

## Indonesia

### Ex-Post Evaluation of Japanese Grant Aid Project “The Project for Bridges Constructions for Regional Development in Central Sulawesi and North Sulawesi”

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#### 1. Project Description



Project Location



Upgraded Bridge (Pujimulyo I)

#### 1.1 Background

After the economic crisis of the 1990s, Indonesia had been seeking its economic growth through a long term planning of the market economy together with the advancement of democracy. However, this policy led to a regional imbalance within the country. In particular, Sulawesi's development lagged behind other regions such as Java and Sumatra and was not enjoying the benefits of economic growth. Within Sulawesi, Central Sulawesi, where part of the project is located, was the least developed. Meanwhile, North Sulawesi also experienced significant scouring damage to bridges along national routes as a result of flooding induced by El Niño phenomena in December 2000. There were also other deteriorating bridges along the trans-Sulawesi Highway<sup>1</sup>, which served as a vital route supporting the industries and economy of not only North Sulawesi, but the entire island as well. The load limits (5 tons) were placed on bridges to avoid pier sinkage and/or excess deterioration, and bridges along the Trans-Sulawesi Highway were not living up to its intended function.

#### 1.2 Project Outline

<sup>1</sup> The main artery crossing Sulawesi Island

The objective of this project is to secure a safe and smooth flow of transportation, reduce transportation time and increase the vehicle load limit by upgrading 16 bridges in Central and Northern Sulawesi.

Grant Limit / Actual Grant Amount	1,107 million yen / 837 million yen (Detailed design, total costs for main units)
Exchange of Notes Date	(Detailed design) November, 2002, (Main units) May, 2003
Implementing Agency	Ministry of Settlement and Regional Infrastructure (Current: Ministry of Public Works )
Project Completion Date	November, 2005
Main Contractors	Obayashi Corporation (Central Sulawesi Province) Mitsui Sumitomo Construction Co., Ltd.(North Sulawesi Province)
Main Consultant	Pacific Consultants International Co., Ltd
Basic Design Study	“Basic design study report on the project for bridge construction in the Central and North Sulawesi Provinces”, January, 2002 – November, 2002
Detail Design Study	January, 2003 – June, 2003

## **2. Outline of the Evaluation Study**

### **2.1 External Evaluator**

Akihiro Nakagome, Hisae Takahashi: Ernst & Young SN Global Solution Co., Ltd

### **2.2 Duration of Evaluation Study**

Duration of the Study : October 2009 – August 2010

Duration of the Field Study: January 14 –January 21, 2010 and April 15 – April 27, 2010

### **2.3 Constraints during the Evaluation Study**

While this project upgraded a total of 15 bridges, field observation was impossible for two bridges in Kabupaten (Regency) Banggai Kepulauan of Central Sulawesi Province (Patukuki I and Patukuki II bridges), due to access restrictions. For this reason, attempts were made to collect the minimal necessary information for evaluation by gathering and checking information through teleconferencing with staff in the Banggai Kepulauan office. However, since beneficiaries in these regions were not included in the beneficiary survey, the impact of

repairs to these two bridges in Banggai Kepulauan is not reflected in some quantitative effects and impacts in this Evaluation.

### **3. Results of the Evaluation (Overall Rating: A)**

#### **3.1 Relevance (Rating: a)**

##### **3.1.1 Relevance with the Development Plan of Indonesia**

The PROPENAS for 1999-2004 (Five-Year National Development Plan) in effect at the time of this project planning identified “promotion of economic restructuring and strengthening of a sustainable and impartial developmental infrastructure based on the national economic system” and “promotion of regional development” as important topics. For this reason, with the goal of abating the isolation of interior and remote areas in order to support economic development, in addition to focusing on improving construction, maintenance and management of public facilities and infrastructure, it calls for efforts such as improving regional capabilities to promote regional development and the swift realization of balancing economic growth in rural regions.

At the time of the Ex-Post Evaluation as well, the National Medium-Term Development Plan 2004 - 2009 (RPJM 2004-2009) called for giving priority to promoting rural development and infrastructure development (i.e., restoration of deteriorated infrastructure and developing agricultural and rural infrastructure) and reducing regional disparities. Furthermore, the Road Transportation Development Program formulated based on RPJM 2004-2009 has the following three major goals:

- (1) Rehabilitation and maintenance of the road transportation infrastructure
- (2) Countering overloading, improving the safety of road transportation, and sustainable transportation development
- (3) Improving order in public transportation and freight transport, and improving national and regional transportation systems

As outlined above, this project, which contributes to improvements to the road networks and to rural economic development in Kabupaten Buol and Kabupaten Banggai Kepulauan of Central Sulawesi Province and in North Sulawesi Province, is consistent with the development policies of Indonesia both at the time of the planning of this project and ex-post evaluation.

