SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

SOUTHERN TRANSPORT DEVELOPMENT PROJECT

IN THE

DEMOCRACTIC SOCIALIST REPUBLIC OF SRI LANKA

July 1999

CURRENCY EQUIVALENTS
(as of 30 June 1999)

Currency Unit	–	Rupee (Rs)
Rs 1.00	=	$0.01402
$1.00	=	Rs 71.3

ABBREVIATIONS

CCD	–	Coast Conservation Department
CEA	–	Central Environmental Authority
EIA	–	environmental impact assessment
RDA	–	Road Development Authority
SEIA	–	summary environmental impact assessment

UNITS OF MEASURE

ha	–	hectare
km	–	kilometer
kph	–	kilometers per hour
m	–	meter
mg/m^3	–	milligrams per cubic meter

NOTE

In this report, the symbol “$” refers to the U.S. dollar.

CONTENTS

I. INTRODUCTION

1. This summary environmental impact assessment (SEIA) identifies the principal findings and recommendations of the analysis of significant impacts that could result from the construction and operation of the proposed Southern Transport Development Project (the Project). The information in this SEIA draws on the results of the environmental impact assessment (EIA) prepared for the Road Development Authority (RDA) of the Democratic Socialist Republic of Sri Lanka by the University of Moratuwa (March 1999). The EIA was provided to the Central Environmental Authority (CEA) in May 1999. The EIA has been circulated by CEA for public review and comment prior to any action to approve or modify the Project.

2. In addition, this SEIA draws from information presented in the Final Report for the Southern Transport Corridor Project (March 1999).[1] Volume IV of the report, *Initial Environmental Examination* (IEE), provides information that supplements and supports the EIA prepared by the University of Moratuwa.

3. During preparation of this SEIA, discussions were held with members of the team from the University of Moratuwa that prepared the EIA. Meetings were also held with public officials and professionals involved in other programs in Sri Lanka with a direct relationship to the Project. An initial site visit was conducted with a representative of the Bank's Environment Division. This was followed by visits to specific sites with representatives of the RDA to further address potential environmental impacts and to identify needed mitigation measures. Appendix 1 lists the individuals consulted.

4. This SEIA conforms to the requirements of the Bank as set forth in the *Environmental Assessment Requirements of the Asian Development Bank* (March 1998).

II. DESCRIPTION OF THE PROJECT

5. The Project involves the development of a new access-controlled highway linking Colombo, the national capital, with Galle and Matara (Figure). The new road will be approximately 128 kilometers (km) in length, connecting to the existing road network at 14 locations. The road will begin at Kottawa on the southern outskirts of Colombo and will terminate at Godagama, near Matara, about 30 km east of Galle. The highway corridor will be approximately 5-11 km inland of the National Highway A2 and the railway that run along the western coast of the country. The new road will pass through Colombo and Kalutara districts in the Western Province and Galle and Matara districts in the Southern Province.

6. The Project will provide high-speed road access to support the development of the economically disadvantaged southern part of the country. It will also encourage and attract industries and services and help to improve the living standards and quality of life of the people residing in the region. The development of the highway will support present and new investments in the region by the Government, private sector, Bank, and other external agencies.

7. The initial construction will consist of a two-lane road surfaced in asphalt with asphalt shoulders. There will be a limited number of intersections with existing roads. The initial construction will include the bridges, drainage features, and traffic control devices for the two-

[1] TA 2892-SRI: *Southern Transport Corridor Project*, for $1.0 million, approved on 9 October 1997

lane roadway. Where justified by technical and cost considerations, the earthworks, including cuts and fills, will be developed so that the road can be expanded to four lanes, and ultimately to six lanes of traffic if demand merits such an expansion.

8. A 3-km wide corridor has been identified for the alignment of the road. Three planning principles have guided the selection of the corridor: avoiding clusters of settlements likely to have significant population, minimizing potential adverse impacts to the natural environment, and minimizing the disruption to traffic and local roads. Final design work will employ these same principles and be based on more detailed map data. The final design works will establish the specific alignment; the location of all intersections and any overpasses or underpasses; and the size and location of bridges, culverts, and drainage features.

9. As described in the final report for TA 2892 (footnote 1), a number of measures have been incorporated into the conceptual design of the Project that could be considered as environmental mitigation. These include measures to ensure proper drainage, prevent erosion, stabilize and replant cut slopes and fill areas, fence the right-of-way to prevent animals and people from straying onto the road, and relocate utilities for the adjacent population.

10. The estimated Project cost is about $300 million. This is for the initial two-lane facility, including the cost of land acquisition and resettlement. The Project will be implemented over six years, from 2000 to 2005.

