

# CENTRAL SULAWESI INTEGRATED AREA DEVELOPMENT AND CONSERVATION PROJECT

## I. Background of the Project

The Province of Sulawesi covers an area of nearly 64,000 square kilometers with a 1995 population of 1.89 million, and with a growth rate of 2.9 percent per annum. About 72 percent of the province is forested, with about 10 percent used for agriculture and settlement. The economy is sustained by an agricultural base comprising forestry, fisheries, livestock, and small-scale food and tree crop production. Poverty prevails in the province where per capita GDP is about half the national average of Rp2.0 million.

Indonesia's biological diversity is among the richest in the world, and Sulawesi highlights the uniqueness of many Indonesian ecosystem types and species. Because of its location, Sulawesi and its offshore islands have fauna and flora evolved from both Asian and Australian biological realms with species that are found nowhere else. The island's isolation from the two continents resulted in further species diversification and its evolution as a unique bioregion. The Lore Lindu National Park, gazetted in 1993, is located in the geographic center of this bioregion. It covers 227,000 ha and contains about 328 bird, 127 mammal, 117 reptile, 5,000 plant species and an unknown number of invertebrate species. Out of these, 27 percent of the bird species, 30 percent of the mammal species and 60 percent of the reptile species are endemic to Central Sulawesi. The Ministry of Forestry began the process of boundary demarcation, deploying park guards, formulating a management plan to establish a system to protect the habitat of the Park, and setting up an independent management authority.

As of January 1995, of the 368 terrestrial and marine protected areas totaling about 49 million hectares, only about 30 have developed

management plans or established management authorities, and many of them have not implemented regulations or models for park and buffer zone development. The Government is currently implementing a number of projects toward establishing national parks based on an approach called integrated conservation and development projects (ICDP).

Current donor support for the rural sector in central Sulawesi focuses on improving agricultural productivity of both irrigated and rainfed farming systems. Central Sulawesi is one of several areas targeted for support under two ADB-funded projects.<sup>4</sup> The ADB has also been working closely with the Government and other aid agencies in identifying and taking action to promote biodiversity conservation. Results include: (i) formulation of the National Biodiversity Action Plan; (ii) testing of the ICDP approach<sup>5</sup>; (iii) completing a technical assistance project to develop an institutional strengthening program to improve government agencies responsible for managing the national protected areas system; (iv) initiating support for a program to improve management of coral reefs; and (v) forming a national biodiversity information network to link relevant agencies that collect or use biodiversity data. Policy issues related to improving management of coastal and marine resources have been identified and, with assistance from the ADB, the National Strategy and Action Plan for Mangroves has been formulated and is being implemented in two ADB-financed projects.<sup>6</sup>

## II. Project Details

The Project area comprises five administrative subdistricts encompassing the park and its surrounding 117 villages (see Map). The target

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<sup>4</sup> *Loan No. 1378-INO: Farmer Managed Irrigation Systems Project, for \$26.3 million, approved on 21 September 1995 and Loan No. 1351-INO: Sulawesi Rainfed Agriculture Development Project, for \$30.36 million, approved on 31 January 1995.*

<sup>5</sup> *Loan No. 1187-INO: Biodiversity Conservation on Flores and Siberut, for \$24.5 million, approved on 12 November 1992.*

<sup>6</sup> *Loan No. 1251-INO: Mangrove Rehabilitation and Management in Sulawesi, approved on 9 September 1993 and Loan Nos. 1475/1476: Segara Anakan Conservation and Development, for \$44.5 million, approved on 17 October 1996.*

Map  
Indonesia Central Sulawesi Integrated Area Development and  
Conservation Project

population totals 122,000 of which 40,000 are located in the buffer zone area of the Park, and 6,000 are located in two enclaves inside the Park. Apart from the settled areas in the two enclaves, most of the Park area is covered with unbroken forest canopy.

