

Summary Environmental Impact Assessment of the Central Sulawesi Integrated Area Development and Conservation Project in the Republic of Indonesia

Appendix 3

ABBREVIATIONS

AMDAL	-	<i>Analisis Mengenai Dampak Lingkungan</i> (environmental impact analysis, in the sense of a process)
BANGDA	-	<i>Bangunan Daerah</i> (Directorate General of Regional Development in the Ministry of Home Affairs)
EIA	-	environmental impact assessment
EIRR	-	economic internal rate of return
GDP	-	gross domestic product
IEE	-	initial environmental examination
NGO	-	Nongovernment Organization
UPT	-	<i>Unit Pelaksana Teknis</i> (Technical Implementation Unit)

NOTE

In this Report, "\$" refers to US dollars.

CONTENTS

- I. Introduction
- II. Description of the Project
 - A. Community Development.
 - B. Park Management and Ecotourism
 - C. Rural Support and Infrastructure Development
 - D. Project Management and Institutional Strengthening
- III. Description of the Environment
 - A. Physical Resources
 - B. Biological Resources
 - C. Human and Economic Development
- IV. Anticipated Environmental Impacts and Mitigation Measures
 - A. Impacts and Mitigation Measures Related to Location and Design
 - B. Impacts and Mitigation Measures Related to Construction
 - C. Impacts and Mitigation Measures Related to Operation
- V. Project Alternatives
 - A. No Project Intervention
 - B. Community Development Only
 - C. Park Protection Only
 - D. Community Development Together with Park Strengthening
- VI. Cost-Benefit Analysis
- VII. Institutional Requirements and Environmental Monitoring Plan
- VIII. Public Participation
- IX. Conclusions

I. Introduction

This Report summarizes the environmental impact assessment (EIA) of the Central Sulawesi Integrated Area Development and Conservation Project (the Project) in accordance with the guidelines and format specified by the Asian Development Bank for environmental category “A” projects. The EIA and this summary EIA were prepared by ANZDEC Consultants Ltd., as part of the Project feasibility study. The study was conducted by a team of sector specialists headed by an EIA specialist, with assistance from two nongovernment organizations (NGOs), The Nature Conservancy and CARE. The EIA report was based on information collected from field studies, site visits, and desk studies conducted over a six-month period spanning 1996 and 1997.

The Project is a community area development project that will be implemented together with the protection of Lore Lindu National Park (the Park) in Central Sulawesi Province, Indonesia. The Project design initially focused on eradication of schistosomiasis from two areas, one inside and the other outside the Park. However, with the entry of the Bank, the Project was eventually redefined with two interrelated objectives: (i) improving the socioeconomic welfare of the communities surrounding the Park to reduce poverty and to make them independent of the Park’s resources for their livelihoods, and (ii) strengthening the Park’s management to ensure the long-term protection of its biodiversity.

II. Description of the Project

The Project encompasses an area of 791,000 hectares (ha) in five mountainous subdistricts just south of Palu, Central Sulawesi’s administrative capital. The Project will focus on improving service delivery to poor and remote communities in an ecologically sensitive buffer area surrounding the Park. The Park, with an area of 220,000 ha, was established in 1982. Despite being a site of international significance for the conservation of a wide range of rare and endemic species, the Park lacks

basic facilities and adequate capacity for their protection. There is only a very basic knowledge of the Park's biological resources. It is facing increasing pressure from residents of surrounding communities who are supplementing scarce agricultural land by exploiting the Park's resources. Planned infrastructure development programs also pose potential direct impacts through lost resources, and indirect threats by providing improved access to the Park.

The Project will address Park protection by directly supporting activities in 60 communities which will work in cooperation with the Park authority to secure the Park boundary. The Project also will strengthen Park management. Because villages along the Park perimeter (the buffer zone) and those within two enclaves inside the Park will have to forego access to the resource-rich area of the Park, the Project will provide alternative means of economic support. While the Project will focus mainly on these 60 buffer zone communities, the Project area includes 117 villages in total, all of which will receive some benefit from Project activities. The Project will also address uncoordinated sectoral planning practices, adopted by local government agencies, which may result in construction of environmentally damaging physical infrastructure such as roads and hydropower development within and around the Park perimeter.

Project implementation will take seven years, and is scheduled to commence in April 1998. The initial year of Project implementation will be devoted to the establishment of Project management and coordination systems, and procurement and contracting services, and to social preparation. The Executing Agency will be the Directorate General of Regional Development (BANGDA) in the Ministry of Home Affairs. NGOs will be contracted to assist in Project implementation, especially at the interface between the Project and the communities. The estimated Project cost is \$48.0 million.

The following components are included in the Project:

A Community Development

This component targets 60 buffer zone villages for an intensive community-driven development planning process to identify and finance

activities that will generate income, health, and social benefits. It will provide consulting services and community facilitators to implement the process through which participants will learn to (i) prepare and submit village infrastructure development proposals to be funded under the Project's rural support and infrastructure component; (ii) self-administer a revolving credit fund from which they can finance environmentally sound income-generation activities, including agricultural production activities, livestock raising, agricultural processing and trading, ecotourism, and other nonagricultural microenterprises; and (iii) manage a modest "social cohesion" grant to finance community-based cultural activities aimed at promoting communal solidarity. The component will also provide technical and financial support to resettle Katu Village to another location of their choice outside the Park through a process based on the Bank's *Guidelines for Involuntary Resettlement*.

B. Park Management and Ecotourism

The Park authority has been recently organized and upgraded to Technical Implementation Unit (*Unit Pelaksana Teknis* [UPT]) status, which means that it will receive additional staff and a separate budget for managing the Park. This component is designed to (i) assist with the implementation of the 25-Year Park Management Plan, and (ii) generate community-based initiatives to promote ecotourism in the Park. The activities are designed to facilitate collaboration among the Park authority, local government units, villages, and NGOs.