III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

11. The Project is to be located on a low peneplain adjacent to the Indian Ocean. The topography generally slopes to the coast and is relatively flat with a few low hills and undulations. The road corridor is in the wet zone of the country and crosses four major rivers: Kalu Ganga near Diyagama, Bentota Ganga near Ranthotuwila, Gin Ganga near Nayapamulla, and Polwatta Ganga near Kananke. It also crosses several small tributaries and streams and lowland areas near Bolgoda Lake and Koggala Lake.

12. No precious mineral resources have been identified in the Project area. The hills contain deposits of rock that could be removed and used for fill and other construction purposes. RDA has identified some potential quarry sites and borrow pits for gravel and earth for the development of the Project. Sand is currently removed from the rivers in the area as well as from the ocean. The Geological Survey and Mines Bureau prefers the use of ocean sand and has identified the available offshore deposits. The identified sand resources are primarily north of the Project area between Colombo and Kalpitiya. Although an offshore sand deposit near Aluthgama is closer to the Project, most of the coast parallel to the highway corridor is composed of calcareous mud and not sand. The Geological Survey and Mines Bureau requires a permit and the payment of royalties for the use of all rock, gravel, and sand resources.

13. Approximately 52 percent of the soils in the Project area are of the red-yellow podzolic group. These occur in the higher areas that are used for the cultivation of a large range of permanent crops. The lower areas are comprised of bog and half bog soils, approximately 32 percent of the total. The remaining areas are a relatively equal proportion of alluvial soils and a mixture of bog, half bog, and alluvial soils.

14. The climate in the Project area is tropical. The monsoon winds from the southwest from May to October and northeast from October to May are the major sources of rain. Intermonsoonal or convection showers of relatively short duration in March and April and in October and November are also the sources of considerable precipitation.

15. Localized surface water flows are dependent on the topography and the amount of rainfall. While all of the runoff from the project area ultimately flows to the ocean, the direction of the flows along the road corridor vary, depending on the slope of the terrain. Periods of high rainfall result in flooding of the lowlands and the areas near rivers, streams, and tributaries.

16. Because of the wet climate, the Project area has a sizable groundwater resource. Depth to groundwater ranges generally from less than 1 meter (m) to a maximum of 13 m.

17. The air quality in the Project area is influenced by the prevailing winds. At present there are no known stationary sources, such as factories or refineries, along the corridor that could be the sources of air contaminants. The primary source of contaminants is from vehicles and fires. The established air quality standards for a one-hour period in Sri Lanka are 30 milligrams per cubic m (mg/m^3) of carbon monoxide, 0.25 mg/m^3 of nitrogen oxides, 0.20 mg/m^3 of sulfur dioxide, and 0.50 mg/m^3 of suspended particulate matter.

18. The population within the corridor is relatively sparse and there are few towns or other large settlements. The prevailing land use is agriculture. Therefore, the environment is generally quiet. The primary human sources of noise are from transport vehicles and farm machinery. However, 10 sites along the corridor are potential noise-sensitive receptors, including 7 temples and other religious sites and 3 schools.

19. Sri Lanka currently has no standards for highway traffic noise. Therefore, with the consent of the CEA, the standards established by the Federal Highway Administration in the United States are being applied to the Project.

B. Ecological Resources

20. The corridor passes through areas that are categorized as man-made, natural, and seminatural habitats. The man-made habitat includes home gardens, rice paddies, and plantations. Home gardens comprise approximately 35 percent of the area along the corridor; paddy and lowlands, 31 percent; and rubber estates, 20 percent. The natural or seminatural habitats include scrub, forest, and riparian areas.

21. Much of the native plant habitat in the Project area has been modified as a result of human habitation and the attendant cultivation. In addition to rice and rubber, agricultural commodities produced along the corridor include tea, coconut, and cinnamon. For a variety of reasons, numerous paddy areas along the corridor have been abandoned.

22. There are no identified preserves or other areas along the corridor that have been designated by the Government for protection because of their ecological value. The proposed corridor generally does not make incursions into natural forests. However, a few patches of forest are found within the 3 km corridor. While rare and endangered plant species have been identified in the general project area, there are limited occurrences along the corridor.

23. A large number of mammals, amphibians, birds, reptiles, fish, and invertebrate species found within the corridor are endemic and/or threatened. However, all of these species are

found in other parts of the country and the region. Animals living in disturbed habitats, such as those along the corridor, are accustomed to human presence and activities, and possess the capacity to adapt to change.

C. Human and Economic Development

24. The four districts that make up the Project area cover about 8 percent of the total land area of the country and support roughly one third of the population. Average annual population growth in the four districts from 1991 to 1994 ranged from a low of 0.9 percent in Kalutara District to a high of 1.5 percent in Colombo District with Galle and Matara districts growing at 1.2 percent. The population in the four districts was reported as 4.70 million, with females comprising 50.9 percent of the total. The population of Colombo District is reported at 2.05 million, Galle 0.96 million, Kalutara 0.94 million, and Matara 0.75 million.

