# ASIAN DEVELOPMENT BANK

## SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

## OF THE

## NEW SAMARINDA AIRPORT
## EASTERN ISLANDS AIR TRANSPORT DEVELOPMENT PROJECT

## IN

## INDONESIA

**May 1997**

## ABBREVIATIONS

| | | |
|---|---|---|
| BIMP-EAGA | – | Brunei, Indonesia, Malaysia, Philippines-East ASEAN Growth Area |
| DGAC | – | Directorate General of Air Communications |
| EIA | – | Environmental Impact Assessment |
| ICAO | – | International Civil Aviation Organization |
| LAPI-ITB | – | Lembaga Afiliasi Penelitian dan Industri-Institut Teknologi Bandung |
| Ldn | – | Day-Night Noise Level in decibels, used to measure aircraft noise |
| MOC | – | Ministry of Communications |
| NSA | – | New Samarinda Airport |
| SEIA | – | Summary Environmental Impact Assessment |

## CONTENTS

# I. INTRODUCTION

1. This summary environmental impact assessment (SEIA) has been prepared as an evaluation and condensation of a full environmental impact assessment (EIA) of the New Samarinda Airport (NSA), prepared for the Government by the consulting group of the Technical Institute of Bandung, Lembaga Afiliasi Penelitian dan Industri-Institut Teknologi Bandung (LAPI-ITB), following Indonesian Government guidelines and the methodologies described in *Environmental Assessment Requirements and Environmental Review Procedures of the Asian* Development *Bank* (1993) and *Environmental Guidelines for Selected Infrastructure Projects* (1990). The SEIA is based on (i) the EIA, (ii) the Project feasibility study prepared by AAROTEC/Airways Engineering Consultants under Bank technical assistance (TA)[1], (iii) discussions with principal authors of the above documents, (iv) field visits to the Project site and local government capital, and, (v) discussions with local government and pertinent National Government officials with environmental responsibilities.

2. The methods used to carry out the EIA included:

(i) review of available literature,
(ii) meetings with National and local government officials,
(iii) site visits to the NSA and surrounding areas,
(iv) discussions with inhabitants near the site,
(v) ambient noise and air quality and surface water quality sampling and testing in the field and in the laboratory, and
(vi) application of professional knowledge and experience.

3. This SEIA presents a synopsis of baseline data and field methods used in the EIA, and incorporates the results and conclusions of the EIA.

# II. DESCRIPTION OF THE PROJECT

4. The rapid development of mining and of the petroleum industry, particularly of natural gas in East Kalimantan, has resulted in a growing demand for air transport. The capital of East Kalimantan, Samarinda City, with a population of 600,000, is currently served by air mainly through the airport of Balikpapan, a two-and-a-half hour drive to the south over a winding and dangerous highway. A small airport, Samarinda Temindung, exists within the city, is surrounded by residential development, and is unsafe. Operations are restricted to general aviation and very small commuter aircraft.

5. The proposed Project is to design and construct a new airport for Samarinda to replace the existing one. Site location studies were conducted in 1992 by an Indonesian consultant, and the site, which is the subject of this SEIA, was selected. From 1994 to 1995, about 300 hectares (ha) of land was purchased by the city of Samarinda for the construction of the NSA. In 1995, a Master Plan study including some preliminary design was conducted by another Indonesian consultant. Based on this study, site clearing was completed by a local contractor in 1996 under contract with the Directorate General of Air Communications (DGAC). Then as previously noted, in June 1996, a feasibility study of the NSA was completed under TA No. 2374-INO.

[1] TA No. 2374-INO: Second Airports Development, for $600,000, approved on 15 August 1995.

6. The NSA is located near the border of the city (kotamadya) of Samarinda, about 35 kilometers (km) north of the city center, in a sparsely populated rural area about 2 km off the main Samarinda-Bontang highway (see Appendix for Project location).

7. The first phase of development of the NSA, the Project, will meet air traffic forecast demand for the year 2008. This involves large turboprop aircraft with sufficient range to cover all of Kalimantan and to reach Jakarta. Development covers the soil improvement and earthworks necessary to construct a landing strip 2,300 meters (m) in length, with an initial runway length of 1,400 m. The project will also include passenger and cargo terminals; carpark and access road; control tower; crash, fire, and rescue building; ancillary buildings; housing for airport staff; wastewater treatment plant and a potable water system; electric power; fuel farm; perimeter fencing; and supporting airfield lighting and navigational aids. An additional 100 ha of unoccupied land will be purchased as part of the Project to provide added protection in the approach areas from future possible encroachment by non-airport development.