1. Park Management

The Project would provide technical assistance to the Park authority to undertake essential first steps in establishing an on-site presence and user-friendly Park service. Key activities to be supported will include (i) developing and implementing a five-year work plan; (ii) training Park guards and villagers to set up a Park boundary and inventory monitoring system; (iii) working with villagers to formulate conservation agreements to grant them temporary harvesting rights until they can find alternative

sources of sustenance from farming or other activities outside the Park; (iv) developing a Park visitor program and recruiting and training incremental staff and villagers to implement it; (v) constructing guard posts, staff housing and visitors' centers; rehabilitating of existing structures; and purchase of field equipment and vehicles for Park resource monitoring purposes; (vi) undertaking inventory and ecological studies to guide Park zoning for various uses; and (vii) constructing and rehabilitating trails to improve access to Park attractions and roads outside the Park.

2. Ecotourism Promotion

The Project would target four "gateway communities"⁴ around the Park to (i) develop and implement a community-based program to encourage residents to establish small-scale tourism facilities and activities such as guiding, mountain-biking, and homestay accommodation; and (ii) encourage networking activities to link local service providers with specialist ecotourism operators outside the Project area to attract and cater to more sophisticated tourists. The Project support will include consulting services, training, and logistical support.

C. Rural Support and Infrastructure Services

This component will target all 117 villages for services to be provided by the provincial agencies responsible for health, agriculture, and rural infrastructure. Health services will particularly focus on schistosomiasis control and surveillance, and on rural health care. Rural infrastructure will include upgrading of rural roads and rehabilitation of village irrigation systems. A further subcomponent will be the creation of a "social fence" around the Park, which will be linked to the community development component. This will include weaning villagers from their farming

⁴ *For the purposes of this Project, these are defined as human settlements that have access to the Park and have distinctive features that can be developed for ecotourism. The four communities are located in the two enclaves within the Park and in Kamarora and the Bada Valley.*

activities and other exploitation in the Park by providing viable economic alternatives through the above-mentioned agricultural development and other support, with the aim of establishing dates when these uses will no longer be permitted inside the Park. The social fence also will eventually include community action to create a living fence of trees and shrubs along the Park boundary. Support will be considered for upgrading existing small ecotourism operations or establishing new ones.

D. Project Management and Institutional Strengthening

The Project will provide support for effective management, financial administration, procurement, and monitoring and evaluation. The component will also include support for establishing a Project Coordination Unit in the Provincial Planning Office; training for all Project staff from the provincial, district and subdistrict government agencies; and forming buffer zone forums to promote local support for conservation activities.

III. Description of the Environment

A. Physical Resources

The terrain of the Project area is extremely rugged, precipitous, and deeply dissected by four principal valleys: the Kulawi Valley to the west, the Palolo Valley to the north, the Napu Valley to the east, and the Bada Valley to the south. The last two are large tectonic basins, once flooded, and are similar in origin and form to the smaller Besoa and Lindu valleys, both of which are within the Park but excluded from it as enclaves. Lindu Valley still contains a lake. The topography of the settled valleys and enclaves is characterized by relatively flat to gently undulating terrain. About 10 percent of the Park lies between 200 and 1,000 meters (m) altitude; 70 percent between 1,000 and 1,500 m; and 20 percent above 1,500 m, rising to the peaks of Mt. Nokilalaki (2,610 m) and Mt. Rorekatimbu (2,356 m).

The geological structure of the Project area falls within the Palu Tectonic Zone, with an active fault line that forms the Palu Valley and has

a northwest-southeast direction. This marks the point of contact between the tectonic plates that support the two halves of Sulawesi. The fault zone moves several centimeters each year and is seismically active, resulting in highly fractured rock formations within the Palu and southern Kulawi valleys. Consequently, the area is extremely susceptible to landslides and, wherever forest cover is lost, to catastrophic soil erosion. Landslides within the Kulawi Valley have caused substantial areas of irrigated rice to be buried by stones, while other villages are threatened by river bank erosion and flooding. In the eastern and northern parts of the Project area, the topography is gentler and the area more stable.

Located just 1° south of the equator, the Project area experiences little climatic variation. The climate is characterized as wet tropical with only slightly pronounced wet and dry seasons. Rainfall is adequate and varies from 1,600 millimeters (mm) on the eastern side of the Park to 2,400 mm on the western side. A rain shadow effect is evident around Palu, where less than 1,000 mm of precipitation is recorded annually. Most of the Project area has fewer than three dry months per year, but Palu has all 12 months dry. Maximum and minimum temperatures for Palu vary between 32°-33°C and 22°-23°C, respectively, while areas that are over 1,000 m above sea level may vary between 26° and 35°C maximum, and between 12° and 17°C minimum. The relative humidity is constant and high in most areas, and varies little between 77 and 85 percent.

The northern half of the Project drains via the Sopo-Gumbasa River into the Palu River, which flows northwards to reach the sea at Palu. The Sopo-Gumbasa supports the irrigation of about 22,000 ha in the Palolo and Palu valleys, the latter being the site of the large Gumbasa irrigation scheme. The southern half of the Project drains into the Lariang River, which encircles the eastern, southern, and southwestern boundaries of the Park before flowing westwards out of the Project area. Copious and intense rainfall makes all of the rivers that drain the Project area subject to flooding. The Gumbasa reaches peak flow rates of 1,000 cubic meters per second, and when in flood is a boulder-carrying river.

B. Biological Resources

Sulawesi occupies a significant transitional zone between the Australasian and Asian biological realms. It contains at least 328 bird, 127 mammal, 117 reptile, 68 freshwater fish, and an estimated 5,000 plant species, and an unknown but very large number of invertebrates, such as insects. Sulawesi's isolation has given the island an extremely high level of endemism, that is, species found nowhere else in the world. Twenty-seven percent of Sulawesi's bird species, 62 percent of its mammals (or 98 percent if bats are excluded), 26 percent of its reptiles, 76 percent of its amphibians, and 77 percent of its freshwater fish are found only in Sulawesi.

Forests occupy 89 percent of the Project area and 97 percent of the Park. The most widespread vegetation types within the Project area are submontane and montane rain forests. Submontane forest occurs between 1,000 - 1,500 m elevation, with montane forest occurring above 1,500 m, and elfin woodlands occurring near the peaks above 2,000 m. The only indigenous eucalypt to occur outside Australia, *Eucalyptus deglupta*, is found within the Park and is endemic to the area. Forests that are outside the Park are for the most part gazetted and under the control of the Forestry Department. Many of these are now being logged. Small-scale illegal logging also occurs within the eastern boundary of the Park, primarily by shifting cultivators resident in Katu Village.