25. In Colombo District, the primary occupation groups are classified as industrial (26.9 percent) and professional (21.3 percent). In Kalutara District the industrial classification represents 26.1 percent of the work force, while agriculture, fishing, and forestry comprise 23.8 percent. In Galle District agriculture, fishing, and forestry represents 39.6 percent of the workforce and industrial 21.9 percent. Matara District has 48.4 percent of the work force engaged in agriculture, fishing, and forestry and 20.0 percent in industrial activities. Given the existing land-use conditions along the corridor, agriculture is the primary occupation in the Project area.

26. Beyond the Colombo vicinity, there are no major urban areas in the corridor, although numerous populated areas are in close to the new road. The new road will also provide access to existing schools, government centers, and industrial sites; however, none of these will have to be relocated as a result of developing the road.

27. The primary transportation access to the area today relies on Highway A2 and the rail line along the coast to the west of the corridor. From the proposed connection of the new road to Highway A4 at Kottawa, south to its terminus at Highway A24 at Godogama, the corridor crosses 12 local roads that connect to Highway A2 to the west and to a number of rural centers to the east. Galle will be accessed by a new road to connect the new highway and Highway A2, and Matara will be accessed through the local road system.

28. The vehicle fleet using the current road network ranges from trucks, buses, and cars to a variety of three-wheeled vehicles, motorcycles, bicycles, and tractor- and animal-drawn carts. Because of the congested conditions along the Highway A2 corridor and the mix of vehicles, speeds average approximately 40 kilometers per hour (kph) for much of the day.

D. Quality of Life Values

29. Beyond the urban fringe of Colombo, the population in the project area is primarily rural and dependent on agriculture. The average monthly household income in the four districts in which the corridor is located ranges from a high of rupees Rs5,967 in Colombo District to a low of Rs3,148 in Matara, with Galle averaging Rs3,578 and Kalutara Rs3,388. Per capita monthly income ranges from Rs1,161 in Colombo to Rs692 in Galle, Rs678 in Kalutara, and Rs590 in Matara. While 18.4 percent of the population in Colombo District participate in the Government's poverty alleviation program, (the *Samurdhi* program), 42.5 percent participate in Kalutara District, 47.7 percent in Galle, and 55.0 in Matara. Unemployment in Galle, Kalutara, and Matara districts is also higher than the national average.

30. The percentage of houses categorized as “temporary” because of their roofing, wall, and floor materials ranges from a low of 16 percent in Colombo District to a high of 33 percent in Galle. Only 2.5 percent of the housing units in Colombo District are without toilet facilities, while 8.8 percent are in Matara, 11.8 percent are in Kalutara, and 15.2 percent are in Galle. In the project corridor the dwellings are generally in upland areas to avoid flooding and other problems associated with the lowland and paddy areas.

31. Colombo District has 47 government medical institutions, while Galle has 44, Matara district has 34, and Kalutara district has 27. The ratio of hospital beds per 1,000 population ranges from a high of 4.8 in Colombo District to a low of 2.2 in Kalutara and Matara Districts with Galle at 2.6.

32. Most of the population in the four districts has received secondary education of grades 6 to 10. However, about 25 percent of the population in Galle, Kalutara, and Matara have received only primary education and in these areas, between 4-8 percent of the population are reported to have received no schooling.

33. The four districts have a variety of recreation resources ranging from the beaches along the coast to the inland water bodies. Because of the terrain and the lush vegetation, the area is aesthetically appealing.

34. The area also has a number of sites, such as historic temples and churches, that have cultural resource value. The forts at Galle and Matara are of historical importance. Most of the region’s 68 historical and archaeological sites are outside the corridor of the new road.

IV. ALTERNATIVES

35. There are a number of alternatives to the Project. The “no action” alternative would involve continued dependence on Highway A2 to provide the primary road access between Colombo, Galle, and Matara. The road is primarily two lanes and has no shoulders in most locations. Dwellings and businesses are often within 2 m of the travel lanes and the road is congested with a wide variety of vehicles traveling at different speeds, pedestrians, and animals. Speeds on Highway A2 could decrease from the current 40 kph to approximately 25 kph by 2010, a saturated traffic condition that would have important consequences from a national as well as local perspective. It would also have environmental implications.

36. Highway A2 runs very near to the coast in many locations and is subject to coastal erosion. For example, in the section between Kalutara and Galle, the coast is eroding. The Coast Conservation Department (CCD) has identified sites near Kahawa, Katukurunda, Paiyagala, Seenigama, and Werallana that need protective revetments and other sites that require sand replenishment. In addition, a number of sites adjacent to the road have been identified by CCD as natural sanctuaries or areas that should be protected because of their archaeological, historical, religious, or cultural value.

