Chapter 2

Socioeconomic Studies in the Study Area

Chapter 2
Socioeconomic Conditions in the Study Area

2.1 Overview of the Economic Characteristics

The municipality of Manado is the center of economic and social activities of the province, and the Bunaken National Park is also famous as a diving tourism destination. The municipality of Bitung is the second largest city in the study area. The city is the center of offshore fishing, food processing and 1st class sea port for exporting regional products. The population of those two coastal cities is 508,000, which is equivalent to 33% of the total population of the study area. The area including Manado and Bitung municipalities and the north part of Minahasa regency has been designated as a *KAPET* (Integrated Economic Development Zone), which aims to encourage and give support to private investors and firms to come in this economic zone.

The Minahasa regency is rich in agricultural production, such as coconut, clove, rice, vegetables, and so on. The centre of the regency is Tondano town, which locates in the lakeside of Tondano lake. Tondano lake is the important economic resource for the area. The lake provides irrigation water for agriculture around the area; it also provides fishing resources for fishers. The lake is also important for tourism, together with hot springs for the local population. The capital of Bolaang Mongondow regency is Kotamabagu town with the population of 61,000, which locates in the highland valley. The main industry of Bolaang Mongondow is agriculture.

2.2 Definition of "Coastal Community" and "Coastal Urban Area"

The Study Team felt the need to define the phrase "Coastal Community" in order to clarify the number of coastal communities existing in the study area. The following definition is used: "*Coastal communities are areas directly bounded by sea.*" Using this definition and the 1999 statistical data, the count of coastal communities in the study area is 179 out of 774

villages/communities (662 in the rural area) and their collective population is around 241,250, or a 16% share of the total population of the study area. However, the boundary of communities is not clear in some areas due to frequent administrative changes by separation of a village or combination of hamlets and making a new village. The population size of the coastal communities varies, but the average size is 1,350 inhabitants/community.

Also in this study, the municipalities of Manado and Bitung are called "Coastal Urban Area." The population share of coastal communities in the study area is only 15.9%, while inland communities account for 50.8% and coastal urban areas, 33.3%.

2.3 Demography

2.3.1 Population and Population Density

The latest population in the study area is 1.52 million (1999 estimate), which is 56% of the whole population of the province. Manado municipality is the most densely populated area in the study area with the rate of 2,202 persons/km^2, which is 10 times more populated than Bolaang Mongondow regency with the rate of 151 persons/km^2. The population of the study area in 1999 is shown in Table 2.1

Table 2.1 Land Area and Population of the Study Area

Regency/Municipality	Area (km^2)	Share (%)	Population	Share (%)	Pop. Density (persons/km^2)
Minahasa	4,503.6	57.5	770,442	50.6	171
Manado	167.2	2.1	388,008	25.5	2,321
Bitung	310.1	4.0	120,051	7.9	387
Bolaang Mongondow *	2,853.0	36.4	245,290	16.1	86
(Bolaang Mongondow Total)	(4,622.9)		(428,332)		(93)
Study Area	7,833.9	100.0	1,523,791	100.0	239
North Sulawesi *1)	19,023.9	1.0	2,736,600	1.4	146
Indonesia *1)	1,904,443.0	100.0	204,783,900	100.0	107

Sources: Area) GIS database of JICA Study Team
Population, Population Density) Data of Year 1999 "Draft Potensi Desa Sensus Penduduk 2000" di Kabupaten Minahasa, Kota Manado, Kabupaten Bolaang Mongondow, Kota Bitung.
*1) Statistik Lingkungan Hidup Indonesia, 1999

Notes: * Sub total of 8 districts in the Study Area in Bolaang Mongondow regency.

2.3.2 Population Growth

The average population growth rate in the study area from 1980 to 1999 of 1.56% is slightly lower than the national average of 1.73% in the same period. However, those of Manado (2.35%) and Bitung (2.08%) are much higher than the national average. This increase is mainly due to inter-migration from Minahasa regency and other regencies nearby. The

population changes in the study area in the last 20 years are shown in Figure 2.1. The population growth rates of all sub-areas between 1990-1999 are lower than that between 1980-1990 except Minahasa regency's.

Table 2.2 Population Growth by Sub-Areas in the Study Area 1980 – 1999

Regency/Municipality	Population			Increase ratio *1)		
	1980	1990	1999	1980 – 1990	1990 – 1999	1980 - 1999
Minahasa	634,281	679,299	770,442	0.69	1.03	1.01
Manado	249,659	320,630	388,008	2.53	2.14	2.35
Bitung	81,252	105,638	120,051	2.66	1.43	2.08
Bolaang Mongondow *1)	171,368	214,733	245,290	2.28	1.49	1.91
Study Area Total	1,136,560	1,338,300	1,523,791	1.65	1.45	1.56
Other areas *2)	978,262	1,108,889	1,212,809	1.26	1.00	1.14
North Sulawesi Province	2,114,822	2,447,189	2,736,600	1.47	1.25	1.37
Indonesia ('000)	147,790	179,379	204,784	1.96	1.48	1.73
Share of the province in Indonesia (%)	1.43	1.36	1.34	-	-	-

Sources: North Sulawesi in Figures, 1996 and 1998, and Sensus Penduduk Tahun 1990

Note: *1) Only eight (8) districts in the Study Area, and *2) Areas outside the Study Area in North Sulawesi province

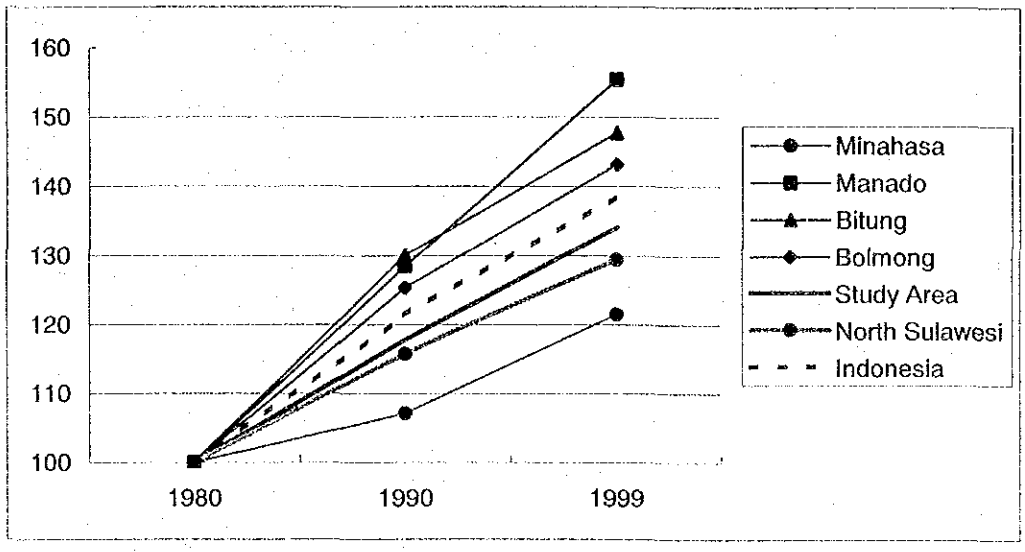


Figure 2.1 Population Changes by Sub-Area in the Study Area (1980-99)

In the period from 1971 to 1990, the ratio of the immigrants to the whole provincial population decreased from 1.7% to 0.8%, while that of the emigrants remained rather stable: 1.0% in 1971, 1.2% in 1980 and 1.0% in 1990. Today the number of emigrants is larger than that of immigrants to the province. Before 1980 the main origins of immigrants were from South and Central Sulawesi, East Java, East Nusa Tenggara and others, but since 1980, East Java has ranked first. In the study area, the urban areas are attracting immigrants from other parts of areas in the province and also from outside of the province.

2.3.3 Population by Sub-Zone

Villages in the study area can be divided into 3 sub-areas by their geographical locations.

- Urban villages: locate in Manado and Bitung municipalities
- Inland villages: locate in the inland zone
- Coastal villages: with sea as a direct boundary.

The population shares by village in sub-areas in 1999 were as follows: Urban areas, 33.3%, Inland villages, 50.8%, and Coastal villages, 15.9%. However, the increase ratios pointed to a slow down in the Urban area and Coastal villages between 1990-1999 than 1980-1990. Decreasing immigration from outside of the province might account for this slower increase of ratio between 1990-1999.

2.3.4 Average Population Size of Village by Sub-Zone

The average population per village in 1999 of the coastal areas was relatively small as indicated below:

Table 2.3 Average Population per Village

Coastal Urban Cities	Inland Villages	CoastalVillages
4,536 persons	1,603 psersons	1,438 psersons

By some reason, the separation of villages and formation of new villages are happening very actively in the coastal area than in other places the last two decades and the population size of the coastal community is getting smaller.

2.3.5 Number and Size of Households

The household size in North Sulawesi has been steadily decreasing because of the vigorous implementation of the national family planning program in the region. The smallest family size is Minahasa regency at 3.81 in 1999, followed by Bitung munucipality at 4.08. There is no obvious difference in the household size between coastal and inland villages/communities, based on other detailed data.

Table 2.4 Change of Household Size in North Sulawesi Province

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Household size	4.49	4.49	4.25	4.49	4.44	4.28	4.21	3.99	3.79

Source; North Sulawesi in Figures, 1996 and 1999.

Table 2.5 Number and Size of Households by Sub-area in the Study Area in 1999

Areas	Population / H.H	No. of Households
Minahasa regency	3.81	201,406
Manado municipality	4.48	86,523
Bitung municipality	4.08	29,407
Bolaang Mongondow regency	5.54 (4.28)*1	44,271 (100,074)*1
Study Area Total	4.21	361,661
North Sulawesi province	3.79	698,706
Indonesia	4.13	50,391,255

Sources: Potensi Sensus Penduduk 2000 de Kabupaten Minahasa, Kota Manado, Kabupaten Bolaang Mongondow and Kota Bitung, and Statistik Linkungan Hidup Indonesia, 1999

Note: *1 shows total of Bolaang Mongondow regency.

2.4 Social Setting

2.4.1 Ethnicity, Religion and Culture

(1) Ethnicity

The data on ethnicity of coastal community is not complete since it is difficult to gather demographic information at the village level. However, the Study Team was able to complete the data on coastal communities from Minahasa Regency, which consists of 61% (110 villages) of the total coastal communities in the study area, Manado municipality and Bitung municipality. Those ethnicities are Minahasan, Sangerian, Golontalonese, Bolomong, Batiknese, Javanese, Chinese, Makasanese Bugisnese, Bajonese, Ambonese Bataknese, and others. The table below shows the top six ethnic groups in Minahasa regency and in Manado and Bitung municipalities.

Table 2.6 Estimated Number of Population by Ethnic Group, 1999

Regency/ Municipality	Minahasan %	Sangerian %	Golontalo -nese %	Bolomong %	Bantiknese %	Javanese %
Minahasa 1)	88.2	6.8	1.4	0.7	0.6	1.0
Manado 2)	50.4	21.8	15.2	4.2	4.6	0.7
Bitung 3)	37.8	40.0	5.0	0.8	-	3.0

Source: 1) Statistics Office Kabupaten Minahasa
2) Statistics Office Kota Manado
3) Information Section, BAPPEDA Bitung

According to the statistics, the dominant ethnic groups in the study area are Minahasan and Sangerian. The population ratio of Minahasan is the biggest in Minahasa regency and Manado, while Sangerian population is slightly bigger in Bitung regency.

(2) Religion

The eastern part of North Sulawesi is dominated by Christians (78.5%), Moslem population is 24.4%, Hinduism and Buddism are less than 1% each. In Minahasa region, the Christian population is over 90%, while they comprise only 20% in Bolaang Mongondow. On the contrary, the Moslem population is only 5% in Minahasa regency, while almost 80% of the population is Moslem in Bolaang Mongondow. The shares of religious groups are almost the same in both Manado and Bitung municipalities.

Table 2.7 Estimated Number of Population by Religion in 1999

Regency /Regency	Moslem		Protestant		Catholic		Hinduism		Buddhism		Total
	Number	%	Number	%	Number	%	Number	%	Number	%	Number
Minahasa	55,787	5.2	934,978	86.8	86,337	8.0	85	0.01	316	0.03	1077,503
Manado	98,421	20.3	345,519	71.3	34,965	7.2	478	0.1	5113	1.0	484,496
Bitung	33,997	21.0	120,177	74.4	7,089	4.4	145	0.1	226	0.1	161,634
Bolaang Mongondow *)	178,707	76.8	48,179	20.7	4,397	2.0	942	0.4	324	0.1	232,549
otal Study Area	366,912	18.8	1,448,853	74.1	132,788	6.8	1,650	0.08	5,979	0.3	1,956,182
North Sulawesi	436,912	24.4	1,542,027	72.1	137,107	6.4	15,703	0.7	6,133	0.3	2,137,882

Source: Sulut Dalam Angka 1999, BPS North Sulawesi

Note: *) Pinolosian, Lolayan, Bolaang, Poigar, Passi, Kotamobagu, Modayag, and Kotabunan

2.4.2 Poverty

According to the central Bureau of Statistics (*BPS*), the poverty rate, which declined to 11% in 1997, increased dramatically to 39.5% in 1998. Notwithstanding the accuracy of this figure, public opinion estimates the poverty level to be critical. The number of people living in poverty increased to an unbelievable number of about 79.5 million nationwide.

According to the data on "Family below Poverty Line" by the Ministry of Family Planning, the rate is declining in the study area; however, the rate is increasing only in Manado municipality. Table 2.8 shows the number of families below poverty line in 1998 and 1999 by district in the study area.