##### **3.1.2 Relevance with the Development Needs of Indonesia**

The region consisting of Kabupaten Buol and Banggai Kepulauan in Central Sulawesi Province and North Sulawesi Province, where the bridges covered by this project are located, was a region seen to be in need of urgent regional development since its economy was developing at a slower pace than other regions of Indonesia. Development of the road network in particular, which plays a central role in regional development, was inadequate, and there

was a pressing need for addressing unpaved roads and bridges that had collapsed or washed away or underwent marked deterioration. While the provincial and kabupaten governments had paved some roads with gravel and repaired some bridges, there still was no prospect for repair of most bridges. Additionally, these were damaged by a large natural disaster in 2000, and restoration from that damage was limited. For these reasons, collapsed, washed-away, and deteriorated bridges had cut off parts of the road network making them impassable to motorcycles, cars, and trucks, and as a result there was a need for urgent responses. In this way, development needs for this project were considered to be high.

Even at the time of the Ex-Post Evaluation, about 45% of bridges and 30% of the road network are damaged by deterioration or natural disaster. Since this region is in an important location linking agricultural areas with ports, it is thought that there is a high level of demand for improvements to the road network and bridges, and that such efforts are both highly important and necessary.

### **3.1.3 Relevance with Japan's ODA Policy**

Indonesia is located on important sea lanes for Japan and is the largest country in Southeast Asia in terms of land area, population, and resources. It plays a very important role in stability and development in the Southeast Asian economy as one of the core members of the Association of Southeast Asian Nations (ASEAN). Based on the above factors, Japan has identified the following as prioritized areas of ODA: (1) securing social and regional equity, (2) the human-development and education sectors, (3) environmental protection, (4) support for restructuring, and (5) industrial infrastructure improvements (economic infrastructure). This project is in the category of assistance for industrial infrastructure improvements, and as such it is consistent with Japan's ODA policies.

In addition, assistance from another donor at the time of this project was also provided by the World Bank's (WB) Eastern Indonesia Region Transport Project sector loan, targeting national roads and bridges on those roads. Since the region subject to that project also includes Central Sulawesi and North Sulawesi provinces, improvements to national roads and rebuilding of bridges have taken place. However, since there is no duplication between the bridges covered by the WB's project and by this project, appropriate courses of action on assistance and complementarity between these projects has been secured.

As mentioned above, this project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

### 3.2 Efficiency (Rating: a)

#### 3.2.1 Project Outputs

During planning stage, the bridges covered by this project were chosen by the Ministry of Settlement and Regional Infrastructure (MSRI) (now the Ministry of Public Works [MPW])<sup>2</sup> based on criteria such as status as older wooden bridges or as bridges damaged in the flooding and earthquake in 2000. These bridges have been upgraded using either of two methods of cooperation: bridges constructions, in which Japan handled tasks through construction of the bridges, and materials(steel grinder) procurement, in which Japan supplied materials and Indonesia constructed the bridges.<sup>3</sup> Planning and actual output are shown below.

Table 1 Planned and Actual Outputs

	Bridge Name	Bridge Length (m)		Approach Road Length (m)	
		Planned	Actual	Planned	Actual
Central Sulawesi Province					
1	Pujimulyo I*	25	25	123.8	123.8
2	Kokobuka I*	80	80	143.0	143.0
3	Kokobuka II	10	10	67.7	67.7
4	Kokobuka III	20	20	87.7	87.7
5	Kokobuka V	15	15	112.9	112.9
6	Kokobuka VI*	21	21	154.1	154.1
7	Kokobuka VII*	60	60	474.0	474.0
8	Bungkudu I*	42	42	128.7	128.7
9	Tavadun II	20	20	158.0	158.0
10	Tavadun III	20	20	154.0	154.0
11	Bonobogu I	20	20	86.9	86.9
12	Matinan *	50	50	129.7	129.7
13	Patukuki I*	42	42	108.2	108.2
14	Patukuki II*	6×4	6×4	72.7	72.7
North Sulawesi Province					
15	Poigar	120	123	87.0	87.3
16	Megawati	Cancellation			

Note: Bridges denoted with asterisks (\*) above were subject to bridge construction, while others were subject to materials procurement.

Regarding the Megawati Bridge in North Sulawesi Province, which had been slated for upgrade, it was confirmed that the degree of damage was worse than expected, and as such for safety purposes a new bridge needed to be constructed instead of upgrading the old one. However, since it was determined that this project could not cover the cost needed for

<sup>2</sup> In November 2004, the name of the Ministry of Settlement and Regional Infrastructure (MSRI) changed to the Ministry of Public Works (MPW).