Sulawesi has several sites that are globally recognized as "centers of plant diversity" and "endemic bird areas," and the Park is individually listed in both categories. The Park has been gazetted as a biosphere reserve by the United Nations Educational, Scientific, and Cultural Organization. Some of the endemic species that the Park contains include the babirusa (*Babirusa babirusa*), a wild pig; the giant civet (*Macrogalidia musschenbroekii*); the mountain anoa (*Babalus quarlesi*), a dwarf buffalo; the Tonkean macaque (*Macaca tonkeana*); the tarsier (*Tarsius spectrum*); the phalanger, or cuscus (*Phalanger celebensis*); and the maleo bird (*Macrocephalon maleo*), which buries its eggs in geothermal hotspots.

C. Human and Economic Development

Within the Project area there are 117 villages with a population of about 122,000 in 24,000 households. About 70 percent of the population is indigenous to the area; the remaining 30 percent is an immigrant population. Immigrants have come to the Project area through spontaneous in-migration and through government transmigration programs from other islands such as Java and Bali. Transmigration settlements have been developed in the Palolo and Napu valleys for about 600 households, and there are plans to accommodate an additional 800 households. The majority (91 percent) of the population in the Project area are concentrated along the river valleys that also form the Park perimeter, while the remainder of the population (9 percent) live in remote villages that are scattered in the west, away from the Park. The average population densities for these areas are 17.7 and 6.5 persons/square kilometer (km²), respectively, although actual densities may reach 476 persons/km² in the most densely settled villages along the Park perimeter. Social and physical infrastructure is generally better in the Park perimeter villages, although all facilities require upgrading.

A social survey conducted in 1996 during the Project's feasibility study showed that 102 villages, or 87 percent of all villages within the Project area, were below the poverty level, having an average income of only Rp597,300. This is about 50 percent lower than the poverty line for the province (Rp1,165,750). Poverty was higher among native families (72 percent) than immigrant families (28 percent). At the provincial level, infant mortality is 79 per thousand live births, and only 50 percent of all residents have access to safe water. Both figures are less than the national average.

Subsistence farming is the main occupation. Land is held under a variety of property rights, with the State possessing overall land ownership. Under this system, traditional land rights can be legally usurped by the State, although this is rarely done. Traditional land occupation is still recognized as being a sufficient guarantee for security against loans. Landlessness among native households is estimated at less than 10 percent, although this is expected to increase as pressure on land increases from more politically and economically astute immigrants.

Only 8 percent of the available land within the Project area is suitable for farming. Land, especially irrigated farmland, is scarce and already occupied. Sigi Biromaru Subdistrict is an exception, with large irrigated areas established in the Palolo and Palu valleys. Normally, agricultural land constitutes less than 10 percent of a subdistrict. In the Project area, 38 percent of the agricultural land is cultivated with rice.

Shifting cultivation has been largely abandoned in the Bada and Palolo valleys and in the northern parts of the Kulawi and Napu valleys. However, some shifting cultivation still occurs in the southern parts of the Napu and Kulawi valleys, in Katu Village, and in the Besoa enclave. This system involves a short fallow rotation of 2 or 3 seasons, and then cropping for 2 or 3 seasons. Land under shifting cultivation occupies about 2 percent of the Project area.

The average farm size is about 2.5 ha, and the main crops are rice (traditional irrigated and dryland), maize, cassava, and soybean. Most of these crops are grown using traditional varieties with few agrochemical inputs, with irrigated rice yielding 3,500 kilograms (kg)/ha and upland rice yielding 1,500 kg/ha. Perennial crops are also grown, including coffee, cocoa, coconut, and clove.

The shortage of available land is now forcing people to move to less suitable areas to plant subsistence and cash crops. Available land has been further reduced by large commercial farming operations, e.g., in the Napu Valley, where approximately 10,000 ha of land has been acquired by a company. The combination of land shortages and large-scale commercial farming operations has forced land-hungry people either to move to steeper slopes, with inevitable consequences in the form of erosion and landslides, or else to occupy land within the Park's boundaries.

Health care within the Project area is generally satisfactory, although a substantial number of the facilities are in need of renovation. Services are well distributed, with 90 percent of communities located within 5 kilometers (km) of a health facility. The two main health problems that are reported within the Project communities are diarrhea and respiratory infections, while schistosomiasis is a major concern in those communities that are near snail foci in the Napu and Lindu valleys. The intermediate host is a small amphibious snail, *Oncomeliana hupensis lindoensis*, which

inhabits irrigation drains and waterlogged areas. Human infection rates were 56-74 percent before control programs were initiated. The programs have reduced the incidence to 1-3 percent. Host reservoirs for the disease, apart from humans, include domestic and wild animals, which will limit the degree of effective control possible since reinfections will occur from these other host reservoirs.

IV. Anticipated Environmental Impacts and Mitigation Measures

The presence of the Park within the Project area makes it extremely important that activities supported by the Project do not affect the integrity of the Park as an ecosystem and as a source of unique biodiversity. Accordingly, the Project has been designed to promote environmental protection near and within the Park, while also supporting the legitimate economic development aspirations of local communities. An impact matrix developed during the EIA study is presented in Appendix 2. It shows that the majority of Project impacts are expected to be beneficial. Project development interventions with potential adverse impacts will be on a small scale, and so the impacts are expected to be insignificant or minor and can be readily mitigated.

A. Impacts and Mitigation Measures Related to Location and Design

Project-supported development activities will be undertaken mainly at locations near the Park boundary. Although these activities are small-scale and intended primarily to provide viable alternatives to using the Park's resources for subsistence and economic gain, there is an inherent risk that they could indirectly encourage further Park degradation. This could occur by attracting further in-migration due to improved social and economic conditions, or by giving local residents the economic means to increase exploitation of the Park's resources. This potential impact has been recognized, and safeguards have been provided as integral components of the Project design. These include support for improving local capabilities in

incorporating environmental considerations into development planning; community-Park conservation agreements that will link support for economic development with demonstrated community support for Park protection; and increased capacity for law enforcement. Target beneficiaries will be registered at the beginning of Project activities, and benefits will be provided only to those families that are so targeted in order to discourage in-migration. In addition, during the design of the Project, the Government agreed to upgrade the Park to full national park status. This status has now been formalized and entails increased and long-term budgetary and human resource provisions. This in turn will strengthen capacities for law enforcement and monitoring.