37. The large number of vehicle turn movements and transit stops along the road exacerbates the congestion. In addition, because of the close proximity of structures to the road, the population in the corridor is subject to high levels of vehicle emissions and noise as well as accidents.

38. One option would be to upgrade Highway A2 with a number of bypasses where feasible. Given the relatively dense land use in Highway A2’s corridor, this could result in the

need for significant relocation and resettlement. It could also result in construction impacts and additional sources of noise, vibration, and vehicle emissions in the corridor. Additionally, upgrading the highway, including the incorporation of bypasses, could result in encroachment on sites with ecological or cultural resources such as breeding areas for endangered turtles or locations with archaeological or religious value.

39. Another option would be to improve the railroad between Colombo and Matara. This would require enhancing the existing roadbed and rolling stock to provide more frequent train service. It would probably also involve developing grade separations and upgrading command and control systems to accommodate increased traffic. Because the existing tracks run close to the coast in many locations, they are subject to erosion. Also, because the tracks are close to residences and other structures, the trains are the source of vibration and noise. Higher speed or more frequent train service could be the source of additional conflicts. Enhancing the rail line would not necessarily reduce the number of trucks and other vehicles on the highway because their origin and destination may not be compatible with a fixed rail service. Further, enhanced train service would not result in better access to areas away from the coast, which is a major objective of the Project.

40. In addition to the corridor finally adopted, a number of alternatives were considered as options to the Highway A2 corridor. One was the original survey route identified by RDA and which deviates from the alignment of the Project in two areas. At the northern end between Kottawa and Paraduwa, it was further to the east. At the southern end, between Boralukada and Kothagoda, it was located further to the east.

41. While the original RDA alternative would have many of the same environmental consequences as the Project corridor, it would result in a greater need for resettlement because a larger portion of the route is located in upland areas rather than in paddy areas. The original survey route would also encroach on more sites with cultural resources and ecological value, including forest reserve land in the south.

42. An eastern alternative and a modified or western alternative were also considered. These alignments would impact a larger number of people than either the project or the original route surveyed. Both alignments would also impact a slightly larger area of lowlands and paddy. In addition, they would be closer to Galle and would result in more urban congestion.

43. In all cases the alternatives would divert traffic from Highway A2 to a new road further inland. This diversion could reduce vehicle emissions, noise, and other environmental concerns arising from the congested condition in the Highway A2 corridor. This assumes that, if one of the alternatives were to be used, the road planning and construction would employ the same principles and assumed mitigation measures as those envisioned for the Project.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

44. A variety of general site-specific and environmental impacts could result from the construction and operation of the Project. The initial project planning has used principles that attempt to reduce or minimize potential environmental conflicts. Standard mitigation measures have also been assumed for incorporation in the project design and will be used to reduce potential impacts during construction and operation of the road. The following sections present the potential impacts of the Project in relation to the impact categories identified by the Bank for

major new highway projects in the *Environmental Guidelines for Selected Infrastructure Projects.*[2]

A. Design Impacts

1. Encroachment on Precious Ecology

45. The corridor through which the road will be developed has been largely modified by human development and no sites within it have been designated by the Government for protection because of their ecological value. While rare and endangered plant species have been identified in the area, there are limited occurrences along the corridor. When the final alignment is chosen, a rare plant survey should be conducted to identify whether any sensitive species exist where the road will be constructed. If such species are found, mitigation will be required, for example moving them to or replacing them at another site. The habitat value of the plant communities where the road will be constructed should also be evaluated and a decision made as to the need for mitigation of the habitat loss. If the planning principles identified previously are applied in selecting the alignment and design of the highway, it should not encroach on sites of ecological significance.

2. Encroachment on Historical, Cultural, or Monument Areas

46. Previous studies have identified 68 sites with historical or archaeological importance within the project area. However, only one of these, an inscription at Diyagama, attributed to the 1st to the 4th century, is close to the road. Again, if the planning principles identified are applied in selecting the road's final alignment and design, site should not be encroached upon.

3. Impairment of Fisheries, Aquatic Ecology, and Other Beneficial Uses

47. The highway will cross four rivers and other tributaries and streams. Bridges and other crossings will be designed and constructed so that they will not impair the movement of fish or disrupt the aquatic ecology of the area.

48. The Project will require the placement of fill, especially in the paddy areas and lowlands, to ensure that the road surface has the required stability and elevation. About 40 percent of the corridor is in areas that are paddy or lowlands. Therefore, fill will be placed over approximately 50 km of the corridor. Obtaining and placing fill material could have an impact on fisheries, aquatic ecology, and other beneficial uses unless it is properly planned and executed. Since the final alignment of the road has not been selected, the volume and type of fill material cannot yet be estimated.