<sup>3</sup> Where local contractors had the technical ability to handle construction, the cooperation method of materials procurement was applied.

construction of a new bridge, the Megawati Bridge was excluded from this project.<sup>4</sup> Also, while the length of the Poigar Bridge was changed from the planned length of 120 meters to an actual length of 123 meters, since this occurred as a result of adjustment when upgrading the bridge connectors rather than extending the length of the bridge itself it had no negative effect on this project. In addition, while changes were made in riprap<sup>5</sup> thickness and in bridge-pier earth covering<sup>6</sup>, these were minor changes with no negative effect on occurrence of project effectiveness or on securing safety.



Upgraded Bridge (Kokobuka VI)



Upgraded Bridge (Poigar)

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Period

The project period was shorter than planned. While the planned project period<sup>7</sup> for this project was 33 months in each province, the actual project periods were shorter, at 28 months in Central Sulawesi Province (85% of the planned period) and 24 months in North Sulawesi Province (73% of the planned period).

One possible reason for the project periods being shorter than planned was the fact that in Central Sulawesi Province while the project was underway daily meetings were held between consultants, contractors, and kabupaten office staff. These meetings were held before starting work for the day and after the end of the day's work. Advancing the work by checking on progress every day in these meetings helped to prevent delays. Examples of arrangements made in these meetings include revising the plans for the following day if the day's work was advancing slower than planned and adjusting the work scheduled before and after the next day's plans if rain was expected the next day. Suggested reasons in North Sulawesi Province

<sup>4</sup> The Megawati Bridge later was constructed by Indonesia.

<sup>5</sup> Riprap work is one method of slope protection, in which substructure components such as embankments are constructed or reinforced by filling or covering with rocks.

<sup>6</sup> Earth covering is a construction term referring to the thickness from the top of a structure built in the ground (in this project, the bridge pier) to the ground surface.

<sup>7</sup> The project period is defined as the period for detailed design plus the construction period.

included the fact that delivery of materials usually subject to frequent delays was made as planned with no delays and contractors getting involved in the project proactively, for example by working even on weekends.

### 3.2.2.2 Project Cost

The project cost was lower than planned. While the limit in the Exchange of Notes (E/N) was 1,107 million yen, the actual project cost was 837 million yen, or 76% of the planned cost. The main reasons for the fact that the project cost less than planned were the cancellation of the upgrade to the Megawati Bridge in North Sulawesi Province and revisions to unit costs during construction as well as design changes leading to cost savings in Central Sulawesi Province.

Both project cost and project period were within the plan, therefore efficiency of the project is high.

## 3.3 Effectiveness (Rating: a)

### 3.3.1 Quantitative Effects

#### 3.3.1.1 Results from Operation Indicators

The effects of this project, according to indicators of effectiveness confirmed in Central Sulawesi and North Sulawesi provinces, are outlined below.

##### (1) Central Sulawesi Province

##### (i) Use of the bridges

Since traffic volume on each bridge is not surveyed in Central Sulawesi Province, it was not possible to measure directly changes in traffic volume in connection with the bridges upgraded under this project. For this reason, data on the number of public buses crossing the bridge and the number of trucks using the bridge among leading transport companies in Buol have been totaled as shown below, as available indicators of bridge use.

Prior to implementation of this project, almost all the bridges had deteriorated or sustained damage from natural disasters, and as such it was difficult in almost all cases for buses to use the bridges. After upgrade, the bridges were passable by buses, and since 2006 the number of public buses using the bridges has increased. (See Table 2.) As the bridges have become passable by public buses, they have come to be used as everyday means of transportation among residents of the region.

Table 2: The Number of Public Buses Crossing the Bridges

Bridge Name	Public Bus (Number)/day			
	2005	2006	2007	2008
Pujimulyo I	—	6	6	8

Kokobuka I,II,III,V,VI,VII	—	4	5	8
Bungkudu I	—	4	4	10
Tayadun I, II	—	9	10	11
Bonobogu I	—	8	9	9
Matinan	—	11	11	14

Source : Public Transportation Office Kabupaten Buol data

As shown in Table 3 below, the number of trucks operated by leading transport companies in Kabupaten Buol using the bridges following their upgrade is on the increase. These trucks mainly transport agricultural products to ports and markets. While previously they had to take detours due to deterioration of bridges, the bridge upgrades have made it possible to use the bridges now, enabling smoother transportation of agricultural products.

Table 3: Number of Trucks of Leading Transport Companies in Kabupaten Buol Using the Bridges

Company	The number of trucks using bridges			
	2005	2006	2007	2008
Transport Company A	-	43	46	54
Transport Company B	-	10	15	15

Source: Public Transportation Office Kabupaten Buol data

(ii) Increase in bridge load capacity for heavy vehicles

The kabupatens covered by this project still have bridges that are not passable to large trucks, and a road network for heavy loads has not yet been formed throughout the kabupatens. However, at least the load capacity of the bridges covered by this project has increased, so that whereas prior to upgrades the load capacity for heavy vehicles was five tons, it has been increased to 20 tons after upgrades, in line with one of the goals of this project. These upgrades can be judged to have contributed to efforts toward formation of a road network for heavy loads, if only partially, while restoring parts of the road network that previously had been cut off. The actual passage of heavy vehicles over the bridges was confirmed in our field observation.