The Project will provide assistance to resettle the 64 households that comprise Katu Village, which is located within the eastern part of the Park. Due to the rugged terrain, only 15 ha is currently available there for rainfed rice cultivation, and so all households depend largely or solely on shifting cultivation, illegal logging, and rattan collection within the Park. These activities have been recognized for nearly two decades as a serious threat to the long-term stability of the Park, and the Government has intended since 1982 to resettle the community. The Project will assist the community and the Government to undertake the resettlement based on the Bank's *Guidelines for Involuntary Resettlement*.

A Resettlement Action Plan has been prepared, which will ensure that the villagers are at least as well off after resettlement as before, but with the added benefit of protecting Park resources. Major provisions of the plan include:

- (i) replacement of houses and community structures of a standard equal to or better than those in Katu;
- (ii) compensation for tree crops;
- (iii) agricultural land of at least comparable size and productivity to that in Katu;

- (iv) basic infrastructure, including water supply, sanitation, access roads, and irrigation at a level sufficient for the villagers to maintain or improve their pre-Project living standards; and
- (v) community services and resources at or above the pre-Project level.

The plan has been costed at about \$150,000 and will be implemented by the Department of Transmigration together with a village committee and local government institutions. An NGO will be contracted under the Project to monitor the process and results of the resettlement. The affected families and the local government have indicated their acceptance of the resettlement plan's provisions.

The snails causing schistosomiasis inhabit poorly drained sites. Some sites remain around the perimeter of existing irrigated areas in the Napu and Lindu valleys. The Project will assist villages to drain some of these sites, most of which are less than 1 ha, and add this land to the irrigated land which, in the process, will destroy the snail's habitat. None of these sites are known to be valuable as wetlands because of their small size and their location next to farm land. However, the precise sites to be drained will be selected only after the villagers are trained in development planning. Therefore, before specific sites are drained, an initial environmental examination (IEE) will be conducted. If the IEE determines that any of the selected sites are of significant value as wetlands, they will be excluded from the drainage program.

B. Impacts and Mitigation Measures Related to Construction

1. Road Development

The provincial government has begun construction of the Gimpu-Gintu road, which will pass through the southwest portion of the Park. Implementation has been halted due to environmental concerns, but the provincial government's future actions are uncertain because it views the road as necessary to provide access to local settlements and to improve the

efficiency of the province's regional road network. Similarly, construction of the Doda-Gintu road is planned by Poso District, and would be located mostly inside the southern portion of the Park.

Although these roads are not included as part of the Project, they were investigated under the Project's EIA study because they are major interventions that will influence Park management. The study determined that these roads will likely cause long-term adverse impacts to the Park, are incompatible with Park objectives, and will be detrimental to the Park's operation and use. Mindful of the provincial government's legitimate desire to improve the local and regional road network, the study suggested that construction of these roads be abandoned, and an alternative route be selected that would meet this function without detriment to the Park.

One potential alternative route is located to the east of the Park and would be approximately 34 km long. An initial environmental and engineering examination of the route was undertaken near the end of the feasibility study. Approximately 60 percent of the area through which the road would pass is considered to be secondary forest, and 40 percent is bush and *alang-alang* (grassland created from formerly forested land due to human disturbance). Based on a right-of-way of 10.5 m, the cost of construction and of detailed engineering and environmental studies is estimated at \$1.5 million. This amount has been included in the Project costs. However, a final decision whether and along what alignment to construct the road will not be made until (i) further engineering studies are done; (ii) a satisfactory EIA has been prepared for the preferred alignment, showing the road to be environmentally feasible and in conformance with the Bank's policy on forestry; and (iii) agreement is reached with the Government that the proposed roads through the Park will be permanently abandoned in favor of this alternative route. The latter two conditions will be included as covenants in the Project loan documents.

The Project will support rehabilitation of existing rural roads, including the Betue-Doda Road (30 km); Rahmat Road (10 km); Puroo-Anca Road (7 km); Toro Road (4 km); and Hanggira-Lempe Road (2 km). The roads are on level or gentle gradients, and rehabilitation will follow the existing alignments. There will be minor widening in some areas, and a 3.5-m gravel pavement will be provided. The environmental impacts from

rehabilitation are expected to be small and short-term, involving primarily minor soil erosion that will be mitigated through soil conservation practices. Best practice procedures for site preparation, clean up, and rehabilitation will be provided in the tender documents, as will penalties for non-compliance. Work crews will be strictly prohibited from bringing firearms or traps into the Project area. Any person found in possession of wildlife or other forest products will be dismissed and the contractor fined. The provision of adequate drainage is expected to improve long-term soil maintenance along the roads.

2. Foot Trails

About 100 km of existing foot trails will be improved in remote areas where road construction cannot be justified on environmental and/or economic grounds. This will primarily involve improving the trails' safety, as they are narrow and dangerous when wet. Work will be done by hand, and trailside vegetation will be maintained. The adverse impacts are expected to be insignificant.

Approximately 110 km of trails will be provided in the Park to assist in park surveillance and to provide tourist access to points of interest. Their precise locations will be determined following an inventory of Park resources and preparation of a zoning plan, to be supported under the Project. The existing 17-km foot trail to Lake Lindu from Sidaunta will be improved for safety reasons. Again, all work will be done by hand, trailside vegetation will be maintained, and adverse impacts are expected to be insignificant.

3. Pedestrian Bridges

Two existing pedestrian bridges will be rehabilitated, and one new bridge will be constructed. These will be located in Bada in the south of the Project area. Adverse impacts will be insignificant.

4. Minor Bank Protection and River Training Works

A total of approximately 20 km of minor bank protection and river training works will be provided at several locations where river bank erosion and flooding are threatening good agricultural land and property. The main sites are within the Fossa Sarasina fault line, which is particularly prone to soil erosion. The objective of this component is to prevent or reduce the dislocation of families from these areas due to the loss of agricultural land and property that would occur without bank protection and river training. The works will consist of a mix of gabion placements and vegetative bank protection using vetiver grass, bamboo, and other suitable plants. Adverse impacts will be insignificant.