There is serious encroachment on park grounds that leads to indiscriminate hunting of wildlife and the harvesting of forest products such as rattan, timber, and sugar palm sap. The potential for further abuse is high due to the weak enforcement of Park laws. Economic factors, primarily extreme poverty, draw surrounding populations to the Park's natural resources. Eighty-seven percent of the residents of 117 villages have average annual incomes of about \$250—well below the provincial household poverty line of \$415. Ninety-seven percent of the population surrounding the Park (about 60 villages) has annual household incomes below \$250.

The Project area has also drawn attention due to public health issues. It is the only region in Indonesia where schistosomiasis (a waterborne parasitic disease) is endemic. The disease is transmitted through a snail population found in two marshy areas contiguous to the Park around Lake Lindu and the Napu Valley. The susceptible human population in these two areas totals about 10,000 persons.

The goal of the Project is to encourage investment in environmentally sound economic activities and resource management beneficial for the local population and the Park. The Project has two interrelated objectives: (i) to improve the socioeconomic welfare of rural communities surrounding the Park so that they would not be a threat to the Park's resources for their economic sustenance; and (ii) to strengthen the management of Park and its buffer zone. The Project will support four components: (i) community development, (ii) park and buffer zone management, (iii) rural and infrastructure and support services, and (iv) project management and institutional strengthening.

The total cost of the Project was estimated at \$54.7 million equivalent, of which \$17.3 million represents foreign exchange costs. The ADB provided a loan amounting to \$33 million with an amortization period of 25 years including a grace period of 7 years (equivalent to the project implementation period).

### III. Analytical Methods

In the Project economic analysis, quantitative valuation was made for direct and quantifiable benefits, comparing the conditions under with and without Project scenarios. A documentation of the environmental assessment of the Project, through a summary environmental impact assessment (SEIA) is shown in Appendix 3. The General assumptions used are: (i) all values have been expressed in local currency in constant 1997 prices using economic prices in the domestic numeraire; (ii) the economic life of the Project is 25 years, including the 7 years of Project implementation. It should be noted however, that Project benefits are expected to be sustained longer than 25 years; (iii) the prices of internationally traded commodities, where available, were forecast based on World Bank commodity price projections and those of other commodities were based on current border prices or local prices as of 1997; (iv) a shadow exchange rate factor of 1.06 was applied for converting foreign exchange costs and prices of traded/tradable commodities; and (v) a wage rate of \$1.30 (Rp3,500) per day for unskilled labor was used based on prevailing wage rates in the Project area. An economic wage rate was estimated by applying a shadow wage rate factor of 0.75, considering the under-employment in the Project area.

The Project costs and benefits estimated for each component or sub-component are indicative values based on tentative development targets and prototype activities. The indicative Project benefits will accrue from: (i) environmental protection through improved park and buffer zone management, (ii) increased agricultural production through intensified agriculture extension support and irrigation development, (iii) decrease in non-working sick days from improved health care and schistosomiasis control, (iv) time savings from improved accessibility of village water supply, (v) mitigation of flood damages through river training and drainage; and (vi) increased electricity supply from micro-hydropower development.

## **IV. Economic Valuation of Environmental Impacts**

### ***A. Extraction of Non-timber Forest Products (NTFPs)***

During the field visits and discussions with project beneficiaries, government officers, and researchers, it was confirmed that residents in the buffer zone villages extract a significant amount of NTFPs from nearby forests for local consumption. Houses were thatched with forest products, poles were used for agricultural activities, fishing purposes, and rattan and wood for furniture making. In addition, rattan harvesting, bee honey collection, and palm sugar production are carried out on a small commercial scale.

Even if the Park were upgraded, it is expected that local residents will continue to extract various materials because of a long history of such activities; they feel it is their right. It will be extremely difficult to stop such practices because of the present economic status of the people. They may reduce the extraction of NTFPs with the increase of family incomes, or they may specialize in a few items with higher economic values instead of extracting a wide variety of items. Controlled or managed extraction of NTFPs should not be considered as a problem in the sustainable management of the Park, and certain regulations can be established after a proper study of the nature of NTFP extraction. If Park administrators should attempt to prohibit residents of the buffer zone from extracting NTFPs, the local poverty suggests that other poaching problems may arise. Therefore, conservation agreements between the Park management and peripheral communities will offer better management of NTFP extraction in the future.

