

4.1 General description of the CKE

The proposed CKE is 24.6 km in length and starts at the New Kelani bridge intersection in the south and ends at the Airport intersection in the north. It will be a four lane expressway with 3 interchanges at Peliyagoda, Ja-Ela and Katunayake (see appendix 4 for a map indicating important features).

In the southern stretch, the CKE follows the service corridor of the Master Plan, East to the Old Dutch Canal, passing through a marsh land area that is heavily altered by human exploitation. The area to the North-East of the Old Dutch Canal is object of a recently started settlement scheme. North-West of the Canal the former rice fields have developed a typical wetland vegetation of reeds, sedges etc.. Woody elements, mainly on the old bunds, are heavily exploited and stunted. The area is important for its aquatic birdlife.

The Old Dutch Canal will be adapted at two places where the CKE will cross it. The remaining stretches are to be connected by a new canal to be dug West of the CKE, while the old part east of the road, near the present visitors centre will be drained by a culvert underneath the CKE. The Canal is very shallow (less than one meter deep) and clogged up with water weeds, indicating that the hydraulic connectivity of the canal is very low compared to its potential. None of the partners contacted expressed concern about the changes to this historic element.

West of the present visitors centre, the road passes through former paddy fields. The border of the Wildlife sanctuary has been shifted to the West to avoid relocation of a limited number of houses. The affected area does not contain high biodiversity values, but the psychological effect of shifting the borders of a protected area in order to satisfy other interests (in this case transport), should not be underestimated. The remaining stretches of the CKE do not enter the Wildlife Sanctuary, nor the proposed extension (by IUCN, 2001) of the Sanctuary to the North-East.

The visitors centre of IRMP, from where boat excursions start into the marsh, will be relocated. The development of a new visitors and education centre for the wildlife sanctuary and the marsh and lagoon system at a new appropriate place, generally meets with positive reactions.

In the northern stretch, the CKE will cross the lagoon over an extent of 1.4 km. in front of the Airport Garden Hotel. Before reaching the planned intersection near the Airport, the road crosses a small bay, isolating less than a hectare of the bay from the main water body. A small stream drains into this bay. Bridges are foreseen in this and other parts of the 'lagoon stretch' to enable fishermen to reach the other side and to permit hydrological exchange

4.2 Background and context

At present there is clear evidence for even the superficial observer, that the marsh is under heavy stress as a result of indiscriminate land fills and land reclamations, small scale enterprises of illegal brewing alcohol, illegal wood-cutting, etc.. Also the lagoon is suffering from ongoing trends of pollution, sedimentation, changes in geomorphology at the outlet of the lagoon and hydrological changes in the catchment area. Along stretches of the lagoon, the natural aspect of the shoreline is virtually non-existent. Indiscriminate land reclamation appears to be going on and settlements encroach into what used to be lagoon and mangrove area. In spite of disturbing downward trends in numbers of key species of animals and plants, the marsh- and lagoon ecosystems still represent a high biodiversity value, worth to be conserved for the benefit of mankind. Moreover, the 'green-lung function' of this natural zone in a larger urbanised area should not be neglected.

4.3 Environmental impacts

4.3.1 Impacts related to design and construction of the CKE

Impacts of road routing

The EIS does not mention the possibility of fragmentation of habitat, which affects species that migrate between upland marshes and the downstream system. The hydraulic connections between lowland and upland have been assured in the design. Since these provide the main passage ways for exchange of biota, the Commission expects that effects of fragmentation will be limited.

The EIS mentions a loss of breeding ground for shrimps and fish where the road crosses and cuts off the lagoon and adjacent mangrove area. This could have an impact on fisheries in the lagoon and along the coast. However, in relation to the quality (an area where there is no natural shoreline and with offensive odour because of dying algae during part of the year) and quantity of area affected and in context of ongoing trends, the Commission is of the opinion that the effects of the road on the extent and health of seagrass beds and fisheries will be marginal.

The expressway in front of The Airport Garden Hotel does alter the view on the lagoon considerably. From the lagoon side these effects are limited, since the skyline is already altered by the hotel itself, as well as by a number of factories, houses etc.. Apparently, the owner of the hotel has no objection.