Table 2.8 Number of Families Below Poverty Line, 1998-1999

	Kab/Kodya	Number of Village				No. of families below poverty line			% of families below poverty line	
		Total	Coastal)							
	Kecamatan	village *)	Total		%	1998 **)		1999 *)	1998 **)	1999 *)
	Minahasa	*523*	*110*		*21.03%*	*77,865*		*75,709*	*41.91%*	*38.00%*
1	Modoinding	8				251		430	9.28%	15.03%
2	Tompaso Baru	18				2,356		3,148	43.29%	54.87%
3	Ranoyapo	10				2,002		1,480	50.34%	35.17%
4	Motoling	26				3,206		2,894	43.16%	36.24%
5	Tenga	23	12		52.17%	4,899		3,879	52.21%	41.45%
6	Tombatu	26				2,118		2,454	23.17%	25.67%
7	Belang	24	15		62.50%	3,646		4,410	49.16%	57.12%
8	Ratahan	13				1,381		1,431	22.06%	26.13%
9	Langowan	28	2		7.14%	2,635		3,606	25.26%	31.20%
10	Tombasian	18	9			2,680		2,815	31.48%	32.41%
11	Tompaso	11				1,240		1,775	32.12%	13.43%
12	Kawangkoan	13				3,171		762	44.38%	10.58%
13	Sonder	10				2,634		2,932	64.09%	65.00%
14	Tareran	13				2,063		1,908	39.27%	35.65%
15	Tumpaan	15	7		46.67%	2,891		2,108	54.00%	40.66%
16	Tombariri	14	7		50.00%	2,280		2,163	37.76%	36.62%
17	Pineleng	17	4			3,480		5,151	41.44%	54.60%
18	Tomohon	34				6,531		6,547	37.87%	33.94%
19	Tondano	17				2,293		1,994	30.12%	24.44%
20	Remboken	11				2,384		2,001	85.25%	66.37%
21	Kakas	20	2		10.00%	2,854		2,492	45.72%	45.01%
22	Lembean Timur	7	5		71.43%	1,417		1,353	86.14%	58.57%
23	Eris	7				1,421		1,578	55.27%	56.76%
24	Kombi	11	7	a)	63.64%	1,167		803	38.85%	25.53%
25	Toulimambot	14				1,251		969	27.92%	22.02%
26	Kauditan	19	3		15.79%	976		1,186	12.28%	14.50%
27	Airmadidi	20				2,445		2,805	25.50%	28.12%
28	Dimembe	21				3,480		2,923	41.44%	39.24%
29	Wori	18	16		88.89%	3,480		1,919	41.44%	46.07%
30	Likupang	37	21		56.76%	5,233		5,793	67.13%	67.73%
	Manado	*68*	*24*		*34.44*	*13309*		*29,421*	*16.68%*	*33.71%*
1	Malalayang	5	3		60.00	1502	***)	3,990	15.74%	43.70%
2	Sario	12	3		25.00	2168	***)	5,554	12.91%	27.98%
3	Wenang	19	3		15.79	2151	***)	5,352	10.77%	22.62%
4	Mapanget	11				1169	***)	2,286	15.77%	23.94%
5	Molas	21	15		71.43	6319	***)	12,239	28.19%	50.30%
	Bitung	*44*	*27*		*61.36%*	*10,899*		*10,121*	*67.04%*	*34.42%*
1	Bitung Tengah	14	11		78.57	1413		3,953	83.02%	30.33%
2	Bitung Selatan	10	10		100.00	4489		1,990	67.08%	52.42%
3	Bitung Timur	9	5		55.56	1689		2,765	45.45%	28.88%
4	Bitung Utara	11	1		9.09	3308		1,413	72.61%	47.05%
	Bolaang Mongondow									
	Sub-total	*135*	*48*	b)	*98.31%*	*17,287*		*17,819*	*52.37%*	*44.56%*
1	Pinolosian	17	16		94.12%	2,104		1,747	74.53%	43.46%
2	Kotabunan	20	15		75.00%	1,374		2,445	19.23%	31.19%
3	Modayag	14				2,202		1,025	44.42%	14.43%
4	Lolayan	20				2,923		2,762	35.90%	33.07%
5	Kotamobagu	17				3,825		3,687	28.08%	28.76%
6	Passi	20				1,307		1,881	18.32%	20.85%
7	Poigar	14	9		64.29%	869		1,677	46.97%	47.41%
8	Bolaang	13	8		61.54%	2,683		2,595	46.74%	48.23%
Total Study area		770	209		27.14%	119,360		133,070	44.50%	37.67%

Source : *) Potensi Desa (Podes) Sensus 2000 dari Kabupaten Minahasa, Kabupaten Bolaang Mongondow, Kotamadya Manado dan Kotamadya Bitung; **) Data base Kecamatan se Sulawesi Utara, 1998, , ***) Diolah dari Kotamadya Manado dalam Angka,1998

Note: a) Data/Information from Kecamatan Office; b) Data/Information from Rural Community Development Office

Figure 2.2 shows the distribution of poor villages in the study area. Accoring to this map, the poor villages are concentrated in the northern part of North Sulawesi, Manado area, the south-east side of Minahasa, and the east side of Bolaang Mongondow.

In general, there must be some truth to an earlier statement that villages located at coastal areas and dependent only on fishing such as the northern part of Minahasa regency seem under developed economically. Manado municipality looks like it has more population living in poverty related to urbanization recently.

It is not easy to argue on the question of whether or not coastal commnities and fishers are the poorest of the poor. One of the reasons is that there is no clear-cut distinction among occupations of individuals as being a full-time fisher or farmer. Often, individuals and households in rural communities obtain income from several occupational resources and engage in a variety of productive activities. It is also true in coastal communities in the study area. Many fishers are also part-time farmers and vice versa, so clear-cut distinctions between fishers and farmers as occupational categories can be meaningless. However, according to the coastal community survey done by the Study Team in August 2000, it could be true that those fishers who depend only on fishing in the coastal area using simple fishing techniques such as hook and line are the poorest of the poor.

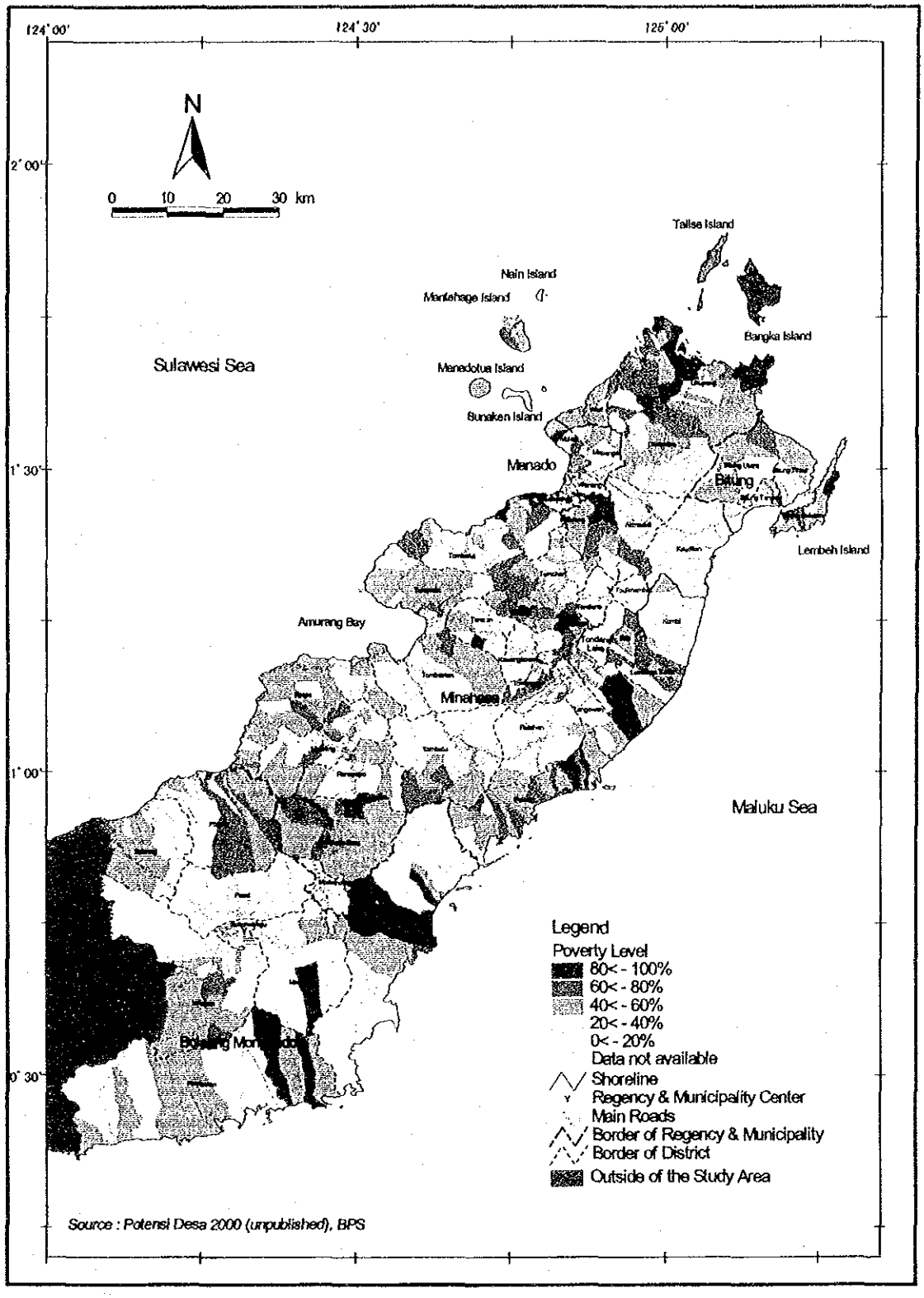


Figure 2.2 Poverty Distribution by Villages in the Study Area in 1999

Source : JICA Study Team

2.4.3 Education

The literacy rates in the study area are shown in Table 2.9. The area has high literacy rates in both male and female than that of the national average.

Table 2.9 Literacy Rates of Population 10 years of Age and Over by Sex in the Study Area, 1999

Regency /Regency	Male (%)			Female (%)			Male + Female (%)		
	Latin	Non-Latin	Illiterate	Latin	Non-Latin	Illiterate	Latin	Non-Latin	Illiterate
Minahasa *1)	96.8	0.5	2.7	94.3	1.3	4.3	95.6	0.9	3.5
Manado *1)	99.0	0.1	0.9	98.8	0.3	1.0	98.9	0.2	0.9
Bitung *1)	99.5	0.0	0.5	99.6	0.0	0.4	99.6	0.0	0.4
Bolaang Mongondow ** *1)	96.8	0.5	2.7	97.8	0.0	2.2	97.3	0.3	2.4
Total Study Area *1)	98.4	0.2	1.4	97.8	0.5	1.7	98.2	0.3	1.5
North Sulawesi *1)	97.0	0.4	2.7	97.0	0.5	2.6	97.0	0.4	2.6
Indonesia *2)	92.9	0.9	6.3	84.5	1.5	14.1	88.6	1.2	10.2

Source: *1) Susenas Propinsi Sulawe Utara, 1999
*2) Welfare Statistics, 1999

Note: ** Pinolosian, Lolayan, Bolaang, Poigar, Passi, Kotamobagu, Modayag, and Kotabunan

It is not a very easy task to look into the education situation specifically on coastal communities in the study area. According to the survey of 24 coastal communities, education level by age has significant trends as shown in Table 2.10. Those between 21 to 30 years old have the highest education level and the trend goes down as the age increases. It means that the younger generation has been more educated than the older ones in coastal communities in a short period of time. Comparing the educational attainment rate as a whole in the study area and the sampled coastal communities, those who attained elementary school level is much higher in coastal communities. However, the sample size of the survey might be too small to argue.

Table 2.10 Educational Level by Age in the 24 Coastal Communities

Age	Illiterate	Elementary School Graduate	Junior High School Graduat	Senior High School Graduate	Total
0 - 20	0 0.0%	5 100.0%	0 0.0%	0 0.0%	5
21 -30	2 2.0%	58 58.0%	28 28.0%	12 12.9%	100
31 - 40	2 1.0%	126 68.8%	38 20.7%	17 9.2%	183
41 - 50	3 2.0%	113 78.4%	25 17.3%	3 2.0%	144
51 - 90	1 1.7%	45 77.5%	8 13.7%	4 6.8%	58
Total	8 1.6%	347 70.8%	99 20.2%	36 7.3%	490

Source: Survey of 24 coastal communities in 2000 by the Study Team

Table 2.11 Percentage of Population 10 Years Old and Over by Educational Attainment in the Study Area

Regency /Regency	Never/not yet attended school	Not completed elementary school	Primary school	Junior High School	Senior High Schools	Higher Schools
Minahasa *1)	0.36	24.98	35.62	19.98	10.91	8.15
Manado *1)	0.24	10.68	21.32	22.51	30.09	15.18
Bitung *1)	1.65	26.53	26.24	17.76	18.21	9.63
Bolaang Mongondow ** *1)	2.38	31.62	37.74	14.80	7.46	6.00
Total Study Area *1)	0.91	22.98	31.83	19.21	15,53	9.54
North Sulawesi *1)	1.38	27.70	32.48	17.09	13.15	8.20
Indonesia *2)	9.79	25.45	32.49	14.62	10.34	7.30

Source: *1) Susenas Propinsi Sulawesi Utara. 1999
*2) Welfare Statistics, 1999

2.4.4 Women's Role in Coastal Communities

In fishing communities, fishing is generally the responsibility of men while fish processing is the women's responsibility. According to the survey of 24 coastal communities done by the Study in August, although it is true that fishing is mainly done by men, women also do this kind of work. There were women fishers interviewed in Libas, Kulu, Nain, and Papusungan. Women go with their husbands and assist their husbands, and some take a boat out and fish by themselves. In Papusungan, one of the interviewed women said that she is a crew (*masanae*) member of a fishing boat with a beach seine (*dampar*) net and they fish everyday.