## III. DESCRIPTION OF THE ENVIRONMENT

### A. Physical Resources and Natural Environment

8. The NSA is located in an area of irregular clay hills alternating with flat areas, which is typical of the topography of the Samarinda area of East Kalimantan. Elevations on the site range between 21 and 49 m above mean sea level. The underlying geology of the area is alluvium (Quartenary), with the soils consisting uniformly of silty clay with an overburden of organic material. The silty clay is suitable for embankment construction, and there is no peat on the site. Records for the past 20 years indicate that the site lies within an earthquake zone of low intensity and frequency.

9. The climate of the area is typical of Kalimantan in not being very monsoonal. Rain falls throughout the year, with September through December being the months with most rain. The average monthly rainfall is 200 millimeters. The site is just above the equator, so there are only small variations in the daily mean, maximum, and minimum temperatures during the year. Monthly average temperatures range from a high of 30.8 to a low of 22.3 Celsius. There are no typhoons in this area; hence, the average monthly wind velocity is only 2 knots, with an average monthly high of 18 knots.

10. Baseline monitoring of air quality and noise was performed at three locations, two on the site and one near the main north-south highway between Samarinda and the industrial center of Bontang. The results are shown in Table 1. At each location the level of air quality was better than the national standards. The levels of hydrocarbons and carbon monoxide were higher along the highway than at the other on-site locations.

**Table 1. Ambient Air Quality and Noise[2]**

| Parameter | Units | Sample Point | | | Air Quality Standard |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | |
| Wind direction | From | SW | W | W | |
| Wind speed | m/s | 2 | 2,5 | 2 | |
| Temperature | °C | 32 | 35 | 36 | |
| Humidity | % | 84 | 75 | 68 | |
| Atmospheric Pressure | cmHg | 75 | 75 | 75 | |
| Suspended Particulate Matter | $\mu g/m^3$ | 123 | 66 | 70 | 260 |
| Oxide Nitrogen ($NO_X$) | $\mu g/m^3$ | 12 | 5 | 8 | 92.5 |
| Sulfur Dioxide ($SO_2$) | $\mu g/m^3$ | 3 | 1 | 1 | 260 |
| Carbon Monoxide (CO) | ppm | 0.165 | 0.100 | 0.105 | 20 |
| Hydrocarbon | ppm | 0.020 | 0.015 | 0.018 | 0.24 |
| Noise | dBA | 45-65 | 39-41 | 40-42 | |

11. On the north side of the site, there is a small, non-navigable river that runs parallel to the location of the proposed runway strip. This creek-sized river is part of the upper stream system of the Karang Mumus River. The Karang Mumus, which has several branches besides the one adjacent to the site, flows west and south into the main Mahakam River, which serves as Samarinda City's principal means of access to the sea and to the interior.

12. Baseline monitoring of surface water quality was conducted at two locations on the Karang Mumus River. Sampling and testing showed some existing pollution ascribed to the humic soil content of the area and to its use for the disposal of human waste by the sparse population that lives on or near it upstream from the site.

13. Taken from the elevation of the small river and from nearby swampy areas that remain wet on a year-round basis, the groundwater level lies about 18-20 m above mean sea level. This is about 7-9 m below the proposed elevation of the airport landside facilities (terminal, etc.). There are no wells in the area from which groundwater could be taken for testing. However, the area of the site where the terminal and other landside facilities will be located is about 1 km away from the river and any potential contamination by it. For this reason, it can be assumed that the quality of the groundwater to be used to supply potable water to such facilities as the terminals is relatively good, requiring minimal treatment. There is no nearby human habitation.

## B. Ecological Resources

[2] There is no Indonesian standard for noise at present.

14. There are no rare or endangered species of flora and fauna in the general area of the site. Fauna are limited to snakes, an occasional wild boar, and flocks of typical local birds. There may be some fish common to the area in the small river, but it is not used for fishing.

15. The site is largely cut over and consists mainly of brush and grassland with some clumps of second-growth trees, primarily on the north side of the site near the small river. Patches of the site have been used for subsistence agriculture in the past. There appears to be more land available for this type of agricultural use outside of the site than there are people living in the area to farm it.

## C. Human and Economic Development

16. The NSA is in an area of low population density. There is no indigenous population in the area. There are approximately 100 families living mainly along the Samarinda-Bontang highway and on the east side of the highway (the side away from the site) within a range of 2-5 km of the site. Most of these residents are recent migrants (within the past ten years) to this area of East Kalimantan from other islands, or from elsewhere in Kalimantan.

17. There are no mineral resources in the area and no industry or mining. The main source of income of the residents of the area is subsistence farming supplemented by small-scale commercial activities along the main highway. The income level is quite low.

18. The predominant land use around the NSA is agricultural. A planning study is being completed by the local government, which is designed to update the previous 1993 land use plan by restricting any future encroachment on the airport site. It is based on recommendations made by DGAC concerning height and use restrictions for the area surrounding the airport.