49. If sand is needed for fill and were to be removed from rivers and streams in excess of the amount naturally deposited, removal could have impacts such as lowering the bed, changing the flow pattern, and disrupting aquatic systems by removing habitat and changing water quality conditions. Removing sand from the ocean has the potential to impact bottom dwelling benthic organisms, decrease water quality, disrupt fish and other aquatic species, and upset the dynamic equilibrium of the coastal area.

50. Placing the fill will alter habitat conditions. Care should be taken in the final design to select areas for obtaining and placing fill where the potential habitat impacts are minimized.

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[2] Asian Development Bank (ADB)-1993. Office of the Environment, ADB. Manila. 1993.

especially where the road alignment is close to rivers, streams, lakes, and other water bodies. With proper planning, and through appropriate provisions in the contract specifications, it should be possible to obtain and place fill so that there is no impairment of fisheries, aquatic ecology, or other beneficial uses.

4. Erosion and Siltation

51. Runoff from the embankments where the fill is placed and the quarries and borrow pits that are used to obtain the fill and other construction materials could be the source of contamination if silt erodes from exposed surfaces. Processing the rock from quarries and borrow pits could also require washing the material and result in water that contains silt.

52. The slopes of all the fill embankments will need to be adequately compacted to prevent erosion and then provided with appropriate vegetation cover to prevent siltation. Reclamation plans should be developed and implemented for all quarry and borrow pit sites. These plans should ensure that (i) all cut slopes are finished to an angle that would not be the source of erosion and siltation, (ii) all exposed soil surfaces are replanted, and (iii) measures to control excess runoff are installed. As appropriate, sedimentation ponds should also be installed to capture and settle any runoff from the construction sites.

5. Environmental Aesthetics

53. The initial planning of the road alignment has endeavored to blend the road with the surroundings. While 40 percent of the road segments will be placed on embankments, they would not be elevated to such a height as to be visually intrusive. In many locations the road will provide the opportunity to view the surrounding landscape. Vegetation is to be used at appropriate locations to reduce the visual impact of the road.

6. Noise and Vibrations

54. Removing materials from quarries will require blasting which will generate noise and vibrations. Processing rock from quarries and borrow pits will require the use of large machinery that could also generate noise and vibrations. These impacts will be localized and will generally be confined within 1 km of each quarry or borrow pit.

55. Because existing quarries and borrow pits are to be used to the maximum extent practical, no new noise or vibration will occur at those locations, unless some change in land use, such as the introduction of an asphalt batch plant, occurs. However, to minimize potential environmental conflicts at these locations, all equipment used at the site should be fitted with devices to muffle sound and the equipment should be operated and maintained to minimize potential impacts.

56. All new quarry sites should be at least 0.5 km from residences and 1 km from any sensitive receptors such as schools, health care facilities, or sites with cultural resources or ecological value. If blasting is to be used, local residents should be informed a minimum of 24 hours prior to its commencement and be provided with a schedule of anticipated operations.

57. Drivers transporting construction equipment and materials to the site should be trained to use methods that reduce noise, especially to minimize the use of air brakes. A construction schedule should be established and published so that all residents in the area are aware of the hours of operations. Excessive noise within 1 km of sensitive receptors should be controled. As

identified previously, 10 sites along the corridor are potential noise sensitive receptors (para 18). The final design will take into account the need to avoid placing the road in close proximity to these sites. However, where this is not feasible, mitigation measures will be incorporated to reduce potential noise problems. For example, during construction, work near schools should be limited to periods when classes are not in session, and work near sites with religious value should be limited to days when services are not taking place. Generally, activities resulting in excessive noise should be limited to daylight periods. In addition, it may be necessary to install noise barriers near sensitive receptors or to provide noise insulation within the structures, while ensuring that this is done without altering their cultural and aesthetic values.

58. Because the alignment has been selected to avoid areas of habitation, sites that have cultural value, and sensitive receptors, traffic on the new road should not result in major noise and vibration problems. In addition, vegetation will be used to reduce potential noise impacts.

7. Air Pollution Hazards

59. Transporting construction equipment and materials to the work site will result in dust and vehicle emissions along the travel route. In addition, using heavy machinery during construction will also be the source of emissions including carbon monoxide, nitrogen oxides, and sulfur dioxide. Suspended particulate matter at the construction sites and at quarries and borrow pits should be controlled by spraying exposed areas with water. If dust blowing from trucks is a problem, the loads should be covered. Trucks used to transport materials to the site should be properly maintained to reduce emissions, as should all of the construction machinery.

60. Processing asphalt for the road surface will require combining crushed rock with a petroleum-based binding agent. This could create air pollution, but it will be localized and of short duration.

61. The vehicle emissions from the new road could create air pollution hazards. However, because of the prevailing breezes and the sparse population in the corridor, there should be no air quality problems.