5. Mini-hydro Installations

Up to five mini-hydro sets with a generating capacity of no more than 20 kilowatts are included in the Project costs. The sites will be selected by the communities following the Project's support for strengthening of capacity for community development planning. Selection criteria will include (i) an established need for electricity, (ii) a demonstrated ability and firm commitment from the recipient community to provide cofinancing and operation and maintenance costs, and (iii) preparation of an environmental assessment that demonstrates that environmental impacts, if any, can be adequately mitigated. The installation of mini-hydro sets has few adverse impacts because the scale is very small, and no construction impacts of major significance are foreseen. The participating communities will assist in the selection of the small areas required for excavation and spoil disposal, and spoil sites will be revegetated and landscaped. Precautions will be taken to minimize downstream sedimentation through implementation of best engineering practices.

6. Irrigation

Small-scale community-managed irrigation systems, each less than 50 ha, will be rehabilitated to serve existing rice fields in the Project area. Rehabilitated systems will require cleaning, which will result in localized and temporary sedimentation of minor significance.

C. Impacts and Mitigation Measures Related to Operation

1. Improved Access to Park Resources

The rehabilitation of the existing Betue-Doda Road, 10 km of which is located inside the Park, could create possible indirect impacts by increasing the potential accessibility to Park resources. This was recognized by the feasibility study team as a critical issue, and the pros and cons of supporting road rehabilitation were given particular attention. The team eventually decided that this component could be supported on environmental grounds because:

- (i) the Central Government will provide assurance that support for the road will be given only in exchange for abandoning plans to construct the Doda-Gintu Road, which would cross 24 km of the Park;
- (ii) rehabilitation work would begin only after community conservation agreements (linking such support to community support for Park protection) are signed with the villages to be serviced by the road;
- (iii) guards will be stationed at a monitoring post located at the point where the road exits the Park;
- (iv) Project support for overall Park surveillance and protection will decrease opportunities for illegal use of Park land adjacent to the Besoa enclave; and
- (v) local NGOs will be encouraged to assist Park authorities in monitoring road use.

2. Wildlife Damage to Crops

Increased cropping within the Park buffer zone may attract Park animals into the area, resulting in crop damage. The impact cannot be

determined at this time. The Park authorities will evaluate the risks involved and then determine how best to provide some measure of crop protection for the farmers, if the study shows that this is warranted. Crops that have a high attraction to wildlife should not be included as components in the agricultural cropping systems to be promoted within the buffers zones.

3. Increased Use of Agrochemicals

The rehabilitation of irrigation areas and introduction of new higher yielding varieties may increase the use of agrochemicals, especially pesticides and some herbicides, with potential adverse impacts on community and ecosystem health. The impact will be mitigated by ensuring that only agrochemicals registered by the appropriate government agency are used; providing farmer training programs, including farmer health and safety, safe storage, mixing, application and disposal of containers, to be conducted by the agricultural extension authority to ensure that farmers are made aware of the dangers posed by these chemicals; and application of integrated pest management techniques.

4. External Threats to the Park

With the exception of potentially increasing opportunistic in-migration because of improved living conditions and economic opportunities, external threats to the Park are independent of Project activities and would occur without Project intervention. Nonetheless, they are discussed here because consideration of these threats affected how the Project was designed, to the benefit of Park protection. Four main external threats were identified:

- (i) Natural population increase within the two enclaves of Lake Lindu and Besoa. In 25 years, population and land cultivation will have doubled in these enclaves.
- (ii) Environmentally damaging infrastructure caused by uncoordinated sectoral planning arising from local government initiatives. Current threats to the Park include roads from Gimpu

to Gintu and from Doda to Gintu, hydropower development at Lake Lindu, and water supply development at Lake Lindu.

- (iii) Increased in-migration, resulting from people displaced by natural disasters, opportunistic in-migration, and transmigration settlements.
- (iv) Exploitation of ecological resources within the Park by commercial interests or local agents of commercial interests resulting from weak enforcement of regulations or collusion with government officials.

The immediate impacts of resource use by the communities will be mitigated by Project support for:

- (i) improved cooperation between communities and Park staff through such programs as the community conservation agreements,
- (ii) increased capacity of Park staff for monitoring and surveillance,
- (iii) stronger law enforcement efforts, and
- (iv) establishment of buffer zone forums to identify and resolve problems.

The longer term impacts of continuing resource use will be addressed by the Park management plan, which will require monitoring of the enclaves' growth and preparation of a program together with the enclave communities to address the long-term need to regulate the exploitation of the Park's resource base.

Regarding unplanned infrastructure development, the EIA study showed that alternatives are available for all of the physical infrastructure threats now posed against the Park. Palu's energy need could be replaced by using generation from Lake Poso, which would also avoid the water

supply proposal, as this shares a common infrastructure base with the hydropower project. Alternative road alignments that are outside and well away from the Park are available to replace the two proposed road links that would cut through the Park. The Project will help to mitigate any future likelihood of serious impacts from unplanned infrastructure development by directly strengthening institutional planning and increasing conservation awareness within the various local government authorities and communities. This will include training in conservation planning, which will be incorporated within the framework of the Government's Regional Environmental Planning Regulations. These threats should be satisfactorily addressed while finalizing the Project proposal.⁵

Increased in-migration will be countered in three ways:

- (i) For those households that may be displaced by natural disasters, the uncertainty of the occurrence will be offset by the Project drawing up contingency plans in conjunction with the local government. Should resettlement be required because of damage to households by earthquakes, landslides, and the like, the Project will be able to act from an informed position and thereby reduce the impact on the Park. This will be similar to a civil disaster plan.
- (ii) Spontaneous settlement will be addressed under the community planning process, which will enable community members to assess their available resources and development options and to reach consensus on the desirability of local in-migration and the application of available control measures.
- (iii) Unsatisfactory location of transmigration settlements will be avoided by applying those mitigation measures outlined above for reducing the impact of unplanned physical infrastructure. Adverse impacts will be reduced by the application of the Government's Regional Environmental Planning Regulations.