19. The Samarinda area, as with the rest of Kalimantan, is the focus of efforts by the National Government to develop the East Indonesia region to bring it up to the level of the more developed areas of the country. Samarinda and East Kalimantan lie within the Brunei, Indonesia, Malaysia, Philippines-East ASEAN Growth Area (BIMP-EAGA), which is the focus of a coordinated approach to economic development by the four countries. The BIMP-EAGA effort is being strongly supported by the Bank, and joint efforts to promote economic development, tourism, and transport within BIMP-EAGA are well under way.

## D. Quality of Life Values

20. There are no cultural, historical, archeological, wilderness, or protected resources or areas on or near the site. There is an elementary school about 5 km south of the site near the Bontang-Samarinda highway, which serves the small population of the area. There is also a public health post at about the same location. There is a power line along the highway, which provides electricity to some of the homes. There is no telephone service available for the inhabitants of the area. Nor are sources of potable

water or of wastewater treatment available. There are no other public facilities in the area.

## IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

21. This section assesses the potential impact of the proposed development of the NSA on the surrounding environment and presents proposed mitigation measures. Covered are potential effects associated with location, with design, with construction, and with operation. Many of these impacts, adapted for the NSA from the Bank's initial environmental examination methodology, are shown in summary form in Table 2. Additional aspects of the environment that will also be impacted but that are not in Table 2 will be discussed.

### A. Environmental Impacts Due to Location

#### 1. Disruption of Surface and Groundwater

22. The location of the site and its proposed development do not intrude into the small river running parallel to the landing strip on the north side of the site. A small existing branch leading to the river crosses the site and could be cut off by the construction of the runway embankment. However, any such disruption will be avoided by placing a culvert underneath the runway embankment to carry the natural flow of water of this branch to the river along the line of its natural location. Care will be taken during design not to disturb the hydrology of the branch, or of the small river, by increasing the velocity of the water flow in this branch. As noted previously, the level of ground water is 7-9 m below the surface level of the airport when constructed and will, therefore, not be disrupted by the proposed development of the site.

#### 2. Relocation

23. No resettlement is required. The nearest residents live outside the site about 2 km from the operational areas of the airport.

#### 3. Land Values

24. A minor increase in land values, particularly of land closest to the main highway, has already occurred as a result of the purchase of the site for airport development. Land values along the main highway can be expected to change as a result of the construction of the airport; however, any adverse effects will be mitigated by land use planning, zoning, and the issuance of building permits by the local government in a manner that restricts development off the site.

## 4. Loss of Ecological, Cultural, or Other Resources

### Table 2. Summary of Potential Environmental Impacts of the NSA Project

| Action Affecting Environmental Resources and Values | Possible Effects on the Environment | Significance of Possible Effects | | | |
|---|---|---|---|---|---|
| | | Not Significant | Significant | | |
| | | | Small | Medium | Major |
| **A. Impacts due to NSA Location** | | | | | |
| 1. Disruption of surface water<br>a. Changes in hydrologic regime | 1a. impairment of<br>• aquatic ecology<br>• drainage<br>• navigation<br>• drinking water source<br>• irrigation usage | <br>x<br>x<br>x<br>x<br>x | | | |
| b. Pollution from leaching of spoils deposits | 1b. impairment of<br>• aquatic ecology<br>• drinking water source<br>• irrigation usage | <br>x<br>x<br>x | | | |
| 2. Disruption of groundwater<br>a. Changes in hydrologic regime<br>b. Pollution by spoils leachate | 2a. impairment of yields<br>2b. impairment of<br>• drinking water source<br>• irrigation usage | x<br><br>x<br>x | | | |
| 3. Resettlement | 3. Disruption of Residences | x | | | |
| 4. Changes in nearby land values | 4. Increases around the NSA and general area | | x | | |
| 5. Environmental aesthetics degradation | 5. Loss of environmental aesthetics | x | | | |
| 6. Loss of terrestrial or freshwater ecology | 6. Loss of forests and/or aquatic ecology | x | | | |
| 7. Loss of archeological, cultural, or historical sites | 7. Loss of significant sites | x | | | |
| **B. Impacts due to Design** | | | | | |
| 1. River erosion, flooding | 1. Downstream flooding, erosion | | x | | |
| 2. Slope erosion | 1. Siltation of river affecting surface water quality | | x | | |
| 3. Human and petroleum waste disposal | 2. Pollution of surface and groundwater | | x | | |
| **C. Impacts during Construction** | | | | | |
| 1. Sediment runoff | 1. Damage to aquatic ecology and/or flooding problems | | x | | |
| 2. Safety of workers | 2. Hazards to workers' health and safety | x | | | |
| 3. Endemic communicable disease hazards | 3. Damage to workers' health | x | | | |
| 4. Malarial disease hazards | 4. Damage to workers' health | x | | | |
| 5. Slum creation hazards | 5. Slums forming in construction housing after completion | x | | | |
| 6. Cultural differences hazards | 6. Social disruption | x | | | |
| 7. Escape of hazardous materials | 7. Damage to health of nearby residents | x | | | |
| 8. Escape of air pollutants and dust | 8. Damage to health and nuisance | x | | | |
| 9. Noise and vibrations | 9. Damage to health and nuisance | x | | | |
| 10. Quarrying/blasting<br>a. Blasting hazards | 10a. Hazards to safety of workers and nearby residents | x<br>x | | | |