(iii) Reduction of transportation times

As shown in Table 4, in representative areas transit times for agricultural goods have been shortened considerably as a result of this project. In fact, we confirmed that it took about one hour to go to the port in Buol from Kokobuka area in our field

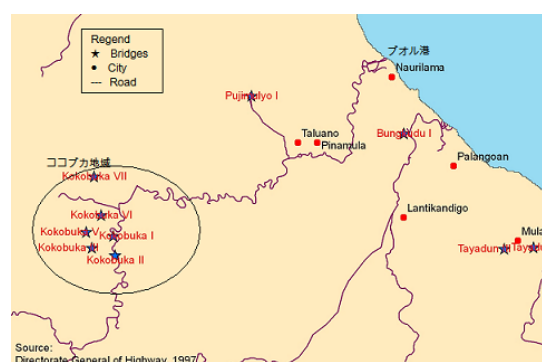


Figure 1 The location of the subject bridges in Kokobuka area Kabupaten Buol



observation. (See Figure 1 for the location of the subject bridges in the Kokobuka area.) Shortening of transit times can be considered to have led to an increase in the number of shipments made by shipping firms as well. In addition, bridge upgrades also can be said to have contributed to the convenience of residents' everyday means of transportation by resolving factors that had impeded smooth transportation.

Table 4 Reduction of Transportation Time

Area			Transportation time		
Area	→	To	Planning	→	Actual
Kokobuka Area (Kabupaten Buol)	→	Port in Buol	3 Hours	→	1 Hour
Area where target bridges were located (Kabupaten Banggai Kepulauan)	→	Salakan*	2 Hours	→	1 Hour

Source: Interview with Kabupaten Buol office and Banggai Kepulauan office

Note: \* Salkan is the capital city of Kabupaten Banggai Kepulauan.

(2) North Sulawesi Province

(i) Average daily traffic (ADT)

Since, like Central Sulawesi Province, North Sulawesi Province also does not survey traffic volume, it was not possible to measure changes in traffic volume in connection with the Poigar Bridge. However, since according to staff of the North Sulawesi Province office, traffic volume on the Poigar Bridge averages roughly 4,000 vehicles per day, traffic can be considered to have increased by roughly three times in comparison with the time of planning. (See Table 5.)

Table 5 ADT (Unit/ Numbers)

	2001	2009
Poigar Bridges	1,303	Approximately 4,000

Source: Interview with North Sulawesi Provincial office as for ADT in 2009.

(ii) Increase in bridge load capacity for heavy vehicles

The Poigar Bridge, which also had a load restriction of up to five tons prior to this project, was passable by heavy vehicles with 20-ton loads after the project. As a result, the road now has regained its function as the trans-Sulawesi thoroughfare and is contributing to regional economic and industrial development.

Table 6 The Load Capacity for Heavy Vehicles (Unit/ Tons)

	2001	2009
Poigar Bridge	5	20

Source: Interview with North Sulawesi Provincial office regarding the load capacity for heavy vehicles for 2009

(iii) Reduction of transportation times

As a result of the bridge upgrades under this project, the transit times between Manado and other main cities for agricultural products and other cargo have been shortened (See Table 7).

For example, the upgrades to the Poigar Bridge have shortened average transit time from Manado, the provincial capital in North Sulawesi, to Mobagu, the capital city of Kabupaten Bolaang Mongondow from about four hours to three hours. (See Figure 2 for the Location of the Poigar Bridge.) This shortening of transit time is a result of the fact that prior to bridge repairs road users, particularly large trucks, used detours to avoid the danger of crossing the bridge due to bridge damage and deterioration but now they no longer need to do so.

Table 7 Transportation Time

Are			Transportation times		
From	→	To	Planning	→	Actual
Manado	→	Mobagu*	4 Hours	→	3 Hours

(From interviews with North Sulawesi province office staff)

\* Mobagu (Kota mobagu) is the capital city in Kabupaten Bolaang Mongondow .



Figure 2 The Location of the Poigar Bridge

### 3.3.2 Qualitative Effects

To examine qualitative effects of the project, beneficiary surveys were conducted in Kabupaten Buol where 80% of the upgraded bridges are located, in Central Sulawesi Province, and in Kabupaten Minahasa, where the Poigar Bridge is located, and Bolaang Mongondow in North Sulawesi Province. Subjects of these surveys were agricultural workers and residents of these regions, and responses were collected from 118 of these subjects in total. The content of each question and responses received are outlined below.