The women process fish when there is an excess amount. Fish processing in this area is normally of two types: drying (with and without salt) and smoking. Selecting fish to be sold to market is also mostly done by a fisherman's wife. She sells fish not only in her own village but also in neighboring villages, and sometimes she goes to distant places such as Bitung and Manado cities. In Tiberias village, 50 fisher wives sell fish at markets near Tiberias. In the survey, it was found that fishing communities in Kema III and Molompar villages were more developed; some fisher wives started out as a small-scale fish vendor (*ba tibo*), and became an owner of *Pajeko*, earning more money than the big-bodied fishermen (*nelayan otot*) or owners of *Katinting*.

Besides fishing activities, women also culture seaweed and collect sea cucumbers. Some women said that they like cultivating seaweed because they can work together with their husbands and manage their working hours, unlike the risks of being out to sea.

Women also look for other income resources such as agricultural activities, to run small shops, to make cookies and bread for selling. Women grow agriculture products for daily subsistence such as cassava, corn, vegetables and spices in almost all villages and for marketing such as cashew nuts, coconut, clove, peanuts, green beans, dry land rice, soy beans, ginger, mangos, tomatoes, chilli and wet land rice as well.

Those economic activities are done besides domestic activities such as preparing food, providing water, cleaning, collecting firewood, laundry, looking after their children and other household chores. Women's participation in economic activities is important and is very significant. Women catch, process, and market fish, cultivate seaweed, collect sea cucumber, also farm, run small shops, make cookies and bread. Women in a fishing community are therefore very important stakeholders to the use of natural resources and need to be empowered by educating them on the sustainable use of coastal resources.

2.5 Economic Setting

2.5.1 GRDP

The economic growth of North Sulawesi is supported mainly by the agricultural sector, service, construction, trade and transportation industries. The table below shows the GRDP of North Sulawesi Province from 1995-1999 at current prices. According to the table, agriculture contributed about 24% to the GDRP in 1999, followed by service, 19%, and construction sector, 15%. The real increase rate of GRDP between 1995 to 1999 was 4.4% in total, and very rapid increase in mining sector was seen due to the gold mining boom. On the contrary there was sharp decrease of financial sector, and very low rate in construction sector due to the economic crisis in 1997.

Table 2.12 GRDP of North Sulawesi Province from 1996 – 1999 at Current Prices (Billion Rp)

	1995	1996	1997	1998	1999	Share (%)
Agriculture	1,035.4	1,245.2	1,466.4	2,324.2	2,600.7	24.1
Mining	130.1	211.4	250.0	391.2	632.3	5.9
Industry	331.7	415.7	480.4	845.8	932.3	8.6
Electricity	25.4	31.5	37.8	74.5	85.4	0.8
Construction	422.9	528.7	615.5	1,476.8	1,578.3	14.6
Trade	459.5	616.3	739.4	1,207.7	1,354.7	12.6
Transport	504.6	594.2	693.6	1,114.3	1,224.0	11.4
Financial	199.4	239.6	272.2	215.9	310.3	2.9
Service	683.5	908.2	1,059.0	1,653.7	2,063.2	19.1
Total	3,792.5	4,790.7	5,614.1	9,304.2	10,781.2	100.0

Source: PDRB Sulawesi Utara 1999

2.5.2 Labor Force and Industrial Structure

Economically active population (EAP) in the province has been slightly increasing in the last 20 years since 1980. However, the work force "looking for a job" is the main contributors to this increase of EAP. Creation of new job opportunities is needed for the economy of this area.

Table 2.13 EAP in North Sulawesi Province, 1980-1998 (%)

Activity	Year		
	1980	1990	1998
Economically Active	45.2	51.3	55.2
- Working	43.8	49.1	49.3
- Looking for job	1.3	2.2	5.9
Not Economically Active	54.8	48.7	44.8
TOTAL	100.0	100.0	100.0

Sources: North Sulawesi in Figures 1996 and 1998

Note: EAP = Economically Active Population

Table 2.14 Working Population in North Sulawesi Province, 1985-1998

Year	1985	1990	1998
Working population	821,150	940,448	1,088,576
Index (1985=100)	100	115	133

Source: North Sulawesi in Figures 1998

2.5.3 Employment Structure

The employment structure of the province is still characterized by the dominance of the primary sectors, Agriculture, Forestry and Fishery, although their shares to total employment indicated a downward trend from 57.9% in 1985 to 49.4% in 1998, while Trade, Restaurant and Hotel sector increased from 12.0% to 16.0% in the same period. The manufacturing sector had almost no changes in its share in the same period.

In the study area, Minahasa regency has relatively similar employment patterns to the province, that is, the dominant sector is the primary sector. Bolaang Mongondow regency's primary sector reaches a share of 75.8%, while Minahasa's is 53.7%. As for the two municipalities, Manado has a higher share of Trade, Restaurant and Hotel sector and Service sector, while Bitung has more shares of Manufacturing and the Service sectors in terms of number of employees. Figure 2.13 shows employment structure of the study area by industry in 1998.

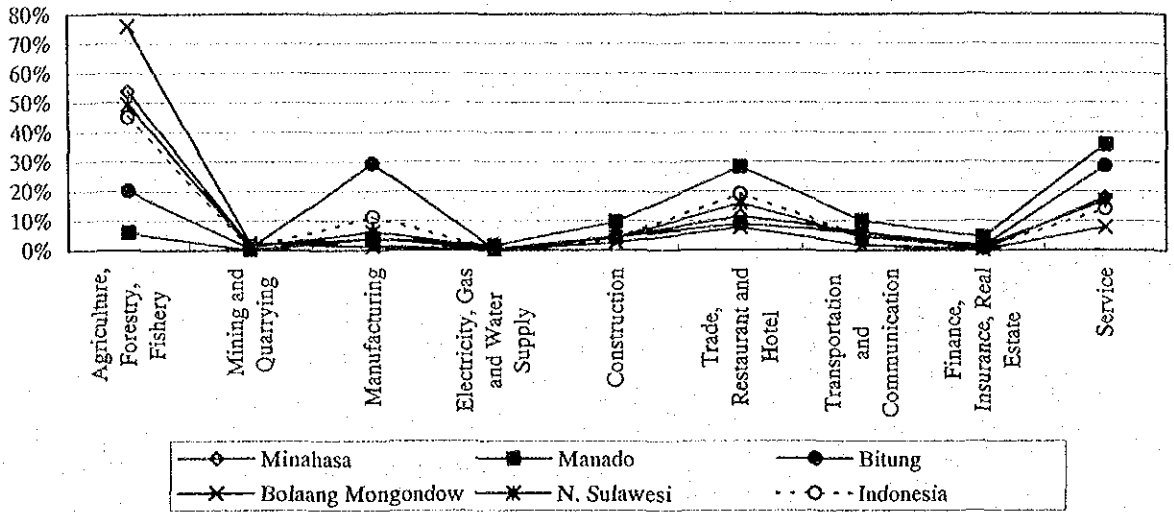


Figure 2.3 Employment Structure of the Study Area by Industry in 1998
Source: North Sulawesi in Figures 1998

2.5.4 Expenditure Level

As the data on household income is not available, per capita expenditure data can be used as substitute to indicate economic conditions of the households in the province. Figure 2.4, which shows monthly expenditure by sub-area, indicates that the big differences of monthly expenditures exist in different sub-areas. The upper middle and upper classes of expenditures (above 100,000 Rp/person/month) are fairly dominant in the two municipalities of Manado (46.7%) and Bitung (32.7%). On the other hand, the regencies are characterized by larger proportions of low and lower middle classes. Bolaang Mongondow and Minahasa, however, show higher proportions of middle and upper middle classes than the other regencies.

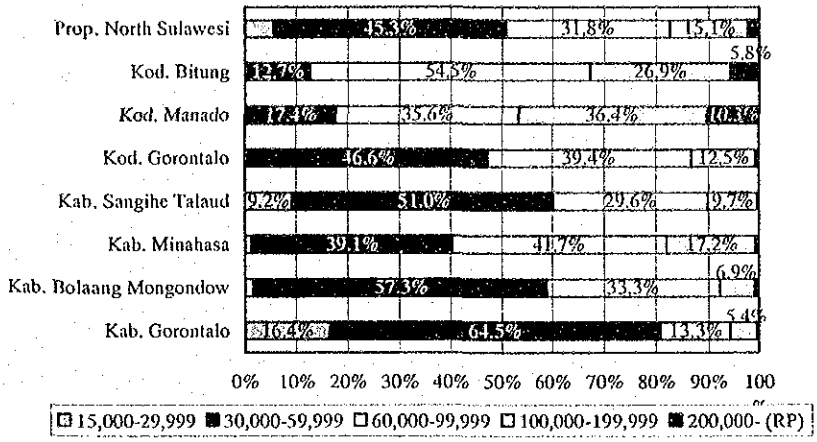
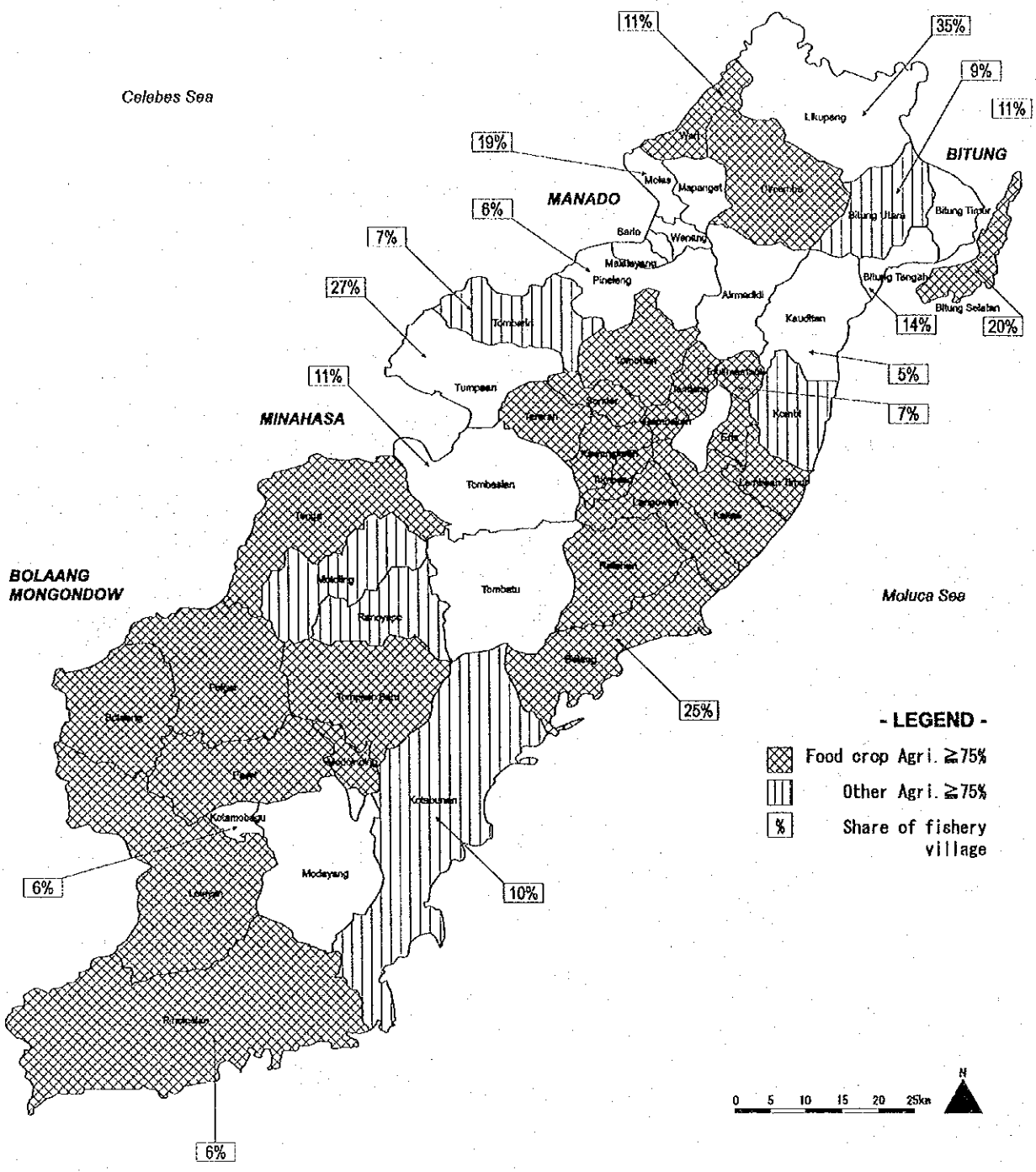


Figure 2.4 Monthly Expenditure by Sub-area in the North Sulawesi Province
Source: North Sulawesi in Figures; 1998

Figure 2.5 shows the classification of the villages/communities by main income. According to this figure, the main income source of the people in 26 districts out of 30 districts was food crop agriculture. The following districts are fishery dominant districts, i.e., their main income source is from fishery: Likupan (35%), Tumpaan (27%), Belan (25%), Bitung Selatan (20%), Molas (19%) and Bitung Tengah (14%).