| | | | | | |
|---|---|---|---|---|---|
| b. Failure to restore quarrysite | 10b. Loss of environmental aesthetics and land values | | | | |
| **Action Affecting Environmental Resources and Values** | **Possible Effects on the Environment** | **Significance of Possible Effects** | | | |
| | | **Not Significant** | **Significant** | | |
| | | | **Small** | **Medium** | **Major** |
| 11. Disruption of nearby utilities | 11. Disruption to services | x | | | |
| 12. Blocking of traffic/access to the NSA | 12. Disruption of through highway traffic | | x | | |
| **D. Impacts during NSA Operation** | | | | | |
| 1. Noise disturbance | 1. Hazard or nuisance to nearby residents | x | | | |
| 2. Vibration disturbance | 2. Damage to nearby residents | x | | | |
| 3. Water pollution | 1. Damage to surface and groundwater quality | x | | | |
| 4. Air pollution | 3. Hazard or nuisance to nearby residents/buildings | x | | | |
| 5. Erosion from newly completed earthworks | 4. Risks to aquatic ecology or flooding | x | | | |
| 6. Pollution from normal highway run-off | 5. Risks to aquatic ecology | x | | | |
| 7. Highway spills of hazardous materials | 6. Risks to residents and passerby | x | | | |
| 8. Escape of sanitary wastes | 7. Health hazards to passengers or nearby residents | x | | | |
| 9. Congestion at airport access or exit points | 8. Loss of time/air pollution | x | | | |
| 10. Hazards to traffic on highways near NSA from proximity to planes landing/taking off | 9. Highway accidents | x | | | |
| **E. Environmental Overview** | | **Comments** | | | |
| 1. Will the NSA cause irreversible losses in the area | 1. Loss of biodiversity and cultural landscapes | No. It will not result in any losses of biodiversity or historical or cultural assets | | | |
| 2. Will the NSA make unwarranted accelerated use of scarce resources in favor of short-term over long-term economic needs? | 2. Nonsustainable use of natural resources | No. It will utilize only common and readily available minerals and materials. | | | |
| 3. Will the NSA adversely depreciate national energy/foreign exchange? | 3. Loss of scarce energy and financial resources | No. It should benefit the country's economy. | | | |
| 4. Will the NSA result in unwarranted hazards to endangered wildlife species? | 4. Loss of biodiversity | No. There are no such species within at least 100 km of the Project. | | | |
| 5. Will the NSA intensify undesirable migration from rural to urban sectors? | 5. Creation of urban social problems | No. Migration to urban areas is already occurring and will continue with or without the Project. | | | |

25. There is no significant impact on the area's terrestrial or freshwater ecology from the location of the airport. There are no archeological, cultural, or historic resources on site, or within the area.

## B. Environmental Impacts Due to Project Design

### 1. Nearby River Erosion, Flooding

26. The construction of the airport will create a large impervious surface in an area that is now covered mainly by grassland and some brush and trees. Rapid run-off from this impervious area could have a moderate impact on erosion and flooding of the small river adjacent to the site. This potentially adverse impact will be mitigated by the proper design and construction of the drainage to incorporate retention into the system in order to avoid direct water runoff into the nearby small river.

### 2. Slope Erosion

27. The main embankment of the runway strip will be located near the small river running parallel to it on the north side and will have slopes of up to 7 m. Potential slope erosion will be mitigated by designing slope erosion controls such as benching and planting as an integral part of the Project.

### 3. Disposal of Human Waste

28. The potential pollution of surface water and groundwater due to the possible introduction of turbidity and coliform bacteria from human waste will be mitigated by the design of a wastewater treatment plant.

### 4. Petroleum Waste Disposal

29. Some spilling of fuel is likely to occur during aircraft refueling on the aircraft parking aprons, and it is necessary to trap and filter out these wastes before they enter the main drainage system of the airport, which will empty into the nearby small river. To mitigate this impact, the drainage system of the aprons will be designed so that water runoff during rains will be channeled into subsurface drains that will contain a trap system, accessible through access holes, to filter out and collect the petroleum wastes. These can then be disposed of at the wastewater treatment plant after being treated to break down the hydrocarbons.