(a) Time saving

【QN】 Do you think the transit time to access market as well as public services has been saved ?	Yes	No	N/A
	113 (96%)	2 (2%)	3 (2%)

(b)Problems before the Project

【QN】 What kind of traffic problems did you have before the improvement if this road? (Multiple answers)	Deterioration of bridges	Long transit time	Impassability in rainy season	others
	102	93	34	5

(c)Improvements on the above problems

【QN】 Were those problems resolved or improved after the project?	Yes	No	N/A
	108 (92%)	4 (3%)	6 (5%)

96 % of respondents to the beneficiary survey answered that bridge upgrades had improved access to markets and public services. In addition, while most of the respondents who used the bridges covered by this project answered that prior to the project they were concerned about issues such as bridge deterioration, long transit times due to detours, and bridges becoming impassable during the rainy season, more than 90% of these said that such impediments had been resolved after the project. Since many bridges were impassable due to natural disaster and users had been forced to wade across rivers or use detours prior to bridge upgrade, the ability to cross the bridges as an effect of this project can be judged to have led to shortening of travel times as well.

As a result, this project has largely achieved its objectives, therefore its effectiveness is high.

### 3.4 Impact

#### 3.4.1 Intended Impacts

##### 3.4.1.1 Promotion of Agriculture

Regarding promotion of agriculture, which had been assumed to be an impact during planning, comments from provincial and kabupaten staff and beneficiaries included the view that bridge upgrades had facilitated the shipping of agricultural products, leading to increased production. In fact, production of paddy, the main agricultural product in Buol and Banggai Kepulauan, in which bridges were upgraded, in Central Sulawesi Province, and in Kabupaten South Minahasa on the Manado side and Kabupaten Bolaang Mongondow on the Gorontalo side of Poigar Bridge in North Sulawesi Province, has increased. (See Table 8.) It also can be confirmed that, with one exception (Bolaang Mongondow), the rate of increase in production (comparing data for 2002 with that for 2008) in the regions where the bridges are located is higher than that for Indonesia as a whole or for Sulawesi Island. In particular, production has

increased by 88% in Buol, where 12 of the 15 bridges covered by this project were upgraded, and the bridge upgrades can be considered to have contributed to this increase.

Table 8 Production of Paddy (Unit: 1000 tons)

	Area where bridges are located	2002	2006	2007	2008	Rate of Growth Note 3
Indonesia		51,490	54,455	57,157	60,326	17%
Sulawesi Island		5,438	5,404	5,479	6,575	21%
Central Sulawesi Province		746	740	840	985	32%
Buol	○	17	20	27	32	88%
Banggai Kepulauan	○	114	126	149	171	50%
North Sulawesi Province		346	455	494	520	50%
(South) Minahasa	○	44 <sup>Note 1</sup>	52	58	68	55%
Bolaang Mongondow <sup>Note 2</sup>	○	216	222	230	231	7%

Sources: Minahasa in Figures 2002-09, Bolaang Mongondow in Figures 2002-09, <http://dds.bps.go.id>

Note 1 In 2003, Kabupaten Minahasa was split into Kabupaten North Minahasa and Kabupaten South Minahasa. To conduct comparison under identical conditions for figures from the time of planning and the ex-post evaluation, 2003 data for South Minahasa is used above.

Note 2 In 2007, Kabupaten Bolaang Mongondow was split into Kabupaten Bolaang Mongondow and Kabupaten North Bolaang Mongondow. To conduct comparison under identical conditions for figures from the time of screening and the ex-post evaluation, in 2008 data was used from the 10 of the 12 counties in Bolaang Mongondow for which continuous data was available from 2002.

Note 3 Rate of growth from 2004 through 2009

As shown below, in the beneficiary survey results, 85% of respondents said that the bridge upgrades had contributed to the revitalization of agricultural activities in the region. Bridge upgrades can be considered to have contributed to the promotion of agricultural activities by achieving a reduction in transit times and improved access.

[Questions and answers on promoting agriculture]