Source : Potensi Desa Sensus 2000 in Minahasa, Manado,Bitung and Bolaang Mongondow

Figure 2.5 Classification of the Villages/Communities by Main Income Source

2.5.5 Fishing and Other Activities in Coastal Area

(1) Productivity of North Sulawesi and the Study Area

North Sulawesi Province has a coastal length of 1,985 km and a total marine area of about 314,000 km^2, which is 2.5% and 5.4% of the whole Indonesia respectively. The potential fisheries resource is estimated at about 125,900 tons/year in the territorial waters and 196,900 tons/year in Exclusive Economic Zone (EEZ) of Indonesia. The fishery production in 1995 was 119,348 tons in the territorial waters (93% of potential production) and 35,590 tons in the EEZ of Indonesia (18% of potential production).

North Sulawesi has also a mariculture potential of about 13,500 ha and fishponds of 19,600 ha. Only 630 ha of the total potential are used to date. To support the mariculture development, North Sulawesi has 4 shrimp hatcheries with a capacity of 30,000,000 post larvae/year. Milkfish larvae are estimated at 100 million larvae per year. Several fish larvae collectors are operated in the region. In addition, rabbitfish, groupers and crabs are sufficiently available in nature. Besides that, seawater also has potential for seaweed culturing. This culture requires relatively calm water.

Latest data on marine and inland fishery productions is given in Table 2.15. According to the table, the total production of fishery sector of the province was 196,878 tons in 1999. The fishery production share in the study area is almost 80% of the total production of the province, of which Bitung shares 59.0% and Minahasa shares 13.8%. More than 90% of fishery production of the province was the catch of marine fishery. It should be noted that the catch of marine fishery in Bitung was 115,632.2 tons, which was 63.6% of the total catch of marine fishery in the province.

The problem area of fishery production data is the inconsistency among different data sources; the information system of the fishery sector needs to be strengthened by such means as standardization of data and networking.

Table 2.15 Production of Fishery Sub-sector and Regency/Municipality in 1999 (tons)

Regency/ Municipality	Total	Marine fishery		Catch (open waters*3)	Inland fishery			
		Catch	Cultured		Brackish pond	Freshwater		
						Pond	Rice field	Net Pond
Minahasa	27,122.0 (13.8%)	16,142.2 (8.9%)	4,416.3	2,010.2	83.8	1,862.6	1,595.4	1,011.5
Manado	7,151.5 (3.6%)	6,671.1 (3.7%)	0	0	0	16.5	0	463.9
Bitung	116,136.6 (59.0%)	115,632.2 (63.6%)	478.2	0	0	23.1	3.1	0
Bolaang Mongondow	8,832.7 (4.5%)	7,544.3 (4.1%)	0	108.5	26.6	767.9	316.1	69.3
Sub-total *1)	159,242.8 (80.9%)	145,989.8 (80.3%)	4,894.5	2,118.7	110.4	2,670.1	1,914.6	1,544.7
Other areas *2)	37,635.2 (19.1%)	35,900.7 (19.7%)	756.6	752.2	60.5	44.8	16.0	104.4
North Sulawesi Total	196,878.0 (100%)	181,890.5 (100%)	5,651.1	2,870.9	170.9	2,714.9	1,930.6	1,649.1

Source: *Dinas Perikanan* (Fishery office), North Sulawesi Province

Notes: *1) Value of Bolaang Mongondow is total of whole Bolaang Mongondow.
(= not equivalent to the production from JICA Study area in Bolaang Mongondow)
*2) Total of Sanglhe Talaud, Gorontalo regencies and Gorontalo municipality
*3) Open water includes lakes, dams and rivers.

In the study area, economic activities in coastal communities are mainly fishing, farming, trading, and construction of fishing boats. People who live near coastline mainly depend on fishing activities; however, for those fishers who have land, their wives farm for their daily subsistence and when the weather is not good for fishing, the men work on their farm, too. In the case of fishers without land, during the time when the weather is not suited for fishing, which is from around September to March, fishers look for work in other towns such as Manado, Bitung, Likpang, and Belang. They end up working as construction workers or farmers, or even on another fishing boat.

It is not an easy task to describe the proportions of fishing and farming mix quantitatively or geographical tendencies in coastal communities in the study area. For example, in Tiberias 90% of fishermen fish exclusively and only 10% fish and farm. In Ambang II, which is close to Tiberias, almost all fishermen engage in both fishing and farming. This mix is probably influenced by complex elements such as fishing resources, geographical conditions, ethnicity, infrastructure such as roads, and economic activities surrounding the area.

In coastal resources management, fishing and other coastal economic activities are important elements to consider. Therefore, the Study Team looked into fishing and other coastal economic activities in the coastal communities in the study area. The results of analysis are as follows:

(2) Type of Fishing Gears and Boats

Tables 2.16 and 2.17 below show the number of fishery households/firms and type of boats by sub-area in North Sulawesi province from 1994 to 1997. There is a tendency of increase both in the number of fishery households/firms and number of boats in general. Majority of the boats (69%) have no motor, and 12% of the fishermen have no boats at all. The fishermen/firms who have modern power boats account for 1% (169 units) only. The number of fishery households/firms shows a steady increase from 1994 to 1998. More than half (58 %) of fishery households/firms live in Minahasa regency.

Table 2.16 Number of Fishery Households/Firms by Sub-areas, 1994 – 1997

	1994	1995	1996	1997	Share in 1997(%)
Minahasa	6,355	6,383	6,930	6,946	58
Manado	916	896	992	910	8
Bitung	1,770	1,767	1,826	1,801	15
Bolaang Mongondow	2,340	2,343	2,340	2,384	19
Sub-total *1)	11,381	11,389	12,088	12,041	100
North Sulawesi	27,085	27,084	29,251	29,105	-

Source: Buku Tahunan Statistik Perikanan Sulawesi Utara, 1994-1997

Note: *1) Sub-total covers administrative units of Minahasa, Manado, Bitung and Bolaang Mongondow, so that it is not equal to the study area.

Table 2.17 Number of Fishery Households/Firms by Type of Boats, 1994 – 1997

	1994	1995	1996	1997	Share in 1997 (%)
No boat	862	842	1,353	1,409	12
Non-power boat	8,245	8,282	8,458	8,345	69
Out-board motor	2,113	2,115	2,120	2,118	18
Power boat	161	150	157	169	1
Sub-total	11,381	11,389	12,088	12,041	100
North Sulawesi	27,085	27,084	29,251	29,105	-

Source: Buku Tahunan Statistik Perikanan Sulawesi Utara, 1994-1997

Tables 2.18 shows the number of fishing gears by sub-area in North Sulawesi province from 1994 to 1997. The number of fishing gears also increased in these years, especially in Bitung. The dominant fishing gear in the region is hook and line (especially troll line and others), which shared 77% of the sub-total in the region, followed by gill nets (especially drift gill nets and set gill nets) and seine nets (especially *payang* and beach seine) as shown in Table 2.19. The number of fishing gears has been rapidly increasing compared with the number of fishery households/firms and boats in the same period of 1994 to 1998. Especially in Bitung, the total number of units increased to 2,512 units in 1997, which is 1.4 times that in 1994, as shown in Table 2.20. Some remarkable sharp increases of lift nets in Manado and Bolaang Mongondow are seen, and so with hook and line in Minahasa and Bitung.

Table 2.18 Number of Fishing Gears by Sub-area, 1994 – 1997

	1994	1995	1996	1997	Share in 1997(%)
Minahasa	5,941	6,421	7,071	6,775	52
Manado	933	906	992	986	8
Bitung	1,979	1,904	2,091	2,809	21
Bolaang Mongondow	2,377	2,379	2,373	2,512	19
Sub-total	11,230	11,610	12,527	13,082	100
North Sulawesi	27,018	27,789	29,947	29,908	(4.3 %)
Indonesia	636,324	662,910	664,477	688,884	(100 %)

Sources: Buku Tahunan Statistik Perikanan Sulawesi Utara, 1994-1997, and Statistik Lingkungan Hidup Indonesia, 1999.

Table 2.19 Number of Fishing Gears by Type of Fishing Gears, 1994 – 1997

	1994	1995	1996	1997	Share in 1997(%)
Seine nets	740	675	655	675	5
Gill nets	1,390	1,475	1,513	1,366	10
Lift nets	539	479	329	397	3
Hook and line	7,636	8,268	9,319	10,056	77
Others	956	713	711	588	5
Sub-total	11,230	11,610	12,527	13,082	100
North Sulawesi	27,018	27,789	29,947	29,908	-

Source: Buku Tahunan Statistik Perikanan Sulawesi Utara, 1994-1997

Table 2.20 Increase Ratios of Fishing Gears by Sub-area, 1994 – 1997

	Total	Seine nets	Gill nets	Lift nets	Hook & lines	Others
Minahasa	114	94	92	57	140	46
Manado	106	112	113	150	104	100
Bitung	142	114	117	37	152	118
Bolaang Mongondow	106	82	99	148	108	93
Sub-total	116	95	98	74	132	62
North Sulawesi	111	86	85	73	125	72

Source: Buku Tahunan Statistik Perikanan Sulawesi Utara, 1994-1997

Note: Increase ratio = 1997/1994 x 100

(3) Earnings

Sample data of income level taken from the survey of 24 coastal communities by the Study is shown in Table 2.21. According to this data, there are basically 3 patterns of income level among coastal communities. The first pattern is that those communities engaged in small-scale fishing around the coastal area have bigger concentrations in the lowest category of income level. The second pattern is that those communities engaged in offshore fishing or a combination of fishing and culturing (e.g.seaweed) or even fish juvenile anchovies by lift nets (Bagan) have larger populations in the lowest and highest categories of income level, while the concentration in the middle income is low. The third pattern is seen only in Nain where economic activity concentrates on seaweed culture. The concentration becomes higher as the income level goes up.

Table 2.21 Income Level by Community

Village name	0~200,000		200,001~ 300,000		300,001~ 400,000		400,001~ 500,000		>500,000		Total	Main Activities
	No.	%	No.	%	No.	%	No.	%	No.	%		
Ambang II	14	66.7	7	33.3	0	0.0	0	0.0	0	0.0	21	F
Basaan I	18	66.7	8	29.6	0	0.0	1	3.7	0	0.0	27	F,(B)
Bentenan	5	23.8	10	47.6	0	0.0	1	4.8	5	23.8	21	F, SW
Blongko	12	80.0	2	13.3	1	6.7	0	0.0	0	0.0	15	F
Borgo	7	33.3	4	19.0	2	9.5	4	19.0	4	19.0	21	OSF
Buyat	3	21.4	9	64.3	0	0.0	2	14.3	0	0.0	14	F
Kapitu	12	57.1	6	28.6	0	0.0	3	14.3	0	0.0	21	F
Kema III	7	33.3	6	28.6	1	4.9	3	14.3	4	19.0	21	OSF
Kulu	8	38.1	7	33.3	1	4.8	0	0.0	5	23.8	21	F, SW
Libas	5	23.8	9	42.9	2	9.5	3	14.3	2	9.5	21	F
Manado Tua II	10	62.5	4	25.0	2	12.5	0	0.0	0	0.0	16	F
Molompar	12	75.0	3	18.8	0	0.0	1	6.3	0	0.0	16	OSF
Motto	15	68.2	7	31.8	0	0.0	0	0.0	0	0.0	22	F
Nain	3	10.3	8	27.6	4	13.8	7	24.1	7	24.1	29	F,SW
Papusungan	5	23.8	8	38.1	5	23.8	2	9.5	1	4.8	21	F
Popareng	9	56.3	1	6.3	1	6.3	3	18.8	2	12.5	16	F
Ranoyapo	17	81.0	0	0.0	0	0.0	2	9.5	2	9.5	21	F
Raprap	19	65.5	8	27.6	1	3.4	1	3.4	0	0.0	29	F,SW
Ratatotok Imr.	13	50.0	6	23.1	1	3.8	4	15.4	2	7.7	26	F,B,SW
Serey	11	73.3	4	16.7	0	0.0	0	0.0	0	0.0	15	F
Talise/Tambun	7	35.0	9	45.0	2	10.0	0	0.0	2	10.0	20	F*
Tateli waru	8	53.3	2	13.3	2	13.3	3	20.0	0	0.0	15	F
Tiberias	14	70.0	5	25.0	1	5.0	0	0.0	0	0.0	20	F
Tumbak	10	47.6	8	38.1	0	0.0	1	4.8	2	9.5	21	F,SW

Source: Coastal Community Survey in August 2000, JICA InteCoReef Study

Legend: F: Small-scale fishing in coastal area, OSF: Offshore fishing, B: Bagan, SW: Seaweed culturing

Note: Tambun is the Proyek Pesisir project site and has been provided some boats to activate fishing activities in the village; it might have some effects on income level. Seasonal work obtained outside of village might have some effects on income level as well.

Pattern 1 Pattern 2 Pattern 3

It could be said that it would be difficult to raise income level only by the single activity of small-scale fishing in the coastal communities. The survey indicates that by adding other economic activities, such as seaweed culturing and other types of fishing such as anchovies fishing by *Bagan*, and/or offshore fishing, coastal communities would be able to realize economic development. In the case of Nain, the community focuses only on seaweed culturing and so far it has been very successful; however, this kind of monopolized economic activity can be easily influenced by any outside conditions such as world economic markets or domestic markets. It might be useful for Nain to look at varying their economic activities for the safety and sustainability of their economic development.

(4) Aquaculture

Aquaculture such as fishponds and seaweed culturing in the study area is booming. Especially seaweed culturing was introduced in the area in the 80s and is spreading widely in the area. A detailed description of aquaculture in the study area is found in Chapter 4 of

this report.