## C. Environmental Impacts During NSA Construction

30. Minimal impacts are predicted during Project construction, provided that good design and construction standards and procedures are adopted. The most appropriate way of ensuring this is by contractual guarantee. Provisions to mitigate environmental impacts associated with construction will be incorporated into construction contract special conditions and specifications and will be enforced by construction supervision. It is anticipated that contractors will undertake to carry out the construction works in a manner that will not unduly affect the natural and human environment. A summary of construction activities capable of impacting the environment is shown in Table 3.

**Table 3. Construction Activities Capable of Impacting the Environment**

| Construction Activity | | Possible Impact on the Environment and Community | Expected Magnitude of the Impact on | |
|---|---|---|---|---|
| | | | The Site | Residential Areas |
| Mobilization of personnel and heavy equipment | | • Traffic disturbance<br>• Vibration<br>• Noise | • Major<br>• Major<br>• Moderate | • Moderate<br>• Moderate<br>• Moderate |
| 2 | Earthworks<br>- Soil improvement<br>- Excavation<br>- Embankment<br>- Compaction | • Vibration<br>• Noise<br>• Air pollution<br>• Water pollution<br>• Siltation and sedimentation | • Major<br>• Major<br>• Moderate<br>• Moderate<br>• Major | • Minor<br>• Minor<br>• Minor<br>• Minor<br>• Minor |
| 3 | Structural and civil works<br>- Excavation<br>- Embankment<br>- Rock crushing<br>- Riveting and welding<br>- Compaction | • Vibration<br>• Noise<br>• Water pollution<br>• Siltation and sedimentation<br>• Air pollution (dust) | • Moderate<br>• Major<br>• Moderate<br>• Moderate<br>• Moderate | • None<br>• Minor<br>• Minor<br>• Minor<br>• Minor |

### 1. Sediment Runoff

31. The construction program does involve some potential impacts of siltation and sedimentation, which could result in silting up the channel of the nearby river and altering its natural flow. This could also cause turbidity in the river, which might affect any fish present. These potential impacts during construction will be mitigated by the implementation of erosion and sedimentation controls such as silt barriers and sedimentation ponds. Open cut areas will be promptly seeded. There will be a number of areas of borrow on the site in order to generate fill for the runway embankment. Borrow areas will be promptly replanted or in some cases converted to temporary retention ponds as necessary. All cut slopes, embankments, and other erosion-prone working areas will be stabilized to the extent feasible while work is going on. Some spoil will be created by the removal of organic matter. Spoil materials will be placed in areas selected with aesthetic considerations in mind as well for economy and distance of transport, and will be graded and replanted to minimize any erosion. To the extent feasible some of the organic matter may be reused as topsoil for open graded areas of the developed site.

### 2. Dust and Noise/Vibration Pollution

32. There is little likelihood of pollution arising from potential sources of construction materials. All materials except for earthwork will be imported and stockpiled

in adequately constructed and protected areas. There will be no quarrying or blasting at or near the site. Noise and vibration from construction will be minimal, as no pile driving or pneumatic drilling activities are anticipated. Since the nearest inhabitants live about 2 km from the main construction area, dust from construction operations and the noise of operating machinery are unlikely to affect them significantly. Risks of dust pollution from rock crushing and from open cuts and earthmoving operations will be controlled by dampening down during dry periods as needed. Contractor mobilization and the import of construction materials will also create added truck noise along the main highway. This will be mitigated by forbidding such operations at night.

### 3. Worker Safety and Health

33. Worker safety will be protected by contractual undertakings to implement safe site practices. Because this is a new airport there are no hazards from operating aircraft. Sanitary practices in regard to providing potable water and the disposal of human waste will be enforced to safeguard worker health as part of the construction contract.

### 4. Slum Creation

34. Practically all of the work force will be recruited locally or from the more urbanized area of the city of Samarinda. This potential workforce lives within busing or walking distance of the site. Hence there will be little need to construct on-site housing, and in any case all of the contractors' on-site temporary structures will be demolished upon job completion. Little hazard of slum creation exists.

### 5. Traffic Congestion, Blocking, or Disruption of Utilities

35. The current level of traffic on the main Bontang-Samarinda highway near the site is 400 vehicles per hour during peak hours, 200 each way. This two-lane highway has a capacity of up to 2000 vehicles per hour at acceptable levels of congestion. The addition of contractor trucks, at a rate of up to 30 or even 60 per hour, to bring in equipment during mobilization and to import construction materials, is not likely to congest this highway. On the other hand, trucks waiting to turn into the site could block through traffic. To mitigate this form of possible congestion, stacking and turning lanes for trucks and heavy equipment carriers will be constructed by the contractor on the main highway. These lanes may be constructed on a temporary basis initially, to be converted into a permanent feature for airport operation.

36. As there are no utilities within the site, and the only utility near the site is a power line along the highway, no disruption to utilities is anticipated.