The following assumptions were made to assess the economic value of NTFP extraction in the Park. About 10 percent of the national park will be subject to extraction of NTFPs for household consumption (people will not be able to walk more than a few kilometers in from the boundary). The NTFPs will include items such as mushrooms, greens, nipah products, roots, fruits, berries, gums, resins, fuelwood, poles, and fish. No wildlife can be hunted and tree felling will not be allowed. An average economic value of NTFP amounting to \$58.48/ha/year in 1996 value was used. This estimate was derived from the figure of \$50/ha/year in 1991 that was based on work

by various scientists who had studied the extraction of other subsistence forest dwellers in the region.<sup>7</sup> To capture the increased extraction and price escalation over the Project period, a 2.5 percent per annum adjustment was used. In the without-Project situation, it is assumed that 60 percent of the present level of NTFP extraction will be reduced. The stream of costs and benefits for the Project are shown in Table 1.

### ***B. Ecotourism***

An estimated 840 foreign tourists visited the Park in 1996. It is expected that this will increase by the year 2000 with tourists from Australia; Canada; France; Germany; Singapore; Hong Kong, China; Republic of Korea; Japan; New Zealand; and the United Kingdom. Activities to promote ecotourism are expected to increase foreign visitors to 910 in the year 2000 (up from 840 in 1996). Based on a travel-cost study, it is estimated that tourists spend \$20 per day on an average stay of four days in addition to approximately \$500 in transportation cost.

### ***C. Irrigation Water Supply***

There are two irrigation schemes bordering the Park: Gumbasa and Pallo. The catchment areas for these two schemes (90 percent of the area of Gumbasa and all of Pallo) coincide with the Park. The Gumbasa scheme is served by the Palu River with a command area of 18,500 ha, while the Pallo irrigation scheme is served by the Sopus River with a command area of 3,500 ha. The present level of cropping intensity in the Gumbasa and Pallo schemes are 200 and 190 percent, respectively, and the unit yield averages about 3.5 t per ha. It is assumed that in the without-Project situation, the cropping intensity of these two schemes will be reduced by 10 percent over the life of the Project. This reduced cropping intensity is assumed to occur because the deterioration of the Park will increase flash

<sup>7</sup> Godoy, R., R. Lubowski and A. Markandya. 1993 "A Method for the Economic Valuation of Non-timber Forest Products." *Economic Botany*. 47:3.

floods and sediment loads of the rivers during the rainy season. Moreover, there will be a reduction of water flow during the dry season. Therefore, a benefit of the Park will be the avoided cost of reduced crop yields.

#### ***D. Carbon Sequestration***

Carbon sequestration has two phases: (i) absorption of carbon dioxide by the tree cover of the Park; and (ii) avoided carbon dioxide release from slash-and-burn agriculture. However, it was not possible to estimate avoided release from slash-and-burn so estimates were limited to direct carbon sequestration. It is assumed that incremental carbon sequestration is about 10 percent of the total carbon dioxide absorption due to the protection of the Park. It is further assumed that the potential to absorb carbon dioxide is 6 tons/ha/year. This is a very conservative estimate considering that tropical forests can generally absorb 6-16 tons/ha of carbon dioxide in one year. The carbon value tables prepared by the Intergovernmental Panel on Climate Change (IPCC) were referred to in converting the physical tonnage into monetary values. The lowest values in the tables ranging from \$7.85 (for 1991-2000) to \$8.89 (for 2021 to 2030) were used.

#### ***E. Value of Biodiversity***

The Park contains a diverse stock of flora and fauna—a portion of which is endemic. Furthermore, the Park provides a valuable stock of butterflies for export breeding purposes. It has been shown that butterfly breeders in the area generate about \$100,000 in annual income and their source of genetic materials is the Park.