2.5.6 Tourism

(1) Recent Tourism in Indonesia

According to the statistics on tourism, the number of foreign visitors to Indonesia in 1997 was 5.19 million. However, due to the economic crisis in 1997, the number in 1998 declined to 4,606,416 visitors or a decrease of 11.2% compared to 1997 figures. This decrease has never occurred in the years before. Then in 1999, the number of foreign visitor arrivals recovered slightly to increase around 5% comparing to the data in 1998. The trend of recovery is expected to continue.

Foreign exchange earning was US$4,331 million in 1998. The average visitor expenditure in Indonesia was US$940 in 1997. The Indonesian Government has made a target in the number of foreign visitor arrivals of 11 million and US$15 billion in 2005 in its development policy. In 1998, the number of domestic tourists was 109.8 million persons who spent 135 trillion Rupiah.

The North Sulawesi province is designated as one of the 13 Tourism Development Areas (DTW) in Indonesia. Number of total accommodations, rooms, beds, and other figures are shown in Table 2.22.

Table 2.22 Number of Total Accommodations and Other Indicators by Provinces

	Establish ments	Rooms	Beds	Employ- ments	No. of guests per day		
					Domesti c	Foreign	Total
North Sumatra	636	13,647	22,883	8,188	4,461	543	5,004
West Sumatra	234	4,315	8,101	2,589	888	58	946
DKI Jakarta	269	27,663	41,394	33,196	7,697	3,025	10,722
West Java	1,295	35,881	62,477	28,705	11,605	1,265	12,870
Central Java	955	20,085	34,090	12,051	7,475	258	7,733
DI Yogyakarta	842	12,331	21,535	8,632	3,012	395	3,407
East Java	904	25,198	45,825	17,639	10,078	925	11,003
Bali	1,288	34,747	57,446	41,696	2,583	10,358	12,941
North Sulawesi	117	2,659	3,963	2,127	590	54	644
South Sulawesi	402	8,476	14,954	5,933	1,497	202	1,699
East Kalimantan	267	5,870	9,442	4,109	1,563	168	1,731
Riau	405	13,749	21,296	10,999	3,412	2,698	6,110
West Nusatengara	294	4,842	8,673	4,358	451	872	1,323
Others	1,945	35,668	62,404	15,883	9,035	350	9,385
Indonesia	9,853	245,131	414,483	196,105	64,347	21,171	85,518

Source: Hotel and other accommodation statistics in Indonesia 1998.

Note: Total accommodation including all kinds of hotels, star hotel and melati accommodation

As the table shows, North Sulawesi province has the lowest numbers in every indicator related to tourism. Also, numbers of domestic and foreign visitors are also the lowest in North Sulawesi. The occupancy rate of the North Sulawesi province was 31.4% in 1998, which was the 9th rank among 13 provinces. However, in terms of the length of stay, recent data (January – July, 2000) in the North Sulawesi province shows that it was much longer than the national average, maybe because the area is very remote from other tourist destinations and the purpose of the visit is concentrated on diving activities.

Table 2.23 Average Length of Stay

Visitors	Indonesia	North Sulawesi
Foreign	3.45	7.12
Domestic	1.68	2.50
Total	2.12	3.33

The number of foreign visitor arrivals was 42,821 in 1997 and the number of domestic visitor arrivals was 1,157,275. However, both numbers declined dramatically in 1998, recovering slowly from 1999. The number of foreign and domestic visitor arrivals in 1999 was 44,087 was and 477,702, respectively.

(2) Tourism Activity in the Study Area

As a tourism destination, North Sulawesi has been attracting visitors by its attractive natural resources such as coral reefs, coral fishes, and some beautiful beaches. Diving tourism is the main strategy for the province for a long time now. Besides these coastal area attractions, there are some spotty attractions in highlands around Tondano lake area. However, tourism facilities in these touristic places except Bunaken National Park are not well established, consequently, they are failing to attract foreign visitors.

Therefore it would be important to look into those aspects of tourism for further development of tourism in the province, such as differentiation and networking of tourist destination from other tourist destinations nearby, increasing number of direct flights from overseas and development of new international flight routes, expansion of markets from diving, connecting various touristic attractions and tourist resources, development of eco-tourism, and development of tourist destinations by community participation, and so on.

The most attractive tourism type in the area is diving tourism to enjoy beautiful coral reefs and fishes. The Bunaken National Park has 25 famous spots for scuba and skin diving and it is said that Bunaken National Park attracts 80% of the foreign tourists to the region. Other tourist areas are the small-scale beach resorts and highland resorts along the Tondano Lake. Those areas attract majority of the domestic tourists who visit the region. Because the

Bunaken National Park faces Manado Bay, the hotels and transportation services are concentrated in Manado urban central area, the southern and northern coasts and Bunaken island. The remote small-scale resort areas can be seen in Likupang, Gangga island, Bitung Timur and Kema in the north part of the study area and Belang in the southern east coast and other beaches. There is potential to develop new destinations of eco-tourism in the protected forests along the coastal area. Those are Manado Tua island and Mt. Tumpak forests in Manado municipality, and Batuputih, Mt. Batuangus and Tangkoko forests in Bitung municipality. Those areas have poor accessibility and require improvement of tourist services and facilities at the sites.

(3) Types of Resources

Table 2.24 shows the types of tourism resources by regional autonomy. There are two types of tourism resources in the region, i.e., marine and beach and the other is coastal tourism resources.

a) Diving sites and facilities

The most attractive marine and beach tourism resource in the region is Bunaken National Park, where tourists can enjoy diving, snorkeling and boating, although there are more than 60 diving sites around north shore of the peninsula. World class drop-off (steep coral walls), good visibility of water and a variety of species highten its charm as resources for scuba diving, although there are some areas where coral reefs have already been damaged through human activity represented by scuba-divers, snorkelers and anchoring of diving boats. North Sulawesi Water Sports Association, which is composed of diving operators and some NGOs, has been working towards the development of safe and eco-friendly marine sports in North Sulawesi.

b) Beach resort areas

In addition to Bunaken National Park, there are lots of white and black sand beaches along the coastlines of both Sulawesi and Maluku Sea. The white sand beaches are mainly dotted in many places between Manado to Tanawanko and Tumpaan to Inobonto at the Sulawesi Sea side and between Bitung to Lembean Timur at the Maluku Sea side. The Bunaken, Talise and Bangka islands also have white sand beaches. Most of those white sand beaches are small and occupied by the coastal communities and some beaches are difficult to access from the main roads. Very few beaches are used or has potential for tourism resort areas, including Ratatotok, Bentenang, Kema, Tateli, Kalasey, Tasik Ria, Malalayang, Gangga, Talisei, Bangka islands, etc. The land reclamation project of Boulevard street in Manado municipality

will provide space for a sea front area, which has big potential for tourism development. This is not categorized as a natural beach resort type; however, this area will create artificial coastal attraction in the future.

c) Eco-tourism forests and other coastal resources

Another tourist attraction in the coastal area of the region is eco-tourism in the seaside forests, which are designated as protection areas. This type of tourism resource is not developed yet. The major eco-tourism potential areas in the coastal area are Mt. Tumpa Grand Forest Park, Manado Tua island in Manado municipality, Manembo-nembo Wildlife Reserve in Minahasa regency and Batuangas and Dua Sudara Nature Reserves, Batuputih and Batuangus Natural Recreational Parks in Bitung municipality. The major attractions of the tourism would be hiking, trekking, bird watching, etc.

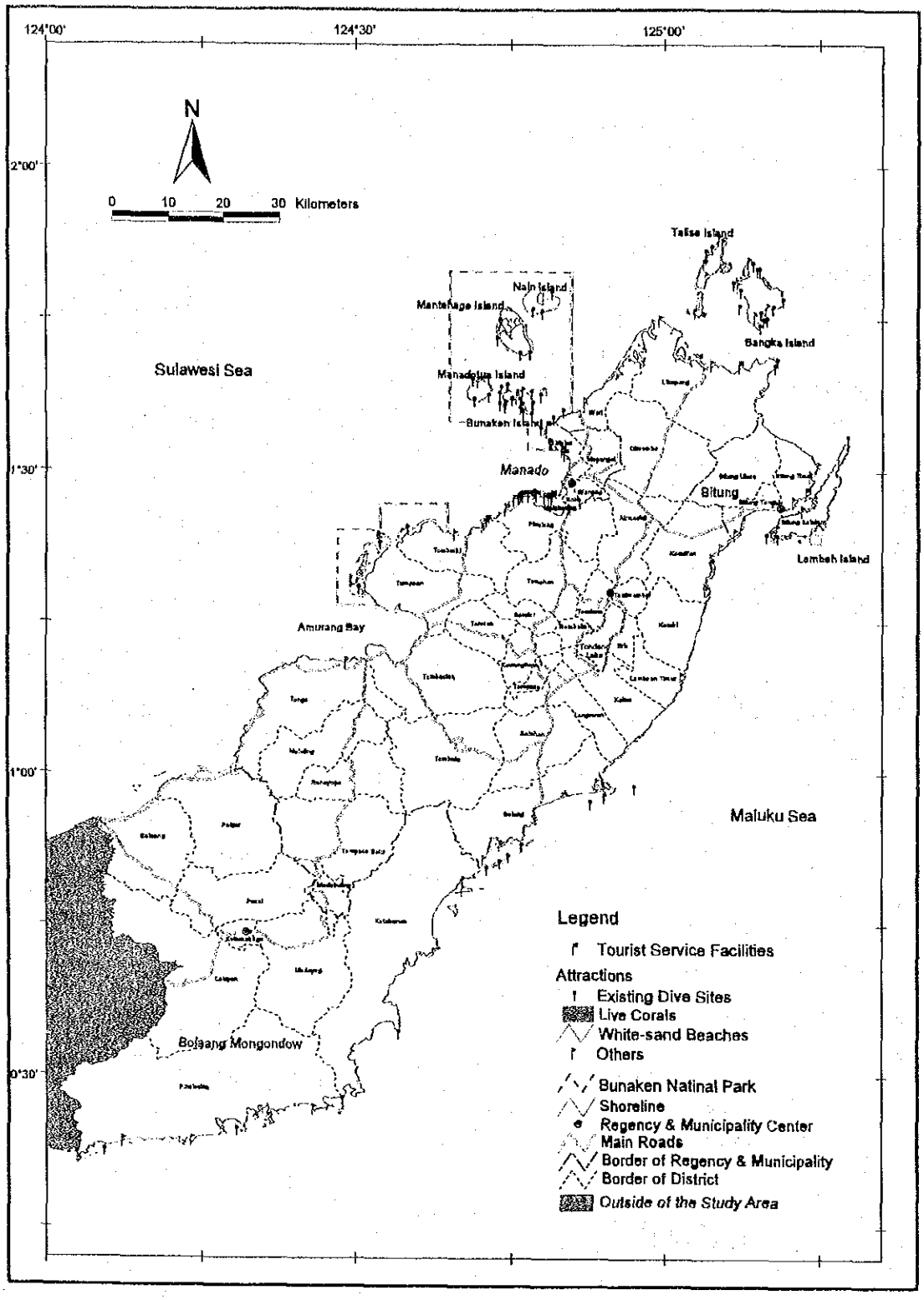
In addition to the forests, there are special attractions of hot spring at Moinit beach and natural cave at Morea in Minahasa regency.

Table 2.24 Major Tourism Resources in the Study Area

	Manado	Bitung	Minahasa	Bolmong
Diving sites resources	Diving in Bunaken National Park (Mantehage and Nain islands, Wori, Tombariri and Tumpaan)	Diving in Lembeh Strait (Kunkungan resort)	Diving in Bunaken National Park (Bunaken, Manado Tua and Siladen islands, and Molas)	
Beach resort resources	Malalayang and Boulevard street	Tj. Merah, Batuputih, Waturirir, Kema and Benady	Likupang, Waleo, Tj. Serei, Wori, Gangga, Tasik Oki, Bungka, Talise and Lelaga islands, Tasik Ria, Tateli, kalasey Tanawangko, Moinit, KoraKora, Bentenang, and Ratatotok	Kumeke and Nenas islands in Kotabunan
Eco-tourism forests and other coastal resources	Manado Tua Island, Mt. Tumpa forests	Tangkoko, Batuangus, Danowudu, Dua Saurdara and Batuputih forests	Manembo-nembo forest, Hot spring at Moinit beach and natural cave at Morea	No forests for tourism in the coastal area

Source: RTRW of Minahasa, Manado, Bitung and Bolaang Mongondow

Figure 2.6 shows the existing tourist facilities such as hotels, restaurants, beach resorts, dive centers, etc., and the tourist attractions such as dive sites, white sand beaches, etc.



Source JICA Study Team

Figure 2.6 Existing Tourist Facilities and Attractions

Figure 2.7 shows the potential areas for the coastal tourism development, analized by the JICA Study Team. The criteria used for the analysis are;

a. White sand beaches(length is more than 300 m);
b. Good live coral;
c. Accessibility (Time-distance from Manado);
d. Scenic beauty; and
e. Other attractions.