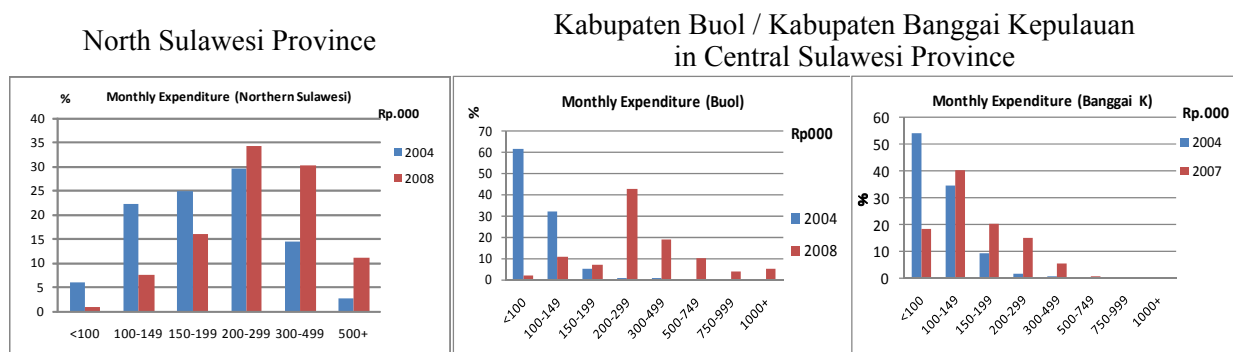
【QN】 Do you think the improvement of bridges contributed to promote agricultural activities in this area?	Yes	No	N/A
	100 (85%)	14 12(%)	4 (3%)

【QN】 How did the road improvements contribute to agricultural activities? (Multiple answers)	Reduced transportation time	Improved access to market	Fewer crops damaged in transit	Others
	74	72	23	1

### 3.4.1.2 Improving Residents' Livelihoods

Figure 1 compares household expenditures in the subject regions from before (blue) and after (red) the project. In Figure 1, the horizontal axis indicates the amount of expenditure, while the vertical axis indicates the percentage of households that spend that amount each

month. From the reduction in the percentage of households with low expenditure and the increase in the percentage of households with high expenditure, it can be confirmed that in North Sulawesi Province and the Banggai Kepulauan as well as Buol of Central Sulawesi Province, the amount of household expenditure overall is increasing. It is thought that bridge upgrades have contributed to some extent to improving the livelihoods of residents of regions in the vicinity by making access to markets and ports easier, in turn leading to increased production and shipping of agricultural products.



Source: Statistics Indonesia, “North Sulawesi In Figures (2009),” Buol in Figures (2009),” “Banggai Kepulauan in Figures (2009)”

Figure 3 Monthly Household Expenditures in the Subject Regions

### 3.4.1.3 Community-Level Effects

#### (1) GDP Per Capita in the Subject Regions

Table 9 below shows trends in gross domestic product (GDP) per capita in the regions subject to this project. In the regions where the bridges are located, the value of GDP per-capita has continued to increase steadily from the time of screening through 2007/08. The bridge upgrades can be considered to have contributed in part to increases in GDP per-capita thanks the effects of bridge upgrades in making access to markets and public services easier, thus leading to increased income, as pointed out in the beneficiary survey; in increasing production of agricultural products through shortening transit times, as pointed out in interviews; and in enabling passage by heavy vehicles, among other results.

Table 9 GDP Per Capita in the Subject Regions

(Unit: Million Rp.)

	2002	2006	2007	2008
Central Sulawesi Province	4.6	7.2	8.2	9.7
Kabupaten Buol	3.9	5.6	6.5	7.1
Kabupaten Banggai Kepulauan	3.2	4.6	5.5	6.2
North Sulawesi Province	5.1	8.6	9.9	10.7
Kabupaten Minahasa	2.7	6.7	8.0	N/A
Kabupaten Bolaang Mongondow	2.1	4.8	5.7	N/A

Sources: Statistics Indonesia, Statistical Year book of Indonesia 2003 and 2009

## (2) Beneficiary Survey Results

### (i) Questions and answers on improving residents' livelihoods

96 % of respondents answered that the bridge upgrades had made access to markets or social services easier. Furthermore, when asked the destinations to which access had become easier, more than 80% cited improvements in access to markets. Also, 92% of respondents answered that improved access had resulted in a change in their income, with more than 90% of these answering that their income had increased. It can be surmised that the bridge upgrades have led to opportunities to earn income by making access to such markets easier.



Asking local residents about changes in their living conditions in the beneficiary survey

【QN】 Has the access to markets or public services become easier after 2005 owing to the improvement of the bridges?	Yes	No	N/A
	113 (96%)	2 (2%)	3 (2%)

【QN】 To which place has it become easier to get access? Please choose all that correspond.	Market	Health Service	Education Service	Shops	Others
	92	70	67	40	41

【QN】 Have you experienced any changes in your income due to the improvement of the access to market or public services?	Yes	No	N/A
	109 (92%)	8 (7%)	1 (1%)

Asked of the 109 respondents who answered “yes” to the above question:

【QN】 How has your income changed after the rehabilitation of bridges?	Increased	Decreased	N/A
	103 (94 %)	0 (0%)	6 (6%)

### 3.4.2 Other Impacts: Impacts on the Environment and Community Residents

This project involved upgrades to bridges already in existence and did not include activities such as construction of new bridges. For this reason, it had been expected from the start that it would have little impact on the environment and that there would be no need for land acquisition as well as resettlement of residents. During field observation, it was confirmed that no issues had arisen in connection with the environment or with land acquisition and resettlement of residents, and no serious environmental impact was confirmed as well.