## D. Impacts During NSA Operation

37. As in the construction phase of the Project, no significant impacts are expected during the operating phase.

### 1. Noise/Vibration Disturbance

38. The effects of aircraft noise and vibration will be minimal in the residential areas closest to the site. As measured by noise monitoring during the EIA study, some residences along the highway are already subject to noise levels of 45-65 decibels from vehicular traffic.

39. A complete noise analysis was performed on the basis of the NSA air traffic forecast for 2008, utilizing the latest version of the Integrated Noise Model, developed by the U.S. Federal Aviation Administration, approved by the International Civil Aviation Organization (ICAO), and specified by the Bank as part of the scope of the TA feasibility study. A criterion of 65 Ldn (day-night noise level) was used to determine the area within which aircraft noise would have a significant impact and would be incompatible with residential land use. The noise analysis showed that in 2008, significant levels of aircraft noise would not penetrate beyond the runway strip itself and would therefore have no significant impact on the nearest residential areas.

### 2. Water Pollution/Escape of Sanitary Wastes

40. The escape of sanitary wastes, and pollution of the surface water and groundwater systems, would occur unless the wastewater generated by the operation of the airport, particularly from the terminal area, is treated. This will be mitigated by the construction of a wastewater treatment plant and sewage distribution lines as part of the Project. The sewage treatment process recommended for the NSA as part of the Project is a secondary wastewater treatment plant with which DGAC and the airport authorities in Indonesia have had adequate experience in operation and maintenance. Potable water for airport operations will be provided from a drilled well, or wells, with treatment to meet World Health Organization standards as part of the Project.

### 3. Air Pollution

41. As previously described, based on monitoring during the EIA, existing air pollution is minimal on and around the NSA site due to the absence of industry and the relatively low level of vehicular traffic on the north-south highway. Gaseous emissions from aircraft will not significantly alter this. The operation of the NSA will not result in an increase in highway or air traffic sufficient to have any significant impact on air quality.

### 4. Congestion at Airport Access and Exit

42. Unless through highway traffic on the main Bontang-Samarinda highway is separated from traffic turning into and out of the airport at the point of main access, congestion could occur. To mitigate any congestion, permanent stacking and turning lanes will be constructed on the main highway in both directions along with appropriate signage. Traffic flows to and from the airport are not anticipated to exceed 400 vehicles per hour combined from the North (Bontang) and the South (Samarinda City). When added to the current peak on the highway of 200 vehicles per hour in both directions, total traffic will not exceed the capacity of the dual lane highway.

### 5. Hazards to Traffic from Operating Aircraft

43. There is no risk of hazard from low flying aircraft to highway traffic, or from the highway traffic to aircraft, since the main approach end of the runway will be

located about 2 km from the highway, and aircraft will be passing at a considerable height over the highway.

### 6. Human and Economic Development

44. The NSA will not directly result in any intensification of rural-to-urban migration, which is already occurring within the urbanized area of Samarinda and of Bontang because of ongoing economic development. Both the construction of the airport and its operation will provide employment for the population near the site who are currently living at a subsistence level. Construction of the NSA will contribute to the general socioeconomic advancement of the area near the airport as well as of Samarinda City and the region.

45. A buildup over time of increasing development along the main highway near the site is likely to occur, but any adverse effects of this process on the Project will be mitigated by careful land use planning and the application of zoning and building permit controls by the local government in coordination with the airport operator. The positive aspect of this buildup is that infrastructure and public facilities, which are currently lacking, will have to be constructed to support the growing population.

### 7. Quality of Life Values

46. The current deficit of public facilities and services, as well as the lack of employment beyond subsistence activities, which adversely affect the quality of life of the population in the area, are likely to improve during the operational phase of the airport. The population around the airport is likely to grow, and as it grows, the installation of such services as telephone and eventually potable water and sewage treatment is likely to occur. As a result, the quality of life of the nearby inhabitants is likely to improve as operations at the airport expand, and an increase in off-site, as well as on-site, supporting infrastructure and services is provided.

### 8. Environmental Overview

47. The NSA Project will not involve the use of any scarce or irreplaceable resources in favor of short-term over long-term needs. The project will use common raw materials such as sand and gravel for its construction and future expansion. These materials are readily available from nonsensitive sites outside of East Kalimantan. No scarce energy or financial resources will be used for the Project. No loss of biodiversity will occur.

## V. ALTERNATIVES

48. Three alternatives were considered in the feasibility study, as follows.

49. **Alternative 0:** In this alternative the existing Samarinda Temindung Airport would be closed for safety and environmental reasons, and a replacement airport would not be constructed. This alternative would have a beneficial effect on the residential areas that closely surround this airport at present. However, it would have the economic, social, and political effects of depriving the capital of East Kalimantan of any direct air service whatsoever, either as a link outside the province, or within the province

to isolated areas of its hinterland that can be reached only by air. This alternative was not considered either practical or economically feasible. The nearest available airport would be at Balikpapan, a two-and-a-half hour drive from Samarinda and a five-hour drive from Bontang.