⁵ *It is noted that these issues will be the subject of discussion between the Government and the Asian Development Bank before the Project proposal is finalized.*

Commercial exploitation of Park resources will be managed by:

- (i) increasing the capability for Park protection under the Park management component,
- (ii) creating a public forum at the local and provincial levels that will encourage exposure of collusion involving Government officials, and
- (iii) increasing public awareness of environmental values and the destructive potential of commercial exploitation.

5. Environmentally and Socially Beneficial Impacts

A major impact of the Project will be in enhancing the protection of the Park together with significant social benefits in terms of improved quality of life, particularly in the 60 communities that surround the Park. The major environmental and social benefits accruing from the Project will be

- (i) improved local decision-making, which will give the community greater confidence in determining their development direction and help to avoid environmentally destructive development;
- (ii) viable economic alternatives to Park exploitation through Project support for increased access to funds for small rural development projects, increased village opportunities from tourism, improved agricultural production systems that utilize land more effectively, and employment opportunities with the Park;
- (iii) greater local understanding of conservation issues and increased awareness of the Park's conservation value, leading to improved community cooperation with the Park;
- (iv) improved health and nutrition, including continuing control of schistosomiasis;

- (v) improved access to the existing road network outside the Park;
- (vi) improved Park management with greater capabilities to monitor threats and protect the Park;
- (vii) an inventory of Park resources, which will be used to establish a Park zoning plan that will define Park use categories and intensity of use; and
- (viii) improved facilities to develop ecotourism, which will assist in funding the Park's operations.

The Project will also have a further significant social benefit for the remainder of the Project communities that will manifest itself in improved social and physical infrastructure. Strengthening of Park management will assist in protecting the Park's forested watershed, which will ensure the continuation of the existing hydrological conditions within the Park. This will have a significant regional impact by ensuring the continued downstream flow conditions that support a large irrigation area and the water supply for Palu.

V. Project Alternatives

The Project evolved from a primarily schistosomiasis eradication project to one that meets the overall need to create sustainable economic development within a biologically important area of Central Sulawesi Province. This significant change in scope resulted from the use of a process method that identified strengths and weaknesses of various alternative scenarios to finally arrive at the preferred Project design.

The major alternatives considered during Project design are described below.

A. No Project Intervention

The current situation of uncoordinated and poorly planned sectoral interventions nearby and within the Park, commercial exploitation of Park resources, and encroachment into the Park by nearby communities would persist and intensify. Under this scenario, the Park's biological base would eventually fail from outside community pressures, poorly integrated sectoral planning, and commercial exploitation.

B. Community Development Only

An early alternative that the Project considered was the need to integrate control of schistosomiasis with community development. While this may have reduced community threats to the Park by offering alternatives to the use of Park resources, it may also have catalyzed exploitation of Park resources by creating conditions for uncontrolled in-migration of outsiders seeking to benefit from improved social services and income-generating opportunities. It would not have addressed the next order of threats from external sectoral agencies imposing uncoordinated infrastructure development on the Park; nor would it have addressed commercial exploitation. This development scenario would have had a beneficial impact on the community, but would likely have adversely affected the Park's resource base.

C. Park Protection Only

This scenario—with little or no provision for local economic alternatives, strengthening of sustainable infrastructure planning capacity, and Park-community cooperation programs—would have required a major law enforcement intervention to safeguard the Park. This would have engendered an adversarial relationship between Park staff and local people, which Park staff could not be expected to win. This scenario was not palatable to either the Government, the feasibility study team, or the Bank.

D. Community Development Together with Park Strengthening

This alternative was finally selected by the Project design team as being the only viable alternative to advance sustainable economic development criteria while still meeting the initial objective of controlling schistosomiasis within the area. The output of the Project will see strengthening of community participation in the “bottom up” planning framework for provincial and district government levels; improvement of quality of life values within a poor rural setting through various coordinated interventions in social, environmental, and infrastructure development; and the benefit of securing the Park’s biological resource base by removing community, commercial, and Government sectoral threats to the Park.

VI. Cost-Benefit Analysis

The cost of the Project over seven years is estimated at \$48.0 million, with an economic internal rate of return of about 18 percent. The base costs include community development, \$11.3 million; Park management and ecotourism, \$7.5 million; rural support and infrastructure, \$20.2 million; management and institutional development, \$3.4 million; and interest during construction/commitment charge, \$5.6 million. The balance is made up of contingencies and interest.

The estimated cost of environmental mitigation and enhancement measures is \$15.8 million. This includes the costs of the community development component, the resettlement of Katu Village, the Park management component, schistosomiasis control, drainage structures along roads, grasses and bamboo plantings on river banks, and consulting services for environmental monitoring and biodiversity inventory studies.

The analysis determined that the main economic and social benefits to be derived from the Project are

- (i) increased value added by about \$3.4 million, derived from the application of a range of improved agricultural technologies, and improved irrigation systems;

- (ii) an increase of 1,196,000 person-days per year of productive labor, valued at \$1.3 million per year, derived from reduced sickness and time required to carry water for domestic use;
- (iii) savings in crop and property damage of \$135,000 per year from improved flood protection;
- (iv) maintaining the benefits of existing downstream irrigation and water supply facilities, estimated at \$3.6 million per annum (in 2013); and
- (v) increased ecotourism earnings from increased direct expenditures by tourists of \$140,000-\$190,000 annually.

Nonquantifiable environmental benefits of the Project were also identified. They include conservation of the Park's irreplaceable habitats of animal and plant species; and the significant amount of carbon stored in its forests, which is a contribution to the global effort to reduce total carbon released to the atmosphere. A possible future economic benefit could be derived from potential biotechnology investments to harvest the Park's biological resources commercially and on an environmentally sustainable basis.

VII. Institutional Requirements and Environmental Monitoring Plan

The Executing Agency will be BANGDA. Project supervision, review, and coordination will be carried out at three levels. A Project Executive Committee will be formed in each district to supervise Project implementation and approve village development proposals resulting from the community development planning process. A Project Coordinating Committee will be formed at the provincial level and will include representation from provincial government agencies and NGOs. A Project Steering Committee will operate at the national level. NGOs will be responsible for developing the community consultation process at the village level.