As outlined above, bridge upgrades in the subject region have led to results including the solution of traffic problems, increased production of the main agricultural product (paddy), and improved access to markets and public services, and increased income for residents. From these results, this project can be considered to have contributed to some degree to impacts such as promotion of agriculture in the subject region and improving residents' livelihoods.

### 3.5 Sustainability (Rating: b)

#### 3.5.1 Structural Aspects of Operation and Maintenance

##### (1) Structural Aspects of Operation and Maintenance

In Indonesia, the provincial offices of the MPW are in charge of provincial roads and the bridges located along those roads, while the kabupaten offices are in charge of kabupaten roads and their bridges. Since all of the bridges upgraded in Central Sulawesi Province were on kabupaten roads, the kabupaten offices in Buol and Banggai Kepulauan are in charge of them.<sup>8</sup> While the Poigar Bridge in North Sulawesi Province is along a national road, since 2008 its operation and maintenance has been handled by the North Sulawesi Province office<sup>9</sup>, under the control of the central government.

While at present there are no problems with the maintenance structure at the North Sulawesi Province office, the issue of staffing shortages was pointed out at each kabupaten office in Central Sulawesi Province. Table 10 shows the number of staff members at each provincial and kabupaten office in charge of maintenance. At present kabupaten offices of Buol and Banggai Kepulauan in Central Sulawesi Province have six and eight persons respectively responsible for bridge maintenance. According to interviews at each kabupaten office, the number of staff needed to handle maintenance of bridges in each kabupaten would be about 25 persons in Buol and about 15 in Banggai Kepulauan since there are more bridges along kabupaten roads than along national or provincial roads. On the other hand, the responses to interviews with staff in North Sulawesi Province stated that at this time there were sufficient numbers of engineers and workers involved in operation and maintenance of national roads and the bridges on those roads.

Table 10 Number of Staff in Charge of Bridges Maintenance

Province/Kabupaten name	Engineer	Workers
Central Sulawesi Province		
Kabupaten Buol	4	2
Kabupaten Banggai Kepulauan	6	2
North Sulawesi Province	40	100

<sup>8</sup> The formal names of the kabupaten offices are the Kabupaten Buol Agency of Public Works and the Kabupaten Banggai Kepulauan Agency of Public Works.

<sup>9</sup> The formal name of the office in North Sulawesi Province is the Office of Highway (Bina Marga) - The North Sulawesi Agency of Public Works.

(From interviews with each office)

### **3.5.2 Technical Aspects of Operation and Maintenance**

In Indonesia, regional governments have handled maintenance of roads and bridges, and there are no particular problems in the level of maintenance capabilities. In addition, in interviews with offices conducted as part of this Evaluation it was confirmed that engineers undergo the education and training required for maintenance and there are no problems with their technical capacity levels.

### **3.5.3 Financial Aspects of Operation and Maintenance**

Kabupaten Banggai Kepulauan and Kabupaten Buol in Central Sulawesi Province, and North Sulawesi Province, where the bridges are located, cover the costs of maintenance. According to interviews with engineers at the Buol office, maintenance costs are estimated to average 10 million rupiah per bridge per year, and since Buol has about 50 bridges the necessary costs of maintenance can be estimated at 500 million rupiah. At the same time, the annual maintenance budget in Buol is less than this necessary amount, at 100 million rupiah. In Banggai Kepulauan as well, it has been reported that while current maintenance costs are 600 million rupiah, a budget of about five times this much would be needed to carry out adequate maintenance. Also, the North Sulawesi Province office has reported an amount of 96 million rupiah as an estimate of the required cost of maintenance for the Poigar Bridge in the Province. However, since the actual bridge maintenance budget for North Sulawesi Province as a whole is 132 million rupiah, it cannot be said that sufficient budgeting has been secured for maintenance costs.

### **3.5.4 Current Status of Operation and Maintenance**

On the whole, the bridges covered by this project are in good condition, as not much time has passed since the completion of the project. However, concerns that, if neglected, problems such as the clogging of drainage ditches could ensue at several locations due to the lack of regular weeding and cleaning were confirmed. Also, at bridges handled using the materials procurement approach, there were defects in the method for tightening bolts on the Indonesian side and temporary materials were not removed completely after construction, and, as also reported in the materials procurement project study conducted in 2008, these will be a hindrance during maintenance. (See the photograph at right below of Bonobogu I Bridge.) While parts of the abutments of the Bonobogu I Bridge and the Matinan Bridge cracked as a result of a 2008 earthquake, these cracks have not been repaired because they pose no problems for bridge safety.