Impacts of culverts and bridges

Detailed hydrological studies for proper dimensioning of culverts and bridges have been undertaken after the completion of the EIS. Such studies were part of conditions for approval by the CEA.

Temporarily damming of streams and canals will affect the hydrology. These obstructions will be limited in time and extent. The Commission recommends to monitor such changes closely and to take appropriate measures to prevent impounding.

The design of culverts and bridges is such that extreme flood events can be dealt with in a satisfactory manner. These constructions are put in places where the major drainage channels and waterways are located, and therefore the effects of the CKE on the water balance are expected to be minimal.

In the Northernmost part of the lagoon, where the CKE will cross the small bay, the tidal action will be affected, but effects are likely to be marginal.

Impacts of new access roads

Although the EIS states that the length of newly created access roads will be limited to 300 m., there is concern that a more important stretch of land will be filled up to improve transport to and from the CKE during construction. Along improved access roads, human encroachment will result. It means that in practice it will be impossible to take the roads out again after having served their purpose for the construction, and that the stress on the environment caused by the access roads will become permanent. Moreover, there is likely to be stress on the contractor and his employees to dump sand in places for private land reclamation purposes not foreseen in the project. Therefore, it is important to stick to the provisions of the EIS, and to stay as much as possible on existing roads and on the part of the expressway that is ready for use, as foreseen in the design.

4.3.2 Impacts during operation of the CKE

Impacts of drainage

The EIS, nor the hydrological studies, give much information about the hydrological importance of the marsh and to what extent enhanced drainage will be an important impact. The Commission expects that improved drainage, needed for proper road functioning, shortens the water retention time in the marsh. As the fishermen correctly observe, the water retention is important for a gradual release of fresh water towards the lagoon during the dry season ('sponge-function'). Also natural water treatment in wetlands (e.g. denitrification, sediment trap, immobilisation of heavy metals, decomposition of chemicals) will be negatively affected. Another consequence of a limited water retention capacity will be a greater risk of salt intrusion in the lagoon and the marshes during the dry season. At this moment, drainage conditions downstream of the CKE are favourable for the marsh to retain large quantities of water during the dry season, especially since most drainage facilities from the time of paddy growing (abandoned in the sixties) are in disrepair.

The improved drainage at the site of the road will be backed up to a certain extent by improved drainage downstream. For instance, the overland flow during floods East of the CKE will be intercepted by the drains along the road and will be led to major drainage channels like the Ja Ela and the Dandugamoya draining directly into the lagoon. This will affect the water retention to a certain extent.

The Commission recommends to design and implement a monitoring system on hydrological functioning of the wetlands during construction of the CKE, in addition to what has been proposed for monitoring of hydrology and water quality in the lagoon.

Impacts as a result of run-off water contaminated by traffic, oil spills

The Commission noticed that there is serious concern among environmentalists and the fishing community about run-off from the expressway where it crosses the lagoon. Run-off water from traffic, oil spills, etc. will affect the lagoon system. More serious is the possibility of accidents where toxic product might be spilled directly into the lagoon. The Commission considers that there is insufficient attention to these potential effects in the EIS or the design of the CKE.

Impacts of noise

Noise levels from the expressway, during and after construction, will rise significantly, especially over the lagoon. Experience in other countries has proved that animals quickly adapt to such situations, and that effects on animals due to noise disturbance are probably short-lived.

Impacts of the road as a barrier

The road will have a positive effect on the protection of the wetland system against further human encroachment. According to the design, the road will be fenced in and people will be prohibited to settle along the road. Although experiences elsewhere in Sri Lanka are negative (expressways providing access to once isolated areas for squatters and people involved in activities which affect the environment), the RDA plans to keep such activities effectively away from the CKE. The presence of marshland, which is difficult to penetrate and a protected area under the jurisdiction of the Department of Wildlife Conservation, in combination with a fence and a vigilant surveying system, makes the RDA feel confident that the problem of intrusion can be kept under control.

Impacts of traffic

The EIS does not consider an increase in traffic induced by the expressway itself. Predictions are made on the basis of observed trends on the A3 roads. Therefore, estimations of future impacts are likely to be an underestimation of the actual development.