8. Highway Runoff Pollution

62. Drainage features will be included in the design to properly convey all runoff from the road surface. Culverts, channels, drains, and similar features will be designed and constructed so that they would not result in any siltation or other pollution problems.

9. Highway Spills of Hazardous Materials

63. Vehicles transporting fuels and other hazardous materials or wastes on the new road could be involved in an accident which could result in a release that would be a threat to residents near the road and to the natural system. The sites of such events cannot be predicted, and the operating procedures for the highway should include a hazardous spills contingency plan.

B. Construction Impacts

1. Erosion and Silt Runoff

64. Erosion and silt runoff during construction should not be a problem if proper controls are exercised. For example, if dust is controled at the construction site by applying water to exposed soil surfaces and if these areas are replanted when the construction is completed they should not be a source of silt. In addition, installation of suitable mitigation measures to control the flow of runoff from the construction site should also reduce the potential for erosion.

2. Other Construction Hazards

65. The machinery used for construction could be the source of contamination if oil, grease, and lubricants are discharged to the environment. In addition, blasting materials could also be a source of contamination if they are not properly managed, as could the binding agents for the asphalt. All potential contaminants should be properly stored and used so that there are no releases that could contaminate the ground or surface water, the natural habitat, or adjacent land. Construction debris should be collected regularly. Where possible, unused materials should be recycled. Where recycling is not appropriate, the residual material should be placed in a properly designed and managed landfill.

3. Hydrologic Impacts

66. Placing the fill during construction, unless properly planned, could result in hydrologic impacts, including interception of sheet flows. In addition to ensuring the structural integrity of the embankment, the final road design must incorporate measures to provide effective cross drainage. The Irrigation Department and the Land Reclamation and Development Corporation indicated that the road can be designed to have no impact on existing irrigation and flood control structures.

67. Culverts and bridges need to be designed to carry the specified flood flow. Bridges are to be constructed to withstand a 100-year flood event and other crossings will be designed for 25-year flows. When the implications of the design standards are established, they should be explained to the public, so they are aware of the expected operating conditions of the road and bridges during large runoff events.

68. Bridge abutments and supports and culverts need to be placed to minimize impacts on hydrology and terrestrial and aquatic systems. In addition, they must be constructed and maintained so that they do not result in scour, erosion, and other hydrologic problems.

4. Social and Economic Impacts

69. Based on the present alignment, which will be refined during Project design, the Project could displace up to 800 families. The final road alignment will be selected with minimizing resettlement a major factor to be taken into account.

70. Construction of the road will result in the loss of agricultural land. Within 1 km of the centerline of the corridor there are 6,584 hectares (ha) of rubber, 5,915 ha of paddy, 5,700 ha of mixed crops, 1,102 ha of tea plantations, and 620 ha of coconut plantations. The final project design will identify the specific agricultural lands that will be needed for the road. Project design

will also incorporate measures such as underpasses to minimize disruption to the existing land ownership and cultivation pattern.

71. In certain areas, such as the section of the corridor near Walpita, the alignment runs close to the electrical power distribution grid which may have to be moved. During such a move, the Project will have to ensure that utility services are not disrupted.

72. Labor may have to be imported for road construction. If labor camps are developed along the corridor, they should be sited so to be compatible with the surrounding population and to avoid sensitive environmental areas. All needed infrastructure, such as water supply, wastewater management, and solid waste management, should be provided so that the labor camps do not strain local resources and are not the source of environmental problems. When the camps are no longer required, the sites are to be reclaimed, all debris removed, and all areas replanted where soil has become exposed.

5. Transportation of Construction Equipment and Materials

73. The roads to be used for the transport of construction equipment and materials will be damaged unless they are properly maintained. The quality of the road surface along the haul routes should be reviewed, preferably once a week at a minimum, to identify and correct areas where the surface has been damaged or problems have been caused by the construction traffic.

C. Operation Impacts

74. Access to the road will be limited to 12 intersections, plus the connections to the Highway A4 at Kottawa and Highway A24 at Godagama. This should reduce cross traffic and increase road safety, even with higher vehicle operating speeds.

75. If land-use controls are reinforced at the road intersections, congestion can be minimized at these locations, and vehicle operating speeds be maintained. Such controls should prevent the development of residences and other structures that would be sensitive to the noise and vehicle emissions that would result from the traffic on the new road.

76. The use of the road is to be confined to trucks, buses, automobiles, and motorcycles. All vehicles that are allowed access to the road will be required to meet specified minimum performance and safety standards. Three wheeled vehicles, bicycles, and similar vehicles that do not meet the standards are to be excluded from the road. This should help reduce the conflicts that are experienced on the existing road network and will result in higher speeds and decreased travel time between Colombo and Galle or Matara.