Most Project interventions will be designed in detail only after community and local government planning capabilities have been strengthened. This will be done so that, by shifting the planning process more firmly to the local level, Project beneficiaries will have the opportunity to fully participate in the design of all major interventions. An important component of this approach will be the provision of training for Project beneficiaries at the village, subdistrict, and district levels in (i) project selection and environmental screening of proposals, (ii) conservation planning, and (iii) environmental management. Training will be contracted to an NGO, which will be assisted by a community EIA advisor. At the provincial level, the Project will provide the position of Park Management Advisor who, in addition to duties directly related to park management, will also advise on the coordination of provincial development planning, and the formation of buffer zone forums to identify and resolve environmental issues. The buffer zone forums would liaise with the existing Environmental Communication Forum led by the Provincial Planning Office.

In March 1997, due in large part to intervention by the Bank during the Project design stage, the Park was upgraded to UPT status (full national park status) which will make Park administration more efficient by reducing the number of administrative levels between the Park and the Head Office and by providing sustained and increased support for Park management. The Project will directly strengthen Park management so as to improve its overall management and enforcement abilities.

Overall environmental monitoring will be the responsibility of the Project's Monitoring and Evaluation Section within the Project Coordination Unit. Park staff will undertake monitoring of activities in and adjacent to the Park. This will include encroachment and illegal use of Park resources, growth in the Park enclaves, as well as direct monitoring of Project interventions along the Park boundary. A monitoring program to be implemented by NGOs has been included within the resettlement action plan for Katu Village. NGOs will also be encouraged to monitor the Betue-Doda Road.

Arrangements will be made for regional environmental monitoring. This will begin at Project initiation by building on available baseline data gathered during the feasibility study, which will lead to the development of key indicators. Those indicators that can be assessed quickly, such as biocide

concentrations in streams, will be checked during annual inspections of the Project area by the Provincial Environment Bureau. Two regional environmental impact monitors will be provided under the Project to direct and participate in more detailed midterm and end-of-Project surveys.

VIII. Public Participation

During the design of the Project, concerted efforts were made to involve as wide a participation of stakeholders as possible in a consultative process. This involved public consultations; participatory stakeholder workshops; and meetings with possible Project beneficiaries, NGOs, and government officials. At the community level meetings, the Project concepts, objectives, and benefits were explained, and feedback from the participants was incorporated into the Project design.

A total of 18 meetings were held, of which half were held with village communities. The total attendance at these meetings was 324 people, of whom 88 were women. Two participatory workshops were also held, and the comments arising from these meetings validated the project proposals with regard to measures and actions that were necessary to enhance community involvement in the decision making process.

One of the outputs of the Second Participatory Workshop serves to illustrate the utility of the public consultation process in the design of the Project. This was an action plan outline developed by stakeholders to deal with existing cultivation in the Park. The plan is comprised of ten components: (i) inventory of land ownership and encroachment inside the Park, (ii) Park zoning, (iii) establishment of the legal status of Park boundaries and zones, (iv) eventual retreat of farmers from the Park with suitable compensation, (v) provision of permission to harvest existing crops but with no maintenance and no new planting, (vi) limited utilization of the Park with clearly defined rights and responsibilities, (vii) resettlement of villagers to areas outside the Park (e.g., Katu Village), (viii) implementation of an environmental awareness and education program, (ix) increased enforcement of Park regulations, and (x) provision of alternative livelihoods outside the Park. The Workshop participants also identified the fol-

lowing major constraints to solving the problem of cultivation inside the Park: (i) zones in the Park are not clearly defined, (ii) there is no Park resource inventory, (iii) there is lack of coordination and control, and (iv) there are limited funds, staff, and facilities for Park protection.

In the next phase, extensive public consultation will be necessary to establish the community consultative approach, which will ensure that equitable representation and distribution of benefits to all groups (including disadvantaged groups and women) are achieved.

IX. Conclusions

The Project will directly improve the quality of life for over 40,000 people living in 60 villages in the vicinity of the Park, and will provide more limited improvement to the rest of the Project communities. Improvements will arise from better health and nutrition, improved disease control, further eradication of schistosomiasis, more productive agricultural systems, improved communication, and reduced property damage within flood-prone areas. Overall, the Project has few potential adverse impacts. Adequate mitigation measures have been proposed for all adverse impacts, and none of these impose difficulty in implementation.

The bulk of the Project's environmental impacts are considered to be beneficial. The Project offers significant promise for much improved protection of Park resources and more generally for natural resources located outside the Park boundary, as well. Without the Project there are few assurances that any significant improvement to the Park's overall protection would eventuate, and the likelihood is that degradation of Park resources would continue and accelerate without Project intervention. From an environmental standpoint, the Project, with implementation of the recommended environmental mitigation and enhancement measures, is viable and supportable.

IMPACT MATRIX

Project Component	Activity	Potential Impact
Impacts due to Design and Location		
<i>Overall Project</i>	<i>Improvement of quality of life</i>	<i>Attract in-migrants</i>
<i>Community Development</i>	<i>Resettlement of Katu Village</i>	<i>Loss of current residence and livelihood</i>
<i>Rural Support</i>	<i>Drainage of schistosomiasis areas</i>	<i>Possible loss of wetland habitat</i>
Impacts due to Construction		
<i>Park Management</i>	<i>Construct Park trails</i>	<i>(i) Habitat disturbance (ii) Erosion</i>
<i>Rural Support</i>	<i>Betue-Doda Road</i>	<i>(i) Habitat disturbance (ii) Erosion</i>
	<i>Rehabilitate village access roads</i>	<i>Erosion</i>
	<i>Improve foot/horse trails</i>	<i>Erosion</i>
	<i>Build/rehabilitate pedestrian access bridges</i>	<i>Erosion</i>
	<i>River training works</i>	<i>Erosion</i>
	<i>Install 5 mini-hydros</i>	<i>Erosion</i>
	<i>Rehabilitate village irrigation systems</i>	<i>Erosion</i>
	<i>New alternative road (Wuasa-Gintu)</i>	
Impacts due to Operation		
<i>Community Development</i>	<i>Improved decision making</i>	<i>Strengthened local awareness</i>
	<i>Alternative livelihoods</i>	<i>Improved quality of life</i>
	<i>Community-Park cooperation activities</i>	<i>Reduced threats to Park</i>
	<i>Resettlement of Katu Village</i>	<i>Reduced threats to Park</i>