There has not been any specific methodology developed to estimate the economic value of biodiversity. Therefore, it is assumed that the total value (use, nonuse, option, existence, and bequest value components) of the Park—excluding the economic value of carbon sequestration—is a proxy value of biodiversity. The value of carbon sequestration is excluded to avoid double counting; it is already a global commodity and separately valued and incorporated into the analysis. Thus, it is important to note



Table 1: Incremental Benefit and Cost Stream (1997 Rp million)

| Item                                                  | 1         | 2          | 3          | 4          |
|-------------------------------------------------------|-----------|------------|------------|------------|
| <i>A. Project benefit</i>                             |           |            |            |            |
| <i>1. Gross benefit</i>                               |           |            |            |            |
| <i>Agriculture support services</i>                   | -         | (3.8)      | 197.4      | 931.5      |
| <i>Prevented decrease in irrigation water</i>         | -         | -          | 56.2       | 219.7      |
| <i>Nontimber forest products</i>                      | -         | 748.4      | 767.1      | 786.3      |
| <i>Recreational benefits (travel cost)</i>            | -         | -          | -          | 199.4      |
| <i>Biodiversity</i>                                   | -         | 1,547.7    | 3,062.7    | 6,683.5    |
| <i>Carbon sequestration</i>                           | -         | 336.6      | 1,007.4    | 2,019.4    |
| <i>Prevented labor losses by improved health care</i> | -         | 48.1       | 166.4      | 358.7      |
| <i>Family labor savings by water supply</i>           | -         | 233.7      | 701.2      | 1,168.7    |
| <i>Prevented production losses by river training</i>  | -         | 80.2       | 156.9      | 230.4      |
| <i>Village irrigation (3,800 ha)</i>                  | -         | -          | 133.6      | 507.4      |
| <i>Willingness to pay to mini hydropower</i>          | -         | -          | 14.0       | 21.0       |
| <i>Subtotal (1)</i>                                   | -         | 2,990.9    | 6,262.9    | 13,126.0   |
| <i>2. Subtracted from (1)</i>                         |           |            |            |            |
| <i>Agriculture production cost</i>                    | -         | 220.6      | 948.7      | 2,303.5    |
| <i>Opportunity cost of illegal timber extraction</i>  | -         | 25,758.0   | 20,749.5   | 16,027.2   |
| <i>Subtotal (2)</i>                                   | -         | 25,978.6   | 21,698.2   | 18,330.7   |
| <i>Total (A)</i>                                      |           | (22,987.7) | (15,435.3) | (5,204.7)  |
| <i>B. Project cost</i>                                |           |            |            |            |
| <i>1. Project investment</i>                          |           |            |            |            |
| <i>Community development and agriculture support</i>  | 3,229.6   | 4,556.4    | 4,856.8    | 4,086.2    |
| <i>Park management and ecotourism</i>                 | 2,230.7   | 4,947.5    | 4,284.0    | 2,918.5    |
| <i>Primary health care</i>                            | 807.0     | 3,014.4    | 1,837.0    | 1,069.6    |
| <i>Village water supply</i>                           | 467.6     | 1,773.4    | 2,768.5    | 2,562.3    |
| <i>Roads, tracks, and bridges</i>                     | 1,546.1   | 5,268.0    | 6,900.9    | 5,325.5    |
| <i>River training</i>                                 | 65.0      | 319.6      | 311.3      | 299.2      |
| <i>Village irrigation</i>                             | 71.6      | 826.3      | 818.7      | 389.8      |
| <i>Mini hydropower</i>                                | 14.8      | 116.2      | 216.6      | 212.5      |
| <i>Subtotal (1)</i>                                   | 8,432.4   | 20,821.8   | 21,993.8   | 16,863.6   |
| <i>2. Project operation and maintenance cost</i>      |           |            |            |            |
| <i>Community development and agriculture support</i>  | 76.1      | 167.3      | 189.6      | 193.9      |
| <i>Park management and ecotourism</i>                 | 286.2     | 289.1      | 292.0      | 294.9      |
| <i>Primary health care</i>                            | 29.2      | 49.8       | 85.8       | 127.0      |
| <i>Village water supply</i>                           | 4.2       | 9.8        | 22.8       | 48.8       |
| <i>Roads, tracks, and bridges</i>                     | 8.6       | 14.5       | 136.0      | 202.8      |
| <i>River training</i>                                 | -         | -          | -          | 2.8        |
| <i>Village irrigation</i>                             | -         | -          | -          | 13.6       |
| <i>Mini hydropower</i>                                | -         | -          | 1.3        | 3.9        |
| <i>Subtotal (2)</i>                                   | 404.3     | 530.5      | 727.5      | 887.7      |
| <i>Total (B)</i>                                      | 8,836.7   | 21,352.3   | 22,721.3   | 17,751.3   |
| <i>Net economic benefit (A-B)</i>                     | (8,836.7) | (44,340.0) | (38,156.6) | (22,956.0) |