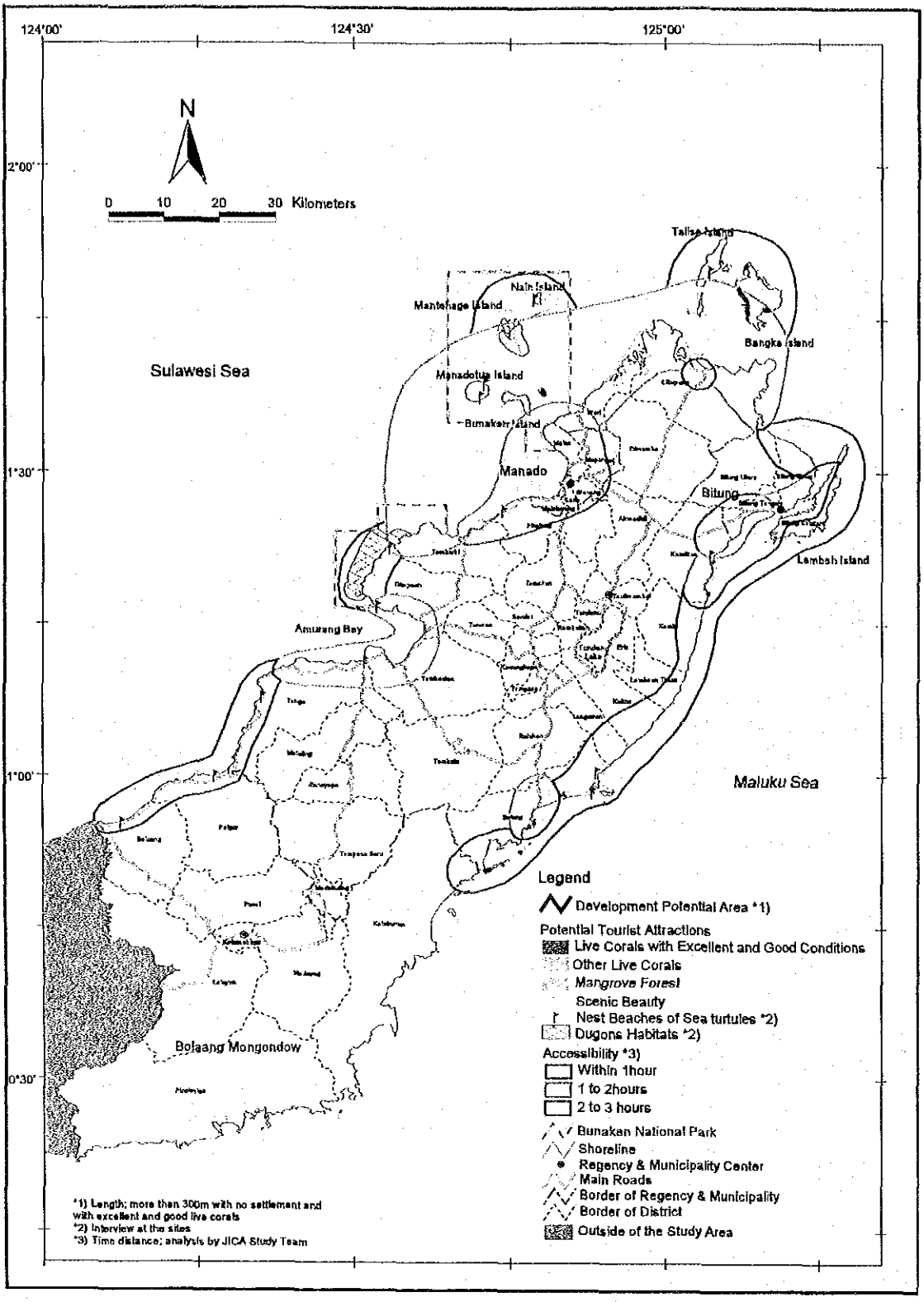
As the result of the analysis, the Study Team identified the priority areas for coastal tourism development as follows;

1) First priority areas:

a. Bunaken National Park(Northern area) and Manado city;
b. Lembeh Island and Bitung city; and
c. Belang-Kotabunan Area.

2) Second priority areas:

a. Bunaken National Park(Southern area);
b. Likupang area; and
c. Kema area.



Source JICA Study Team

Figure 2.7 Potential Areas for the Coastal Tourism Development

(4) Uses of resources

Table 2.25 below shows the number of foreign and domestic visitors in the North Sulawesi province.

The number of visitor arrivals to North Sulawesi province reached 42,821 foreign and 1,157,275 domestic visitors in 1997. However, both numbers dropped rapidly in 1998, especially domestic visitors became less than half the number of the previous year. In 1999, the number of foreign visitors recovered to 44,087, and that of domestic visitors was 477,702.

Table 2.25 Trend of Foreign and Domestic Visitors in North Sulawesi

Year	Total	Increase Ratio(%)	Foreign	Increase Ratio(%)	Domestic	Increase Ratio(%)
1995	667,045	-	23,762	-	643.283	-
1996	1,025,522	53.7	32,525	36.9	992,997	54.4
1997	1,157,275	12.8	42,821	31.7	1,114,454	12.2
1998	502,004	-56.6	34,502	-19.4	467,502	-58.1
1999	521,789	3.9	44,087	27.8	477,702	2.2
2000 *1)	143,077	-	12,215	-	130,862	-

Source; Tourism Office, Province

Table 2.26 shows the number of passengers at Sam Ratulangi Airport. The number of passengers has been dropping since 1997 for total and 1998 for international flights, similar to the number of total visitors mentioned above. The number of passengers at Sam Ratulangi Airport was 123,895 in 1999, which shared about 24% f the total visitors to the province. The new terminal building of Sam Ratulangi Airport was completed last year and the runway was extended to 2,850 m. The number of flights of Singapore – Manado has been increased to 4 flights a week recently. The contribution of the airport as the gateway to the region will be greater in the future.

Table 2. 26 Number of Passengers at Sam Ratulangi Airport

Year	Total passengers *1)	Increase ratio (%) from the previous year	Passengers by international flights *2)	Increase ratio (%) from the previous year	Share of direct flight
1995	165,577	-	7,323	-	4.4 %
1996	182,761	10.4	9,174	25.2	5.0 %
1997	177,419	-2.9	9,827	7.1	5.5 %
1998	128,582	-27.5	9,160	-6.8	7.1 %
1999	123,895	-3.6	8,358	-8.8	6.7 %

Source: *1) Provincial transportation office, North Sulawesi, *2) Immigration office, North Sulawesi.

Note: *1) including passengers of both domestic and international flights to Sam Ratulangi Airport *2) Only passengers by international flights from Singapore and Davao.

2.5.7 Manufacturing Industry

The main industrial area of North Sulawesi, KABIMA (Kauditan-Bitung-Kema) industrial zone, is located close to Bitung Seaport, as a main exporting gate of North Sulawesi. The types and location of existing industries in the study area are shown in Table 2.27 below.

Table 2.27 Types and Location of Industries in the Study Area

Location	Types of industries
Coastal Districts (Kecamatan)	
Molas *1)	Food, Soybean, Soy sauce, Beverage, Coffee, Ice, Woodworks, Plastic/Sponges, Chemicals, Garments
Wenang *2)	Food, Soybean, Ice, Auto workshop, Building materials
Sario *3)	Building materials, Food, Beverages, Ice, Soybean
Malalayang *4)	Food, Nutmeg, Building materials
Pineleng	Nutmeg Canning, Cloves Oil, Nutmeg Oil, Brick, Thatch roof
Wori	Tapioca, Fish meal, Carbon, Palm sugar, Dried Fish, Biscuit, Coconut Oil, Rice mill, Meat, Abattoir, Hotels
Likupang	Tapioca, Fish meal, Carbon, Palm sugar, Dried fish, Fish-smoking, Biscuit, Soybean, Cattle feed, Coconut Oil, Carbon, Hotels
Inland Districts (Kecamatan)	
	Rice mill, Meat, Slaughterhouse, Tanning, Garments, Metal works, Auto workshop, Clove Oil, Ceramic, Brick, Sulfur, Kaolin, Corn, Carbon, Palm sugar, Nutmeg Canning and Oil, Printing, Soybean, Cattle feed, Woodcarving

Source: Dalam Angka and Monografi, 1991

Notes: The information on Bolaang Mongondow Regency is not available.

*1) Mostly in Bitung Karang Ria, Tuna Kombos, Singkil, and Tuminting Kelurahan

*2) Mostly in Tikala Ares, Calaca, Dendengan Dalam, Istiqlal, Pal Dua and Pinaesaan Kelurahan

*3) Mostly in Ranotanaweru, Teling Atas and Wanea Kelurahan

*4) Mostly in Balu and Kleak Kelurahan

2.6 Infrastructure

Generally speaking, there are differences in terms of infrastructure, such as roads, communications, water supply, toilet facilities, and school/health facilities, between urban areas and rural areas. Also in rural areas, there is a difference between coastal areas and inland areas. These social and economic infrastructures affect the development of areas directly. In order to secure equity in development among the areas, it is very important to fill the gap of their infrastructure development through the efforts of their respective local government.

2.6.1 Wastewater Treatment Facilities

Most industries in the study area do not have treatment facilities and discharge their wastewater directly into surface waters. These industries are generally small to medium scale and majority is engaged in food processing operations, especially in Bitung. A greater portion of the contaminants in the wastewater from these industries will be oxygen

demanding (mainly organic) compounds. Some nitrogen and phosphorous compounds will also be discharged. Currently, there are no industries that discharge toxic substances

Table 2.28 Major Industrial Factories in the Study Area and their Waste

No.	Type of Industry and name of company	Production/ year	Quantity of solid waste	
			(m^3/day)	(m^3/year)
I	Fish Meat Processing	21,148	21.50	3,870.00
1	PT. Union Pasifik	2,188	2.00	360.00
2	PT. Sinar Pure Food	12,000	1.50	270.00
3	PT. Deho	6,060	6.00	1,080.00
4	PT. Sari Cakalang	900	12.00	2,160.00
II	Sugar	180	130.00	23,400.00
1	PT. Naga Manis	180	130.00	23,400.00
III	Alcohol and Soft Drink	149,357	0.60	172.25
1	PT. Sehat Sentosa	76,456	0.30	75.00
2	Champion	19,000	0.01	3.75
3	Kabesaran	9,155	0.01	3.75
4	Tandu Rusa	9,266	0.01	2.25
5	Sumber Air	6,113	0.12	50.00
6	VIP	23,517	0.05	12.50
7	Super Top	5,850	0.10	25.00

Source: Laporan Neraca Kualitas Linkungan Hidup Daerah Sulawesi Utara, 1995

2.6.2 Sanitation and Wastewater Facilities

Treatment of human waste in Manado is carried out in a conventional way, as each house is equipped with a septic tank or latrine, while bathroom and kitchen wastewater is discharged to municipal pipes, rivers and other channels through the local sanitation system. According to the survey results of National Social Economy 1999 (BPS) the situation of sanitary facilities in the municipality is as follows:

- 69.6 % : use own toilets
- 26.9% : use shared toilets (MCK)
- 0.8 % : use river
- 2.7% : others

At present, human waste is transported by P.D. Pembangunan Sulawesi Utara and KUD (Village Unit Cooperation) Wenang using 2 vacuum cars with a capacity of 2 – 3 m^3 each. Some of the waste is conveyed to Tomohon district for composting. It is estimated that the volume of human waste pumped out in 1994 was 2.59 m^3/day or 464 m^3/year. There are 2 sites for treatment of human waste with capacity for only 20,000 septic tanks in Manado. There is fear of underground water contamination by infiltration of non-treated human waste especially in the highly dense areas in the city. Utilization of coral for the septic tank directly impacts coral reef. The quantitative data on use of coral for the septic tanks are shown in Chapter 4.

The "Master Plan for Human Waste and Wastewater Disposal for the City of Manado," IBRD Loan No. 3340 – IND Sulawesi Irian Jaya UDP, had been formulated between August 1994 and July 1995. Its implementation was expected to start in 2001 for completion in 2018. The master plan identified the necessary measures for the management of the human waste of Manado as follows:

- Campaign and environmental education on health and sanitary;
- Building of public toilets (MCK) along the rivers and sea front;
- Provision of soft loan for the installation of appropriate individual septic tank;
- Provision of off-site system in high density areas; and
- Increase of vacuum cars.

At this moment, the implementation of this plan has not been confirmed yet.

In Bitung municipality, according to the survey results of National Social Economy 1999 (BPS), majority of households in Bitung have their own toilet (63.2%). Only 9.3% of households have no toilet at all, while the rest use either shared or public toilets. The main concern of Bitung municipality is to deal with those who still discharge human waste directly into rivers or drainage systems.

According to statistics, the study area has the most number of villages with private toilets, an average of 84%. However, according to the survey of 24 coastal communities, only 41.4% of the sampled population answered that they use a toilet, and the rest of sampled population uses river (5.8%), beach (44.2%), and others (8.6%). It means that although private or shared toilets are available, people in coastal communities tend to use water areas as toilets.

Table 2.29 Number of Villages by Type of Toilet Facility, 1999

	Private		Shared	Public	No-toilet	Total
	#	%	#	#	#	#
Minahasa	473	90	17	5	28	523
Manado	66	97	2	0	0	68
Bitung	44	100	0	0	0	44
Bol. Mongondow*)	62	46	8	13	52	135
Total Study Area	645	84	27	18	80	770

Source: Potensi Desa Sensus 2000 in Minahasa, Manado, Bitung, and Bolaang Mongondow
Note: *) Pinolosian, Lolayan, Bolaang, Poigar, Passi, Kotamobagu, Modayag, and Kotabunan

2.6.3 Solid Waste Management

The existing three-hectare final disposal site (TPA) in Sumompo, which is located about 6 km northwest from the center of the city, has been in operation since 1971. The site is still operational because it is a controlled landfill and its easy and economical operation suits the

present budget. However, there is no leachate treatment plant and because of the TPA's proximity to residential areas, the municipal government has decided to prepare a new TPA site in Teling Atas (the decision letter was signed by the previous Mayor of Manado), but still the study of alternative sites, for instance in Ranomuut or other suitable places, needs to be carried out, according to the staff of the BAPPEDA Kota Manado.