4.3.3 Impact of induced urban and economic development

The EIS lacks a description of possible adverse effects due to induced economic development of the area following construction of the expressway. Induced changes in land-use in the catchment area will affect:

Hydrology

The hydrographs of the rivers and streams draining into the marshes will change. More severe extremes in terms of floods and dry spells will occur more frequently. Given the design criteria of culverts based on a 100 years event, effects of flooding can still be dealt with in an acceptable way. However, a lower base flow during the dry season may affect the downstream wetland systems negatively.

Water quality

Already, squatters near the future CKE/Ja-Ela bridge complain about the lack of good drinking water in the area because of high salinity. The future presence of the CKE will certainly step up industrial and urban developments in the area upstream, with subsequent loading of the system with pollutants, while the change in hydrology will provoke more salt intrusion during the dry season.

Sedimentation

The Commission noticed that sedimentation in the lagoon from upland areas is becoming a serious threat to the ecosystem. This leads amongst other things to loss of seagrass beds, and appearance of new shoals in the mouth of the lagoon[4]. The tidal channels are becoming increasingly narrow, with adverse consequences for exchange of fresh- and seawater, tidal mixing, migration of fish and prawns, exchange of nutrients and pollutants, etc.. Although there is no direct or indirect impact of the CKE on this process, the induced changes in upland land-use are likely to accelerate erosion and to increase sedimentation.

The Commission feels that these impacts should have been predicted on the basis of different development scenario's, so that management measures could be timely foreseen and implemented by the relevant authorities (see also 4.4.2).

4.4 Mitigating measures

4.4.1 During construction and operation

In response to the conditions set by the CEA, the RDA plans to extend the surface area of the lagoon with up to 7.5 ha., thus fully compensating the lost part of the lagoon. The consultants on hydrology have indicated a number of sites that meet the requirements, but they recommend a separate EIS, since these sites may affect the remaining mangroves. The Commission feels that the effect of addition of 7.5 ha of surface water to the lagoon remains small, and its effect on the functioning of the system is questionable when mangrove areas will be affected. Moreover, outside the few remaining natural areas, the shoreline is already fully occupied and compensation may meet opposition. Alternatively, the Commission suggests to use the financial resources to address other threats to ecosystem functioning [5].

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[4] This trend is accelerated by the creation of artificial islands in the mouth of the lagoon for settlement of part of the population of Negombo itself.

[5] For instance:

- Dredging of the lagoon locally near the outlets to improve the hydrology and tidal mixing, as a response to sedimentation, gaining at the same time sand for land reclamation and construction elsewhere.
- To enhance natural water treatment in the wetlands of the marsh before entering the lagoon.
- Dealing with illegal prawn farms that are spreading rapidly on the shorelines of the marsh. They form an important new threat to the survival of the (semi-) natural areas (notably within the sanctuary!) while contributing to the pollution problem in the aquatic systems where they discharge their waste water.

Compensation measures as foreseen in the CEA approval, and fully incorporated in the RDA plans, include the planting of mangroves, the establishment of sea grass beds and the clearance of part of the lagoon from accumulation of dead algae[6]. The Commission observes that these measures do not address the basic causes of the observed phenomena of algae growth and degradation of sea grass beds and mangrove stands. If the major threats (such as sedimentation, pollution, which are mostly not related to the CKE) are not controlled, the effect of the proposed compensation measures will be temporary at best.

The Commission observes that the issue of run-off water carrying pollutants from the CKE directly into the lagoon, has not been dealt with adequately. The Commission recommends to adapt the design of the road in the stretches bordering surface waters in such a way that run-off water from the CKE will be collected and dealt with in an environmentally acceptable way.

The Commission equally recommends to develop and implement an accident preparedness plan to deal with accidents on the expressway where toxic substances enter the environment. In particular, road design should be adapted to prevent highly toxic substances to enter the lagoon system in case of accidents.

The filling in of the small stretch of lagoon between the road and the existing shoreline in front of the Airport Garden Hotel presents interesting options for management (e.g. risk aversion for accidents occurring on the road) and compensation of damages elsewhere (e.g. affected aesthetics for the Hotel occupants). The Commission suggests that this option be valued on its problems and merits for the major target groups of the affected area, i.e. Hotel owner and guests, fishermen and local inhabitants.