Shadow exchange rate factor = 1.06

Economic internal rate of return (EIRR) = 17.51%

Net present value @12% = 39,567.5

| Year      |          |          |          |          |          |          |          |          |
|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 5         | 6        | 7        | 8        | 9        | 10       | 15       | 20       | 25       |
| 2,516.4   | 4,926.8  | 7,498.1  | 9,917.3  | 11,654.0 | 12,734.6 | 13,339.9 | 12,279.6 | 12,022.2 |
| 481.7     | 850.2    | 1,320.0  | 1,885.7  | 2,550.5  | 3,302.1  | 7,353.7  | 9,134.6  | 9,185.8  |
| 806.0     | 826.1    | 846.8    | 867.9    | 889.6    | 911.9    | 1,031.7  | 1,167.3  | 1,320.7  |
| 399.0     | 600.4    | 797.9    | 997.3    | 1,196.9  | 1,370.6  | 1,795.3  | 1,795.3  | 1,795.3  |
| 10,671.4  | 13,333.8 | 14,628.2 | 14,854.9 | 14,854.9 | 14,854.9 | 14,854.9 | 14,854.9 | 14,854.9 |
| 3,709.2   | 5,563.7  | 7,787.5  | 10,014.8 | 12,240.2 | 12,240.2 | 12,608.5 | 12,608.5 | 12,608.5 |
| 608.6     | 919.0    | 935.5    | 952.4    | 969.5    | 987.0    | 1,079.1  | 1,179.7  | 7,738.8  |
| 1,636.1   | 2,103.6  | 2,303.9  | 2,303.9  | 2,303.9  | 2,303.9  | 2,303.9  | 2,303.9  | 2,303.9  |
| 305.2     | 379.0    | 375.9    | 373.4    | 370.2    | 369.6    | 365.2    | 365.2    | -        |
| 1,107.1   | 1,764.4  | 2,200.6  | 2,409.8  | 2,438.6  | 2,434.4  | 2,405.4  | 2,405.4  | 2,405.4  |
| 42.0      | 42.0     | 42.0     | 42.0     | 42.0     | 42.0     | 42.0     | 42.0     | 42.0     |
| 22,282.7  | 31,309.0 | 38,736.4 | 44,619.4 | 49,510.3 | 51,551.2 | 57,179.6 | 58,136.4 | 64,277.5 |
| 3,707.8   | 5,192.8  | 6,343.6  | 7,026.4  | 7,698.7  | 8,352.3  | 11,114.4 | 12,078.2 | 12,076.6 |
| 12,363.8  | 8,929.4  | 8,586.0  | 6,868.8  | 6,298.4  | 4,579.2  | -        | -        | -        |
| 16,071.6  | 14,122.2 | 14,929.6 | 13,895.2 | 13,997.1 | 12,931.5 | 11,114.4 | 12,078.2 | 12,076.6 |
| 6,211.1   | 17,186.8 | 23,806.8 | 30,724.2 | 35,513.2 | 38,619.7 | 46,065.2 | 46,058.2 | 52,200.9 |
| 3,318.2   | 2,510.8  | 375.8    | -        | -        | -        | -        | -        | -        |
| 1,590.6   | 536.1    | 585.7    | -        | -        | -        | -        | -        | -        |
| 751.0     | 688.7    | 434.9    | -        | -        | -        | -        | -        | -        |
| 2,521.3   | 2,533.0  | 1,207.9  | -        | -        | -        | -        | -        | -        |
| 4,858.6   | 1,581.3  | 595.4    | -        | -        | -        | -        | -        | -        |
| 258.8     | 260.2    | 265.2    | -        | -        | -        | -        | -        | -        |
| 303.1     | 24.8     | 31.4     | -        | -        | -        | -        | -        | -        |
| 5.4       | 5.8      | 7.4      | -        | -        | -        | -        | -        | -        |
| 13,607.0  | 8,140.7  | 3,503.7  | -        | -        | -        | -        | -        | -        |
| 191.9     | 191.3    | 190.1    | 190.1    | 190.1    | 190.1    | 190.1    | 190.1    | 190.1    |
| 297.8     | 300.8    | 303.8    | 306.8    | 309.9    | 313.0    | 329.0    | 345.6    | 363.4    |
| 140.5     | 178.3    | 187.5    | 187.5    | 187.5    | 187.5    | 187.5    | 187.5    | 187.5    |
| 74.9      | 94.3     | 120.3    | 120.3    | 120.3    | 120.3    | 120.3    | 120.3    | 120.3    |
| 256.0     | 256.0    | 256.0    | 256.0    | 256.0    | 256.0    | 256.0    | 256.0    | 256.0    |
| 5.6       | 8.5      | 11.3     | 11.3     | 11.3     | 11.3     | 11.3     | 11.3     | -        |
| 13.6      | 13.6     | 13.6     | 13.6     | 13.6     | 13.5     | 13.6     | 13.6     | 13.6     |
| 3.9       | 3.9      | 3.9      | 3.9      | 3.9      | 3.9      | 3.9      | 3.9      | 3.8      |
| 984.2     | 1,046.7  | 1,086.5  | 1,089.5  | 1,092.6  | 1,095.6  | 1,111.7  | 1,128.3  | 1,134.7  |
| 14,591.2  | 9,187.4  | 4,590.2  | 1,089.5  | 1,092.6  | 1,095.6  | 1,111.7  | 1,128.3  | 1,134.7  |
| (8,380.1) | 7,999.4  | 19,216.6 | 29,634.7 | 34,420.6 | 37,524.1 | 44,953.5 | 44,929.9 | 51,066.2 |