According to the City Cleaning Service Office, *Dinas Kebersihan*, waste collection is carried out using 22 trucks with a capacity of 10 m^3 each, averaging 3 trips per day from transfer station (TPS) to TPA. The amount of transported waste is from 700 to 800 m^3 per day. The local government has been planning to construct a leachate treatment plant for the existing TPA in Sumompo, but it has not been started yet due probably to economic constraints. Wastewater from the TPA is discharged to the Kuala Bailang River and goes into Manado Bay at Tumumpa. For this reason, the water quality of the river should be examined but this has not been done. Some 50 households are living near the TPA, and some people in the area work as scavengers, collecting and selling paper, aluminum, plastic bottles, steel and glass bottles for a living. The construction of the new TPA would provide a safe deposit site; however, the following issues have to be addressed:

- Closing the existing TPA;
- Increasing the service ratio;
- Decreasing waste generation;
- Increasing waste recycling; and
- Cleaning the beach and sea water areas, including Bunaken National Park.

The City Cleaning Service Office is responsible for cleaning the beach and river, and they collect waste from the TPS near the beach and river regularly. There are no responsible organizations for cleaning seawater areas, except harbor water areas, where one of the most dirty water areas is found. The port authority is responsible for cleaning the harbour water areas.

Solid Waste Management in Bitung

The total amount of solid waste handled by the Cleaning Service Office (Dinas Kebersihan) in Bitung was 33,480 tons in 1997. The office has 7 trucks, each with a capacity of 6 m^3 and makes 3 trips a day in average. This service covers only 19 communities in Bitung Tengah and Bitung Timur districts. The existing TPA (final deposit site), which is an open dumping system, is located in Desa Tewaan, Bitung Utara district. It has some problems as follows:

- It is located far from the city center (13 km);
- The location is a steep slope area;
- Operation cost is expensive; and

- It has the potential to contaminate underground water by infiltration.

The site has the capacity to handle solid wastes for only 5 years at the most, so that the municipality is planning to develop a new sanitary landfill (sanitary TPA) with an area of 7 ha in Desa Aertembaga (10 km from the shoreline). The municipality is also encouraging households in the community to segregate their waste into paper, steel, plastic and organic waste.

2.6.4 Sea Port

PT. Persero Indonesian Port IV in North Sulawesi is the authority for managing the Manado Port (4^{th} class port). Manado Port has the capacity to handle 500 deadweight tonnage (DWT) and has a network with ports in Sangihe Talaud, North Maluku and Central Sulawesi. The port has facilities of a quay with the length of 224 m, a terminal with an area of 174 m^2, storage with a capacity of 6,430 m^2 and office with an area of 300 m^2. There is a proposal to provide a fast ship facility for international network from Manado to Davao in 18 hours.

Bitung port, which is called "Bitung Ocean Port," is important for economic and social development, and political defense for the municipality. The problem area of the port is its low level of service quality due to constraints of physical facilities and human resources. A study done in 1999 shows that Berth Occupancy Rate (BOR) is a maximum of 60%. It means that the port would be able to serve port services for a short period of time, not more than 5 years. For construction of a container port in Bitung Port (Pelabuhan Samudera Bitung; 1st class port), the land reclamation proposal has been approved by the Mayor in 2000.

In order to support the service of Bitung Seaport, it is urgently needed to improve the provision of coast guards. The first operation of rescuing and shipping is usually done by the Coast and Beach Guard Unit (*Penjagaan Laut dan Pantai:PLP*). However, the coast guard operation around Bitung is constrained by a lack of patrol boats. This is highly needed for spot checking any sea accident and any illegal fishing operation in the territory of Bitung port.

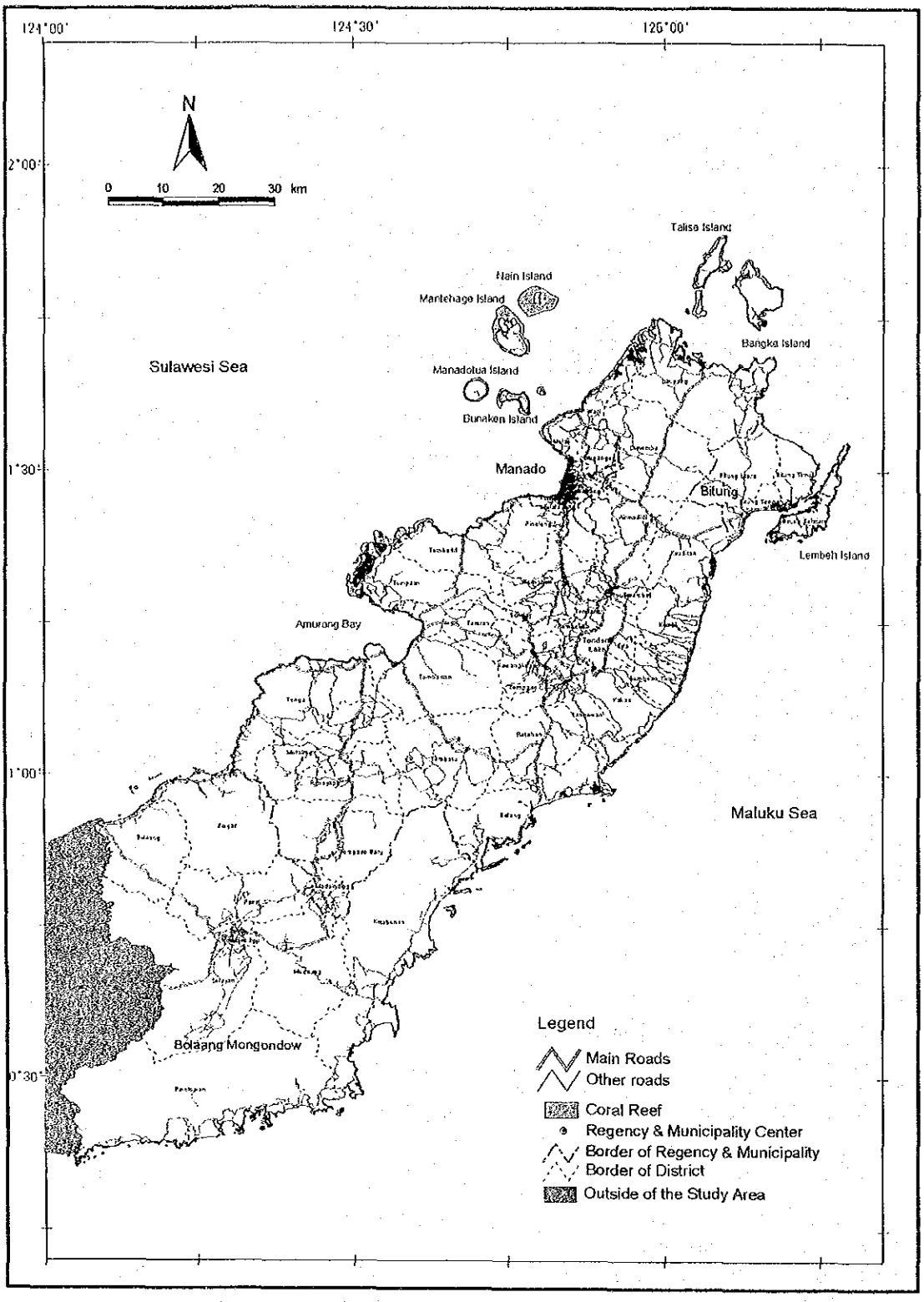
2.6.5 Basic Social Infrastructure

The basic social infrastructure such as roads, water system, schools, health facilities, and communication facilities in the study area differs from urban to rural areas, from peninsula to island, from inland to coastal area.

(1) Roads

The concentration of roads is remarkably different between urban areas and rural areas. Figure 2.8 shows the road network in the study area. The concentration is in Manado area and in the middle of Minahasa around Tondano Lake area. Access depends on the availability of road and also their condition. The access to coastal communities from cities is generally more difficult due to poor roads in the study area than the situation in inland communities. Access to islands such as Talise, Ganga, Libas, Nain, Mantehage, Bunaken, Manado Tua and east side of Lembe island is easier during dry season from March to October, but it becomes difficult during wet season from November to February. In Libas village in Libas island, community people do not possess boats with motors, making it very difficult for them to go to Likupan, which is the nearest town in North Sulawesi Peninsula. They rely on public transportation to go to Likupan for buying commodities, for getting medical service, or for any other necessary occasions.

Along Trans Sulawesi highway (Manado to Makasaar), the situation is better. From Manado to Inobonto (the end of the study area, about 200 km away from Manado) it takes about 4 hours by car along the Trans Sulawesi highway. On the other hand, from Manado to the northern part of the peninsula, the situation is much worse. It takes about three to three and half hours by car to get to Kulu, which is only 40 km away from Manado. Also the road situation to the east side of the peninsula is very difficult as well. This poor accessibility is one of the constraints to limit the development of coastal communities caused by isolation from markets, information, and ideas. The condition of road surface is 100% paved in Manado, while Minahasa's roads are 70% paved.



Source : JICA Study Team

Figure 2.8 Road Network in the Study Area

(2) Water Supply System

The water facility in the study area varies from place to place. The coverage of piped water is lowest in Minahasa and highest in Manado. According to PDAM, service coverage in Manado shall reach 80% in the year 2000. In Minahasa and Bolaang Mongondow, unsafe water system covers 70% of areas in both regencies. In Minahasa regency, water supplied by PDAM (Clean Water Supplier) is available only in Tomohon and Tondano areas. Other areas use well, river, spring and rain for their water supply. The situation of water facilities in the coastal area is much worse than these inland and urban areas. In the survey of 24 coastal communities, it was found that there was no community with piped water system. Most of communities have either wells or springs for water resources. Tumback village, which locates on dune, does not have any water resources and the community needs to get water from a river nearby.

Table 2.30 Number of Villages by Source of Water by Regency/Municipality

	Pipe		Pump		Protected Well		Unprotect -ed Well		Spring		River		Rain Water		Others		Total	
	Numver	%	Numver	%	Numver	%	Numver	%	Numver	%	Numver	%	Numver	%	Numver	%	Numver	%
Minahasa	114	21.8	1	0.2	3	0.6	200	38.2	200	38.2	3	0.6	0	0.0	0	0.0	523	100
Mando	44	64.7	2	2.9	1	1.5	13	19.1	7	10.3	0	0.0	1	1.5	0	0.0	68	100
Bitung	28	53.5	0	0.0	0	0.0	8	18.1	7	15.9	1	2.3	0	0.0	0	0.0	44	100
Bolaang Mongondow*)	53	39.3	2	1.5	0	0.0	57	42.2	23	17.0	0	0.0	0	0.0	0	0.0	135	100
Total Study Area	239	31.0	5	0.6	4	0.5	278	36.1	239	31.0	4	0.5	1	0.1	0	0.0	770	100

Source: Potensi Desa Sensus 2000 in Minahasa, Manado, Bitung, and Bolaang Mongondow

Note: *) Pinolosian, Lolayan, Bolaang, Poigar, Passi, Kotamobagu, Modayag, and Kotabunan

(3) Communication

The communication facilities in the study area is very limited as shown in Table 2.31. Surprisingly, the number of households owning a radio is very low. Parabola antenna is more prevalent than the radio. According to the coastal community survey, there is not much difference seen in the number of radios and televisions between coastal communities and other areas. VCD is now becoming a very popular medium in coastal communities as well.

Table 2.31 Number of Households by Type of Communication Facility

	Telephone		Radio		Television		Parabola Antenna		Number of Households
	#	%	#	%	#	%	#	%	#
Minahasa	9,283	4.6	1,575	0.8	57,617	28.6	6,238	3.1	201,406
Manado	12,580	14.5	1,150	1.3	40,955	44.3	1,654	1.9	86,523
Bitung	1,746	5.9	217	0.7	10,909	37.1	1,922	6.5	29,407
Bol.Mongondow*)	1,233	2.5	268	0.6	12,284	27.7	2,680	6.1	44,271
Total Study Area	24,842	6.9	3,210	0.9	121,765	33.7	12,494	3.5	361,607

Source: Potensi Desa Sensus 2000 in Minahasa, Manado, Bitung, and Bolaang Mongondow
Note: *) Pinolosian, Lolayan, Bolaang, Polgar, Passi, Kotamobagu, Modayag, and Kotabunan

(4) School Facilities

It can be said that most of the villages in the study area are equipped with very basic facilities. An island community like Libas village in Libas Island has only an elementary school. According to the survey of 24 coastal communities, 9 out of 24 communities have Junior High Schools and only 6 out of 24 communities have Senior High Schools.

(5) Health Facilities

In Indonesia health services are provided at different levels of health facilities. At primary health care level, each village has several Integrated Health Service Post called *"Posyandu."* Above that, covering several villages, a Sub-Public Health Centre called "*Puskesmas Pembantu: Pustu*" is offering simple curative service. Above *Puskesmas Pembantu*, each district has more than one Public Health Centre called "*Pukesmas*" which offers a higher level of medical service than *Puskesmas Pembantu* and *Posyandu.* Table 2.32 shows the number of health facilities and health personnel in the study area in 1999.

According to statistics in 1999, the average number of *Puskesman* per 100,000 population was 5.27 in 1996 and 5.12 in 1998. The average number of *Puskesmus* per 100,000 in the study area was 9.20 in 1999 which means that the health facility in the study area is better in terms of quantity. The number of dispensaries, however, is very low in Minahasa regency and Bolaang Mongondow.