4.4.2 Recommendations to address induced impacts

There is a need to balance upstream developments with downstream interests that need to be conserved. The RDA seemingly considers the indirect effects of induced economic development of the CKE as outside its competence. That being the case, the fact remains that accelerated sedimentation, more frequent events of high floods and prolonged drought and pollution from upland areas together with overfishing constitute major threats to the lagoon ecosystem. The natural wetland that is formed by the marsh presents a unique opportunity to address the first three problems. Induced effects of the expressway on land-use (accelerated industrialisation and urbanisation) leading to even more pollutants and sediments into the system can, for a good deal, be mitigated by an adapted wetland-management. Conservation of wetland functions therefore is important for biological diversity and human society alike.

An important instrument to achieve a balanced integrated development is the Masterplan for the Muthurajawela marshes and Negombo Lagoon. This

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[6] According to information from the fishermen this is a seasonal phenomenon, caused by the combined effect of pollution, salinity changes and wind whereby decomposing algal masses accumulate in the north eastern corner of the lagoon.

provides a sound basis for integrating sectoral plans and setting conditions for upstream developments. The Commission observed that the Masterplan played an important role in the trace and design of the road, and the choice of the location for the sand stockpiling. The Commission recommends to strengthen the role of the Masterplan as an integrated framework for conservation and management of the interests associated with the Muthurajawela marshes and Negombo lagoon.

In addition, the Commission suggests to consider the set up a cross-sectoral management body, sufficiently mandated and equipped to enforce the provisions of the plan upon all sectors. The Monitoring Committee installed by the CEA, in which all major stakeholders are represented offers interesting experiences for a possible Management Authority for the marshes and the lagoon.

5. OTHER COMMENTS

5.1 Communication

Communication about the CKE, its design, its trace and its impacts appears to be problematic. The Commission noted that issues stated by some of the contacted parties as facts, did not meet the realities as perceived in the field or even the official documents. Examples include the extent of the CKE that crosses through the lagoon and the trace running past the sanctuary. The Commission recommends to overcome this problem by means of clear presentation on maps.

5.2 Environmental monitoring

In compliance with the instruction to tenders, the contractors have prepared a draft Environmental and Social Mitigation and Monitoring proposal. Although the details of the monitoring programme have still to be filled in, the most relevant aspects of the works have been covered in the programme.

Environmental monitoring of the dredging works as well as the road construction works will be carried out by an independent consultant (Snowy Mountains Engineering Corporation). In addition, monitoring of the works will be carried out by the contractors themselves as part of their ISO 14001 Environmental Management Plan.

However, although ample attention is being paid to drafting proper environmental monitoring programmes for the various components of the project, the budget allocated for these works seem to be small. This leads to a situation in which processing of the data will stop at a certain point in time or various components of the monitoring programme will be cancelled due to lack of funds.

The following is stated in the EIS and shared by the Commission for the offshore sand dredging works:

"As far as the consultant is aware, pre and post project monitoring of the borrow area has not been systematically undertaken at any previous sand borrow site. Thus the speed of recovery of the seabed ecosystem has been the subject of informed speculation. Particularly as seabed sand mining is expected to increase rapidly in the near future, it is imperative that a strong, long term monitoring programme is undertaken as soon as possible."

For the road construction and operation component the Commission recommends to put major emphasis in the monitoring of hydrology and water quality in the marsh lands and the use of existing roads for access, and taking out the newly created access roads.

5.3 Recommendations for further studies

In order to be able to judge the feasibility of interventions in the lagoon ecosystem, it is needed to gain more insight in lagoon hydrology and lagoon water quality. Mathematical modelling has proven to be an essential tool for evaluating alternative measures under different scenarios. The Commission therefore recommends to develop a mathematical model for the lagoon/ marsh system, and its exchanges with the upland systems as well as with the sea.

More insight is needed in the importance of the marsh for the gradual release of fresh water to the lagoon during dry spells. Therefore, the Commission suggests to undertake a study that leads to concrete proposals for improving the water retention capacity of the wetland. This study should also consider the importance of the marsh for the natural purification of water during its passage through the wetlands.