Area/Size of Impact	Significance	Duration	Mitigation
<i>Periphery of Park</i>	<i>Moderate</i>	<i>Long</i>	<i>Community development planning support; strengthened Park management and protection; community-Park cooperation programs</i>
<i>64 households</i>	<i>Major</i>	<i>Short</i>	<i>Resettlement Plan</i>
<i>Small and localized</i>	<i>Insignificant</i>	<i>Long</i>	<i>Avoid prime wetlands if found</i>
<i>(i) Trail length</i>	<i>(i) Small</i>	<i>(i) Short</i>	<i>Park zoning plan</i>
<i>(ii) Local streams</i>	<i>(ii) Small</i>	<i>(ii) Short</i>	<i>Good construction practice</i>
<i>(i) 30 km road length</i>	<i>(i) Small</i>	<i>(i) Short</i>	<i>Park zoning</i>
<i>(ii) Local streams</i>	<i>(ii) Small</i>	<i>(ii) Short</i>	<i>Guard post</i>
<i>23 km length Local streams</i>	<i>Small</i>	<i>Short</i>	<i>Contract specifications</i>
<i>210 km Local streams</i>	<i>Insignificant</i>	<i>Short</i>	<i>Good construction practice</i>
<i>3 bridges Local streams</i>	<i>Insignificant</i>	<i>Short</i>	<i>Good construction practice</i>
<i>20 km river bank</i>	<i>Insignificant</i>	<i>Short</i>	<i>Good construction practice</i>
<i>5 hydro sets</i>	<i>Small</i>	<i>Short</i>	<i>Good construction practice</i>
<i>50 ha plots (3,800 ha total)</i>	<i>Insignificant</i>	<i>Short</i>	<i>Good construction practice</i>
<i>60 villages</i>	<i>Major</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>60 villages</i>	<i>Moderate</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Park and buffer zone</i>	<i>Moderate</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>800 ha enclave removed</i>	<i>Moderate</i>	<i>Long</i>	<i>Beneficial impact</i>

Project Component	Activity	Potential Impact
<i>Park Management</i>	<i>Community Conservation Agreements</i>	<i>Reduced threats to Park</i>
	<i>Strengthen Park services</i>	<i>(i) Reduced threats to Park (ii) Community employment</i>
	<i>Park inventory study</i>	<i>(i) Strengthened Park planning (ii) Increased ecotourism opportunities</i>
<i>Rural Support</i>	<i>Schistosomiasis control program</i>	<i>Improved health of communities</i>
	<i>Construct water supply systems</i>	<i>Improved water supply</i>
	<i>Install latrines</i>	<i>Improved health and sanitation conditions</i>
	<i>Renovate health centers</i>	<i>Improved health conditions</i>
	<i>Agricultural production support</i>	<i>(i) Alternative livelihoods available (ii) Improved food supply (iii) Wildlife nuisance</i>
	<i>Rehabilitate Betue-Doda Road</i>	<i>(i) Improved road access to villages (ii) Improved access to Park resources</i>
	<i>Improve 23 km of village access</i>	<i>Improved access to villages</i>
	<i>Improve horse/foot trails</i>	<i>Improved access to villages</i>
	<i>Three pedestrian bridges</i>	<i>Improved access to villages</i>
	<i>20 km of river training</i>	<i>Reduced bank erosion and flooding</i>
	<i>Install 5 mini-hydros</i>	<i>(i) Improved energy supply (ii) Sedimentation</i>
	<i>Rehabilitate irrigation systems</i>	<i>(i) Improved food supply (ii) Increased use of agrochemicals</i>

Area/Size of Impact	Significance	Duration	Mitigation
<i>Park and buffer zone</i>	<i>Major</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Park and 60 villages</i>	<i>Major</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Park and adjacent communities</i>	<i>Major</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>28,000 people; Lindu and Napu valleys</i>	<i>Small</i>	<i>Medium</i>	<i>Beneficial impact</i>
<i>70 villages</i>	<i>Major</i>	<i>Medium</i>	<i>Beneficial impact</i>
<i>13,500 families</i>	<i>Moderate</i>	<i>Medium</i>	<i>Beneficial impact</i>
<i>58 centers</i>	<i>Major</i>	<i>Medium</i>	<i>Beneficial impact</i>
<i>(i) Park buffer zone</i>	<i>(i) Major</i>	<i>(i) Long</i>	<i>(i) Beneficial impact</i>
<i>(ii) 60 Park buffer zone villages</i>	<i>(ii) Major</i>	<i>(ii) Long</i>	<i>(ii) Beneficial impact</i>
<i>(iii) 60 Park buffer zone villages</i>	<i>(iii) Unknown</i>	<i>(iii) Long</i>	<i>(iii) Park management plan, monitoring, compensation if needed</i>
<i>(i) 2,500 people in Besoa</i>	<i>(i) Major</i>	<i>(i) Long</i>	<i>(i) Beneficial impact</i>
<i>(ii) 10 km in Park</i>	<i>(ii) Small</i>	<i>(ii) Long</i>	<i>(ii) Guard post, agreements with villages, strengthen enforcement, etc.</i>
<i>Buffer zone</i>	<i>Moderate</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Remote communities</i>	<i>Small</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Bada Valley communities</i>	<i>Moderate</i>	<i>Long</i>	<i>Beneficial impact</i>
<i>Kulawi River communities</i>	<i>Moderate</i>	<i>Medium</i>	<i>Beneficial impact</i>
<i>(i) 5 communities</i>	<i>(i) Moderate</i>	<i>(i) Medium</i>	<i>(i) Beneficial impact</i>
<i>(ii) Downstream</i>	<i>(ii) Moderate</i>	<i>(ii) Short</i>	<i>(ii) Training; hand operation</i>
<i>(i) 3,800 ha buffer zone</i>	<i>(i) Major</i>	<i>(i) Medium</i>	<i>(i) Beneficial impact</i>
<i>(ii) Community health</i>	<i>(ii) Small</i>	<i>(ii) Long</i>	<i>(ii) Training/IPM</i>
<i>(iii) Ecosystem health</i>	<i>(iii) Small</i>	<i>(iii) Long</i>	<i>(iii) Training/IPM</i>