50. **Alternative 1:** This is the without-Project alternative of remaining at the existing Temindung airport within the urbanized area of Samarinda City. Besides obliging the continuance of unsafe air operations (the existing airport is completely out of compliance with applicable ICAO safety standards and practices), this alternative would maintain its currently significant adverse environmental impacts on the surrounding, close-in residential areas including (i) significant and incompatible levels of aircraft noise; (ii) hazards of aircraft potentially crashing into residential areas on take-off or landing, or even by veering off the runway by as little as 40 m; (iii) hazards of aircraft crashing into vehicles on nearby streets; (iv) continuing traffic congestion on regular city streets, which are also used for access to the airport; and (v) the wholesale taking of existing residential and some commercial property, and the resettlement of up to a 1,000 families living around the airport, if it were to be expanded to meet future air traffic demand. This alternative would also keep air service to Samarinda and the important industrial area of Bontang to the north at its current substandard level, constituting a serious limitation on the future socioeconomic development of East Kalimantan, including its tourism potential.

51. **Alternative 2:** This is the Project alternative of constructing the NSA as planned. This alternative, with the implementation of the proposed mitigation measures, will have only a minimal impact on the environment, and will represent an improvement in terms of significant environmental effects in comparison with the continued operation of the existing airport under Alternative 1.

52. Alternative 2 is clearly preferable on environmental grounds. Its location will have little or no significant impact on the environment. While the airport's construction has the potential of creating some adverse impacts, these will be mitigated by normal, good design and by properly implemented construction techniques. The most important of the potentially adverse impacts from airport operations, which are on water quality and land use, will be mitigated by providing a wastewater treatment plant and by the purchase of additional land for a buffer zone off both ends of the runway, as well as by the implementation of a revised land use plan for the area. This plan will restrict off-site development incompatible with the airport. The Project will clearly have less environmental impact than continuing the operation of the existing airport within the urbanized area of the city.

## VI. COST BENEFIT ANALYSES

### A. Internal Rates of Return

53. The economic internal rate of return for the Project was estimated at 14.4 percent by the TA consultants. Because of the large initial investment required in the airside (runway) portion of the Project, the Project as a whole has been estimated to have a financial internal rate of return of 4.7 percent based on an increase in airport rates and charges that occurred after the completion of the TA study.

## B. Economic Benefits

54. The main benefits included in the economic analysis were (i) incremental net visitor expenditures, (ii) time savings of passengers, and (iii) the value of foregone passenger and cargo traffic. Benefits such as cost savings in domestic aircraft operation; reduction in hazards to aircraft crews and passengers; generation of additional employment (direct and indirect); and increased property values were not included in the analysis.

## C. Project Costs

55. Project costs include (i) civil works, (ii) other construction, (iii) equipment and its installation, and (iv) consulting engineering design and supervision. These Project costs also include the cost of mitigating all negative environmental impacts during construction and into the operating phase, which amounts to $400,000, or about 0.6 percent of the total Project base cost.

## D. Monitoring and Reporting Costs

56. Monitoring will be required during the period of construction and during the operation of the Project. The minor cost of the equipment required for monitoring environmental impacts is also included in the Project cost. The personnel to carry out the monitoring and testing will be provided by the contractor but supervised by the Project Administration of DGAC, assisted by the supervision consultant, during construction. During operation, DGAC (or Airport Authority) operating staff of the airport will be responsible for monitoring environmental impacts. The necessary staff and budget for monitoring will be allocated in the regular operations and maintenance budget for the NSA, as is customary in Indonesia.

## E. Nonquantified Environmental Impacts

57. Nonquantified environmental impacts from airport development and increased other development off-site, including noise pollution, air pollution, and surface water pollution, were considered marginal, and additional economic assessment to internalize such costs and benefits was therefore not required. Since the recommended mitigation measures involve standard drainage design and construction practices for airports, it was not considered necessary to analyze their cost effectiveness.

# VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PROGRAM

## A. Institutional Capability

58. There is extensive experience in Indonesia, within DGAC and within the two airport authorities, Angkasa Pura I and Angkasa Pura II, in carrying out the EIA planning process and in implementing EIA monitoring programs. Pertinent governmental regulations and guidance concerning environmental protection have been in place since 1987. These regulations were revised and updated in 1994 by the issuance of Government Regulation No. 51, *Regarding Environmental Impact Assessment*, and *Guidelines for the Implementation of Government Regulation No. 51*. Also in 1994, the

Ministry of Communications (MOC) issued *Guidance for Environmental Impact Analysis of Airports and Its Facilities*, which includes environmental impact monitoring. In MOC Decree No. KM 58-1991, which concerns the organization and duties of DGAC, Clause 94-03 states that the duty of the Environmental Section of the Directorate of Airport Engineering of DGAC is "to provide and conduct technical guidance on environmental management, provide specifications on land use and provide for environmental impact monitoring and control." In view of the long experience of DGAC in environmental monitoring and control, no special training is required.