77. The road is to be fenced to prevent encroachment. The fencing should also prevent access by pedestrians and animals which slows the traffic and results in safety problems, especially at night. Postconstruction monitoring will be needed to ensure that the landuse controls, vehicle restrictions, and fencing are effective or to determine whether additional mitigation measures are needed.

VI. ECONOMIC ASSESSMENT

78. Only minor environmental costs are expected for the Project because the planning and design have incorporated environmental principles and mitigation measures, and these are

included as part of the overall project estimated cost. However, additional environmental costs could be incurred if noise barriers or other noise control measures are needed. The University of Moratuwa estimated the cost of such noise control measures to be Rs18 million. However, the required attenuation of noise could be obtained by planting trees and other vegetation and requiring buffer areas between the edge of the road and any new buildings. Noise barriers, sound walls, building insulation, and other measures could be required near sensitive receptors such as schools and sites with cultural value. Because only 10 sites that have been identified as sensitive receptors, it should be possible to avoid them or to screen them using vegetation, so that they do not require structural mitigation measures. Therefore, with proper planning and design, few noise barriers will be needed, and the costs of noise mitigation should be relatively minor.

79. Additional environmental costs could result if adequate drainage for floods is in not incorporated into the Project. The Land Reclamation and Development Corporation and the Department of Irrigation, among other parties, have identified this as a potential impact of the Project. However, the design standards established for the Project are sufficient to mitigate any potential adverse impacts on surface water flows and no additional cost is required for such mitigation.

80. Costs associated with any resettlement would include the value of the land acquired for the road, the value of structures to be demolished, and the value of income forgone from the loss of production or employment. The presently estimated cost of land and resettlement is about Rs1,200 million. This is a project cost and is not applicable to environmental mitigation.

81. Operation of the new road will have some significant environmental benefits with respect to traffic. Automobiles, trucks, and buses traveling between Colombo, Galle, and Matara will use the new road because of the higher operating speeds and reduced travel time and vehicle maintenance costs. Thus, the transport time of fish from the Galle and Matara area to Colombo will decrease, resulting in a better quality product available to consumers. A similar enhancement will occur with transporting aquarium fish to Colombo for export. Since the new road will be developed to modern highway standards, including the provision of bridges and culverts to carry flood flows, it will enhance transportation when other roadways are affected by flooding.

82. Traffic diverted to the new road will reduce the average traffic on Highway A2, at least until local traffic increases to the current level. This will reduce congestion, noise, vehicle emissions, and accidents in the Highway A2 corridor.

83. The quality of life of women and children residing along Highway A2 will be improved by diverting the through traffic to the new road and reducing the traffic in the existing highway corridor. With less congestion in the existing corridor, transit times between homes and school and employment would be reduced. In addition, reducing traffic and the accompanying dust, noise, and vehicle air emissions will enhance the quality of life of people residing near the existing road. The new road will also increase opportunities for women and children living near its intersections with existing roads. They will have better access to Colombo, Galle, and Matara and their medical, educational, and cultural resources, and markets and commercial areas.

84. Environmental benefits of the Project will include positive land-use changes, such as development of industrial parks, that proper planning in the corridor and the provision of a controled access road will stimulate. Further, the road could stimulate residential development

to the east of Colombo and away from the congested Highway A2 corridor and assist in achieving the goals and objectives of the Colombo Metropolitan Region Structure Plan (May 1998).

85. The Master Plan Study for Southern Area Development identified the Project as a priority to support the needed economic and social enhancement in the area. The development of the road will satisfy the first basic strategy of southern area development by strengthening links with Colombo and improving access to inland areas. It will also enhance opportunities related to agriculture and for the development of industry and tourism, thus addressing the problems of poverty and unemployment in the area. For example, the Master Plan identifies the beach resorts adjacent to Galle as one of the four important tourist resources of the country. Construction of the project road will enhance access to these resources.

86. The Project could also have some site-specific environmental benefits. The CCD has identified a number of areas along the coast adjacent to Highway A2 where there is the need to provide revetments and replenish the beaches that have been eroded. Under a proposed Bank-financed Project, offshore areas would be skimmed to obtain the sand required to replenish these eroded beaches. With proper planning, the Bank-funded beach replenishment and the construction of the new road could be coordinated to reduce the potential for environmental impacts. For example, the evaluation of the sites where the mining would take place could consider the needs for both projects and they could be addressed in a single environmental clearance. In addition, the on-shore locations for sand processing could be combined for both projects and the trucks carrying sand from the coast to the road site could return carrying the rock needed for the revetments from the inland quarries.

87. In summary, the Project has been planned and has incorporated design standards and mitigation measures that will not result in measurable environmental costs. While it is difficult to quantify the environmental benefits of the Project, they will occur throughout the corridor and support planned development in Colombo and the southern area region.

VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING ROGRAM

88. CEA will be responsible for overseeing and coordinating all monitoring to ensure that the assumed and specified mitigation measures are implemented. Appendix 2 provides an initial identification of the mitigation measures that should be implemented. RDA will conduct the monitoring as part of overseeing construction of the road.

89. To facilitate effective review and reporting, RDA should develop a mitigation-monitoring program, an example of which is provided in Appendix 3. This should be implemented prior to the initiation of the Project. For each potential environmental impact, the mitigation measure required should be identified, the party responsible for conducting the monitoring designated, and the frequency of the monitoring effort specified. Reports summarizing the monitoring results should be prepared quarterly and submitted to CEA. If the monitoring report identifies that the construction activities or operations of the road are resulting in unanticipated environmental impacts, then additional mitigation measures will be prescribed and implemented. In addition, if the monitoring identifies that the prescribed mitigation measures are not reducing impacts to a level where they are not significant, the mitigation activities will have to be modified and expanded.

VIII. PUBLIC INVOLVEMENT

90. During the development of the EIA, the University of Moratuwa held 14 meetings with government officials, nongovernment organizations, and the public. In all, approximately 475 individuals attended. In addition, RDA conducted two meetings, one in Galle and the other in Matara, to explain the Project. In Galle, 32 individuals attended and 78 attended in Matara.

91. The major environmental issues reported as a result of the meetings relate to displacement of people and their houses, the interruption of agricultural land uses, and potential loss of employment opportunities. People were also concerned that the new road could result in flooding if drainage provision is not adequate to carry existing and future flows. They generally expressed an interest in being kept informed of the Project and its potential impacts.

92. Many of the concerns expressed at the meetings were incorporated into selecting the corridor for the new road and will be taken into account in selecting the road's final alignment. Specifically, alignment selection will reflect the need to avoid areas with ecological or cultural resource value, to limit the number of dwellings that would be impacted, and to minimize the disruption to traffic and local roads. Others were addressed in the standards, such as the hydrologic criteria, that were established for the Project and are to be incorporated into the final design. Compensation for land and properties that will be acquired, or the interruption of agricultural production, are being addressed by RDA through the Project's resettlement plan.

93. Subsequently, and as required by the Government's environmental impact legislation, RDA exhibited the EIA publicly. The document was made available at RDA headquarters and at the 16 divisional secretariat offices within the area affected by the highway. At the end of the one month exhibition period, on 8 June 1999, 287 written comments had been received from the public. These covered a total of 2,380 specific matters, broken down broadly as follows:

(i) damage to houses and properties (588 comments);

(ii) damage to houses and properties, and environmental impacts (1,782 comments);

(iii) environmental impacts only (2 comments); and

(iv) miscellaneous, including criticism of the EIA's quality (8 comments).

94. Within these broad categories, about 10 percent of the comments referred specifically to environmental matters. Some comments on each have also been provided. The comments on environmental matters are grouped as follows:

(i) The EIA does not define the objectives of the project properly, and the option of upgrading the railway has not been considered adequately (1 comment).

(ii) The EIA does not adequately address the issue of sand supply for embankment construction (several comments). Note: These comments are based on the assumption that sand, sourced from rivers or the sea, will be required for embankment construction. Pending completion of detailed design work, the nature of the embankments and the source of the material from which they will

be constructed is not known. It is unlikely, however, that sand will be a major requirement.

(iii) The hydrological regime (stream and surface water flows, flooding, etc.) of the area will be changed by the highway. Note: This design issue can be addressed without difficulty.

95. In summary, the comments received indicated that there was no significant opposition to the Project, but that the project designs must carefully take into account the concerns of the people regarding flooding and water control generally, materials extraction, and a small number of similar detail matters. These issues can all be eliminated or mitigated by careful attention to design, preparation of specifications and contract documentation generally, and construction supervision.

96. RDA is presently consolidating the comments received, and will present them to CEA. CEA will review the report and formally advise RDA of the changes it requires in the EIA, and possibly to details of the Project, and thereafter provide its clearance for the Project to proceed. The clearance is likely to be available by the end of July 1999.

IX. CONCLUSIONS

97. The Project will construct a new road linking Colombo with Galle and Matara in the Southern Province. It will decrease the travel time between these points and will reduce vehicle-operating costs compared with the existing Highway A2. It will also increase opportunities for development along the new corridor and enhance economic conditions in the area.

98. From an environmental perspective, the Project will not result in any significant impacts that cannot be mitigated. The conceptual layout of the road has incorporated sound land-use and environmental planning concepts. In addition, the preliminary design has included a range of mitigation measures that will help reduce potential environmental conflicts.

99. The EIA prepared by the University of Moratuwa identifies the environmental attributes of the Project area and potential environmental impacts of the road. The EIA, as well as the IEE prepared as part of the Bank-financed TA, did not identify any potential impacts of the Project that could not be mitigated. This conclusion is supported by this SEIA.