Note: ERR decreases by about 5 percent if computed benefits from carbon sequestration is removed; and EIRR decreases by 14 percent if the computed benefits from both biodiversity and carbon sequestration are removed.

that the estimated value of biodiversity is only a lower bound. The upper bound value of biodiversity is, at this time, immeasurable.

## **V. Notable Aspects**

A novel aspect of this project is that it seeks to enhance the well-being of those living in the buffer zone around a nature park so as to enhance the prospects for sustainable management of the Park's ecosystem. The evidence is clear that when local people are alienated from nearby parks and reserves, the costs of management—largely through the difficulty of enforcement of rules on habitat alteration and poaching—are very high. This Project seeks to lower those costs by incorporating local people into the management and investment decisions affecting the Park. By improving the socioeconomic well-being of residents in the buffer zone, those minor forest products that are still needed by local residents may be less than if the present extreme poverty were allowed to continue.

The improved management of parklands will also bring benefits in the form of enhanced catchment area management. As a result, siltation of reservoirs and irrigation channels will be reduced. The Project will also enhance the protection of biodiversity and carbon sequestration.

Another interesting dimension of this Project is related to the time horizon. Specifically, the economic life of the Project is said to be 25 years, but that the stream of benefits should continue long beyond that time. This situation arises from the fact that some of the project components are not dependent upon physical structures that deteriorate with age but rather entail new management processes and behaviors that should be sustainable long into the future.

The Project was found to be economically viable with an overall economic internal rate of return of 17 percent. This result arises despite the fact that a large number of other potential benefits were not included due to various difficulties.