Furthermore, while there is no problem with the bridge itself, in the case of the damage from riverbank erosion near the Kokobuka I Bridge caused by a change in the current of the river has been reported for several years. While the Buol office carried out construction to stop the erosion as a countermeasure, this is only a simplified response. If erosion were to continue in the future, further responses would be required.<sup>10</sup> In such a case, budgetary assistance from the national or provincial government would be needed. However, under Indonesia's current bridge maintenance structure, while the states of periodic maintenance and of maintenance overall are reported to the MPW under the Bridge Management System (BMS), there is no system requiring for each provincial or kabupaten office to report bridge conditions which is in charge of maintenance of provincial or kabupaten roads and their bridges to the MPW. As a result, there is no system in place making it possible to ascertain the conditions of bridges comprehensively throughout the nation as a whole, and rural bridges tend not to be selected as subjects of allocation of maintenance costs and support projects. As such, there are some concerns about future conditions.



Construction to prevent erosion near the Kokobuka I Bridge (Kabupaten Buol)



Bonobogu I Bridge: Temporary materials have not been removed completely

As outlined above, some problems have been observed in terms of staffing and budgeting in the maintenance of this project, therefore sustainability of the project is fair.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

In light of the above, this project is evaluated to be highly satisfactory. While minor concerns for the future sustainability are observed in areas such as staffing, budgeting, and the

<sup>10</sup> There are concerns that if erosion and scour (erosion by the river current of riverbank slope and earth) caused by river movement were left unchecked, in the future the river would flow around the rear side of the Kokobuka I abutment.

state of maintenance, this project has achieved its targets, for the most part such as securing safe, smooth transportation in the subject region through repairing bridges, shortening transit times, and promoting agriculture in the subject region.

## **4.2 Recommendations**

### **4.2.1 Recommendations to Implementing Agency**

- (i) To the extent possible, the Kabupaten Buol office has implemented construction to prevent erosion at the Kokobuka I Bridge, which has sustained damage from riverbank erosion. For this reason, no major damage from erosion has appeared at present. However, this response was only an urgent measure. In addition, due to staffing and budgetary shortages tasks such as periodic inspection tend to get backlogged at present, and it is expected that if the current of the river continues to change in the future then erosion would continue. To prevent major damage, there is a need to implement periodic inspection and, if maintenance or repairs are needed, to carry out maintenance quickly through means such as getting support from the MPW or the provincial office.
- (ii) While a maintenance structure under the BMS is in place in Indonesia for bridges on national roads, no system is in place for monitoring and ascertaining matters such as the state of maintenance of bridges on provincial or kabupaten roads. Furthermore, as part of the trend toward decentralization, government responsibilities on maintenance of bridges on provincial or kabupaten roads currently is entrusted to provincial or kabupaten offices. As a result, according to the regional offices, problems have arisen such as insufficient ascertaining by the MPW in the central government of the state of maintenance and current conditions of bridges on provincial or kabupaten roads, insufficient budgeting for the costs required for adequate maintenance, and a tendency for support projects to be directed to bridges on national roads. Therefore, in the future, there will be a need for development of a maintenance structure that includes bridges on provincial and kabupaten roads and consideration of a reporting system linking the national and local governments, in order to ascertain appropriately the current state of maintenance of bridges, carry out the necessary maintenance, and make the necessary budget requests for maintenance based on such information.

## **4.3 Lessons Learned**

- (i) In Kabupaten Buol, while construction was underway on the bridges covered by this project, daily meetings were held at the start and end of work for the day. The fact that consultants, contractors, and kabupaten office staff all took part in these meetings, checking on the progress of work every day, is through to have helped prevent project delays. It is also said that since the practice of discussing problems through daily

meetings is rare in Indonesia, local contractors and kabupaten office staff were able to learn discipline through these meetings. Holding meetings such as these can be considered one effective method of preventing future delays in project periods.

- (ii) In previous studies and in this field observation, problems were confirmed at the bridges upgraded in Central Sulawesi Province under the materials procurement approach. These included some defective construction and failure to remove temporary materials after erecting the bridges. While they do not impede bridge safety, in the future it would be desirable to improve the quality of construction when the country's local contractors carry out construction, through thorough periodic monitoring by the contractors during the project period and incorporating technical guidance in some areas, as well as follow-up efforts through activities such as holding training on maintenance and management.
- (iii) Results of the field observation showed that there were cases of graffiti on bridges, drainage ditches clogged with weeds or sand, and scattered litter as cleaning and other tasks had not been conducted. For such everyday maintenance, it would be desirable to promote the participation of users and nearby residents, who benefit from the bridge repairs, instead of relying solely on the government. To maintain consistent effectiveness, it would be effective while implementing similar projects in the future to incorporate efforts such as activities to raise awareness among local residents and potential bridge users, so that a maintenance system could be developed even after the project is complete.