## B. Monitoring Program

59. The impacts of the proposed NSA Project are predicted to be of little significance. Therefore, a major monitoring program is not required, but a modest program will be implemented.

60. Monitoring during the construction phase of the Project will focus primarily on sedimentation and control of erosion and water runoff, water quality, worker safety and health, and traffic interference. Monitoring of construction operations such as the placement and maintenance of constructed siltation barriers and erosion controls will be done on a daily basis as part of the ongoing supervision and inspection of construction, as will worker safety and public health. Monitoring of water quality in the small river will be done on a monthly basis. Periodic observations of the water flow in the river will be made after heavy rainfalls to determine the effectiveness of the erosion and runoff controls that have been put in place as part of the construction process. Truck traffic will be monitored during mobilization and the import of materials to the site to determine that the traffic improvements at the entrance to the site are functioning properly. Monitoring during construction will be the responsibility of DGAC on-site Project administration assisted by the supervisory and inspection force of the consultant for design and supervision. They will ensure that the construction contractor carries out the necessary control and mitigation measures specified in the contract documents. The results of the environmental monitoring process will be contained in the monthly progress reports of construction prepared by the supervision consultant. These monthly progress reports will be sent to the DGAC central office in Jakarta, and to the Bank for review.

61. Monitoring during the operational phase will focus primarily on noise, land use, and development around the site, and water quality, and will continue for three years during the operational phase, after construction is finished. Monitoring will be performed on a monthly basis, supplemented by spot checks as necessary of water flow and quality. The airport operational and administrative staff of DGAC, or the Airport Authority, depending on which is responsible for operating the airport, will carry out the environmental monitoring work during the operational phase of the Project. Relevant monitoring data concerning noise and water quality will be obtained monthly at locations both off and on the immediate site. With the objective of monitoring and controlling off-site land use around the airport, DGAC will develop an agreement with the local government by which any changes in land use in the restricted zones of the land use plan adopted to control the area around the airport must be submitted to the Airport Authority (the airport operator) for review and concurrence prior to local government approval. Environmental monitoring reports will be submitted quarterly to the DGAC central office and to the Bank for review during the three-year period.

### C. Submission of Reports

62. As previously noted, construction progress reports, containing the results of regular monitoring, will be submitted monthly throughout the construction period, and monitoring reports during the operational phase will be submitted quarterly. These reports will be submitted to the DGAC central office, with copies to the Bank. DGAC will be requested to provide MOC and the Provincial Planning Board (BAPPEDA) with copies of these quarterly reports during the operation phase for their information and comment. The Directorate of Engineering of the central office of DGAC, as specified by MOC regulations, will provide general supervision of the monitoring process.

## VIII. PUBLIC INVOLVEMENT

63. Beginning in 1992, a number of meetings have been held by a series of consultants working on the NSA, with various departments of the local (Samarinda) government such as the transport, economic, land use planning, and public works departments. Meetings were held with various offices, subdirectorates, and directorates of DGAC, with the Planning Directorate and the Engineering Directorate being principally responsible. Each study was coordinated by a coordination committee of DGAC, composed of the subdirectorates of the various directorates of DGAC as well as with higher level committees involving representatives from MOC and the Airport Authorities.

64. Local residents in the area were consulted during the site location, land acquisition, and site clearing processes by the consultants and the local government. Extensive consultation was involved during the site acquisition process, with all landowners being compensated for the sale of their land. The feasibility study consultants, accompanied by Bank staff and DGAC officials, met with local officials of the city government during a visit to Samarinda and the site in February 1996. During the EIA study in December of 1996, members of the field team of the Indonesian environmental consultants, LAPI-ITB, met with local residents of the area near the airport and solicited their views. These local residents expressed general support for the new airport.

65. It is planned that, during Project implementation, the Project administration, in coordination with the local government, will keep related agencies and the local population near the airport informed about the Project, and will solicit their views as the Project progresses. Based on consultations with the local government and local residents, there are no relevant nongovernment organizations in the area.

## IX. CONCLUSIONS

66. The proposed NSA development will have no significantly adverse impacts on the surrounding environment. The construction, while involving soil improvement and considerable earthwork will, use proven construction techniques and conventional earthwork methods. Potentially minor adverse impacts can readily be avoided by good site management and construction practices, particularly related to drainage system design.

67. A simple monitoring program is needed to cover the construction phase and the first three years of operation. This will be prepared during the design phase of the Project by the engineering consultants and adopted by DGAC. It will then be implemented during Project construction by the Project administration assisted by the engineering consultants, and by the staff operating the airport (DGAC or Airport Authority) during airport operation. The monitoring program will be supervised by the Directorate of Engineering of DGAC.