Table 2.32 Number of Hospitals, Public Health Centers *(Puskesmas)*, Sub-Public Health Centre (*Pustu*), and Dispensaries *(Apotik)* in the Study Area

	Hospitals		Public Health Centres		Sub-Public Health Centre		Dispensaries	
	Number	No.of Dist.	Number	No.of Dist.	Number	No.of Dist.	Number	No.of Dist.
Minahasa 1*)	10	30	40	30	181	523	8	523
Manado 1*)	6	5	10	5	10	68	43	68
Bitung 1*)	2	4	5	4	5	44	4	4
Bol. Mongondow 1*)	1	15	26	15	127	265	4	265
Total Study Area 1*)	23	93	140	93	724	1523	72	1523
Indonesia *2)	1123		7248		21811		4980	

Source: *1) Sulawesi Utara Dalam Angka, 1999
*2) Statistik Indonesia, 1999

According to the survey of 24 coastal communities, most of them have at least an Integrated Service Post (*Posyandu*), while only 8 communities out of 24 have a community health center (*Pustu*).

2.6.6 Fishery Market Facilities

Table 2.33 shows the fishery facilities and infrastructure in the study area. The major markets and distribution centers are concentrated in three big fishery centers of Manado, Bitung and Amurang, and sub-central areas of Likupang, Langowan, Inobonto, etc.

Table 2.33 Existing Fisheries Facilities

	PPI*1)	TPI*2)	BJBI*3)	Hatchery	Experiments	Processing units
Minahasa-Manado-Bitung	Tumumpa (2 units)	Kema	-	Sentral	Tatelu	Fish center in Bitung
	Manado city	Tumpaan	-	Tatelu	Tumpaan	-
	Aertembaga (Bitung)	Likupang	-	Langowan	-	-
Bolaang Mongondow	Dodepo	Inobonto	Labuan Uki	Mogolaing	-	-
	-	Salongo	Sangotombolang	Bungko	-	-
	-	Popodu	Kotabunan	-	-	-
	-	Dodepo	Pinolosian	-	-	-

Source: Protection of the coastal area
Notes: *1) PPI; Fish market center, *2) TPI; Fish auction center, *3) BJBI; Fish transaction place

Chapter 3

Existing Coastal Use in the Study Area

Chapter 3
Existing Coastal Use in the Study Area

3.1 Existing Coastal Spatial Use

3.1.1 General

This chapter focuses on the coastal area in terms of spatial use and resources use. Coastal use of fishery is divided into two aspects: 1) as area and 2) as resources. For example, mariculture such as seaweed culture and fish cultivation uses the coastal area rather than its resources. On the other hand, to engage in fishing is to take from coastal resources and utilize them directly for family sustenance or for business and other opportunities.

3.1.2 Spatial Use of the Coastal Land Area

The North Sulawesi province is very narrow in shape with a distance of only 30 km in the northern part of the province where the study area is located. The study area has several volcanos in the northern part and many high mountains in the southern part, so that the topography of the region is very steep and hilly even in the coastal area. Majority of the coastline forms are sandy beaches (45%) followed by mud (29%), rocky shore (23%), and artificial structure (3%). Coral reefs are found in almost the whole stretch of coastline. A typical section of the coastal area is composed of steep land with palm coconut trees, small fishery and/or farm villages in the inland side and sandy beaches with coral reefs in the water side. The considerable quantity of mangrove, seaweed and algae are located mainly in Tumpaan – Tombariri, Bunaken and neighboring islands – Wori – Likupang – Bangka island, at the Sulawesi Sea side. All the small islands are closely located near the coastlines of the main island. The beautiful coral reefs and other marine resources around Bunaken, Manado Tua, Siladen, Nain and Mantehage islands are designated as the Bunaken National Park, a national natural heritage site and famous for diving tourism as well. The municipalities of Manado and Bitung are located in the coastal area, while the capitals of Minahasa and Bolaang Mongondow regencies of Tondano and Kotamobagu respectively

are located in the inland area.

Coastal spatial use is categorized into non-resource use or geographical based activities

The following activities do not rely on coastal natural resources but make use of the environmental characteristics of coastal areas:

- urban development (Manado and Bitung);
- mariculture (pearl, seaweed, shrimps, coral fishes, tilapia, etc.);
- industry (canned fish processing, coconut processing mainly in Bitung and Amurang);
- marine tourism in Manado Bay (Bunaken National Park), Bitung, Likupang, Belang;
- agro-forestry on coastal zone (generally palm coconut trees);
- port facilities such as jetty and harbor (Ocean, National, Local and Pioneer harbors); and
- main roads in the coastal area (90% of national roads and 25% of provincial roads run in the coastal area of the province).

Following are descriptions of the characteristics of the existing spatial use of the coastal area. The coastal area can be divided into coastal land and coastal water zones from spatial use point of view.

The coastal land zone can be divided into two areas: 1) coastal urban area, and 2) coastal rural area.

(1) Coastal Urban Area

Coastal urban area means a municipality administrative area with sea as boundary(s). There are two coastal urban areas in the study area, i.e., the municipalities of Manado and Bitung. The settlement area covers 26% of the municipal land of Manado, while in Bitung, the settlement area occupies only 7%. Both settlement areas stretch along the coastlines. The coastline of the municipality of Manado is largely occupied by artificial structures of roads, land reclamation, residential and commercial buildings and ports, with a length of 10 km. The coast of the municipality of Bitung is also lined by artificial structures of roads, residential houses, commercial buildings and factories and ports facilities with a length of 10 km. For the remaining areas other than settlement areas, majority of the land is used for planting of coconut palm or mixed coconut palm and tree crops, and areas mixed with extensive agricultural farm. The shares of agricultural farmland and paddy field are very small in the two urban areas of Manado and Bitung. It is noted that the dense forest nature reserves and nature recreation park areas cover 23% of the land of Bitung. Table 3.1 below shows the land use of the coastal urban areas of Manado and Bitung municipalities in 2000.

Table 3.1 Land Use of the Coastal Urban Areas of Manado and Bitung Municipalities in 2000

Land Use Type	Manado (ha)		Bitung (ha)		Total Urban (ha)	
Dense forest	174	1.0%	7,309	23.6%	7,483	15.7%
Extensive agricultural farm (Grass fallow)	9	0.1%	590	1.9%	599	1.3%
Fish or shrimp pond	18	0.1%	40	0.1%	58	0.1%
Mangrove	233	1.4%	17	0.1%	250	0.5%
Mixed coconut palm plantation and extensive agricultural farm	1,890	11.3%	2,542	8.2%	4,432	9.3%
Open forest or shrub land	376	2.2%	1,127	3.6%	1,503	3.1%
Open wet paddy field	51	0.3%	308	1.0%	358	1.0%
Mixed wet paddy field and coconut palm tree	0	0.0%	29	0.1%	29	0.1%
Coconut palm or mixed coconut palm and tree crops plantation	8,659	51.8%	16,541	53.3%	25,200	52.8%
Settlement and others	5,313	31.8%	2,512	8.1%	7,825	8.1%
Total	16,723	100.0%	31,014	100.0%	47,737	100.0%

Source: JICA Study Team based on the photo interpretation of aerial photographs taken in 2000.

(2) Coastal Rural Area

Coastal rural area means a village administrative area of coastal communities (*Desa*) with seas as boundary(s). Coconut palm or mixed coconut palm and tree crops plantations, and areas mixed with extensive agricultural farm are dominant land uses and share 65% of the coastal area in Minahasa regency, while dense forest at 64% share of the coastal area is dominant in Bolaang Mongondow. The extensive agricultural farms with grass fallows are largely spread in the slope areas of the districts of Kauditan, Kombi, Lembean Timur, Kakas, Langowan, Belang, Likupang, Tombasian, Tumpaan, Tombariri in Minahasa regency and Bolaang in Bolaang Mongondow regency. The southern coastal area of Bolaang Mongondow regency such as Pinolosian and Kotabunan districts are deeply covered by dense forest, and small plantation and farming areas with small villages dot small coves along the coast. The dominant land use types of the small islands are also coconut palm or mixed coconut palm and tree crops plantations.

Table 3.2 Land Use of the Coastal Rural Area

(Unit : ha)

Land Use Type	Coastal (ha)			Inland (ha)			Total Rural (ha)		
	Minahasa	Bol. Mon.	Sub-total	Minahasa	Bol. Mon.	Sub-total	Minahasa	Bol. Mon.	Sub-total
Dense forest	7,864	97,718	105,582	64,227	68,906	133,133	72,091	166,624	238,715
Open forest or shrubland	500	0	500	2,103	145	2,248	2,603	145	2,748
Mangrove	6,420	551	6,971	0	0	0	6,420	551	6,971
Coconut palm or mixed coconut palm and tree crops plantation	41,808	15,484	57,292	103,622	12,158	115,780	145,430	27,642	173,072
Mixed coconut palm plantation and extensive agricultural farm	37,194	18,836	56,030	54,209	6,975	61,184	91,403	25,811	117,214
Clove plantation	7,720	277	7,997	46,763	4,116	50,879	54,483	4,393	58,876
Tree crops plantation excluding coconut palm and clove	0	0	0	1,004	2,367	3,371	1,004	2,367	3,371
Intensive dry agricultural farm	0	65	65	8,073	5,784	13,857	8,073	5,849	13,922
Extensive agricultural farm (Forest or bush fallow)	519	6,033	6,552	1,123	25,202	26,325	1,642	31,235	32,877
Extensive agricultural farm (Grass fallow)	14,725	1,275	16,000	4,004	435	4,439	18,729	1,710	20,439
Open wet paddy field	2,312	4,792	7,104	16,494	7,646	24,140	18,806	12,438	31,244
Mixed wet paddy field and coconut palm tree	471	0	471	7,848	339	8,187	8,319	339	8,658
Fish or shrimp pond	*302*	*18*	*320*	0	0	0	302	18	320
Swamp	16	201	217	24	0	24	40	201	241
Bare land	0	96	96	1,196	0	1,196	1,196	96	1,292
Water body	20	278	298	4,801	685	5,486	4,821	963	5,784
Settlement and others	3,758	1,500	5,258	11,245	3,415	14,660	15,003	4,915	19,918
	123,629	147,124	270,753	326,736	138,171	464,907	450,365	285,295	735,660

(Unit : %)

Land Use Type	Coastal			Inland			Total Rural		
	Minahasa	Bol. Mon.	Sub-total	Minahasa	Bol. Mon.	Sub-total	Minahasa	Bol. Mon.	Sub-total
Dense forest	6.2%	64.4%	37.7%	19.7%	48.4%	28.3%	15.9%	56.7%	31.8%
Open forest or shrubland	0.4%	0.0%	0.2%	0.7%	0.1%	0.5%	0.6%	0.1%	0.4%
Mangrove	5.1%	0.3%	2.5%	0.0%	0.0%	0.0%	1.4%	0.2%	0.9%
Coconut palm or mixed coconut palm and tree crops plantation	34.5%	13.2%	23.0%	32.5%	9.9%	25.8%	33.1%	11.6%	24.7%
Mixed coconut palm plantation and extensive agricultural farm	30.5%	13.0%	21.0%	16.9%	5.4%	13.4%	20.7%	9.3%	16.3%
Clove plantation	6.2%	0.2%	2.9%	14.6%	3.0%	11.1%	12.2%	1.5%	8.1%
Tree crops plantation excluding coconut palm and clove	0.0%	0.0%	0.0%	0.3%	1.7%	0.7%	0.2%	0.8%	0.5%
Intensive dry agricultural farm	0.0%	0.0%	0.0%	2.5%	4.2%	3.0%	1.8%	2.1%	1.9%
Extensive agricultural farm (Forest or bush fallow)	0.4%	4.1%	2.4%	0.3%	18.8%	5.9%	0.4%	11.2%	4.6%
Extensive agricultural farm (Grass fallow)	12.0%	0.8%	6.0%	1.2%	0.3%	1.0%	4.2%	0.6%	2.8%
Open wet paddy field	2.0%	2.6%	2.3%	5.3%	5.8%	5.5%	4.4%	4.2%	4.3%
Mixed wet paddy field and coconut palm tree	0.3%	0.0%	0.1%	2.5%	0.2%	1.8%	1.9%	0.1%	1.2%
Others	2.4%	1.3%	1.8%	3.4%	2.1%	3.0%	3.1%	1.7%	2.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: JICA Study Team based on the photo interpretation of aerial photographs taken in 2000.

3.1.3 Spatial Use of the Coastal Water

Mariculture is an activity that utilizes the coastal zone. According to the data of the provincial Fishery Office, the term "mariculture" is defined as the cultivation of seaweeds,

sea cucumbers, coral fishes and pearl shells.

a) Pearl culture area

In Bangka and Talise island, there are pearl culture areas which are operated by a Japanese company. There are also small pearl culture areas in Lembeh Strait in Bitung. Those areas are characterized by calm waters and relatively fast currents.

b) Seaweed culture area

The seaweed culture areas can be found in several places of the coastal area. The major seaweed culture areas are in the islands of Mantehage and Nain and the districts of Tumpaan, Wori, Likupang and Belang where natural seaweed is grown. The operation of seaweed culture is usually made on the coral reefs. Although data is not available, the production of seaweed in the study area seems to increase in recent years. The potential seaweed culture areas in the study area are shown in Table 3.3. PT. Bahasu Agro is the first enterprise of seaweed culture in the region. It is said that the production of seaweed is 300 tons/month in Minahasa regency and 700 to 800 tons/month in North Sulawesi province. There are 35 groups of seaweed workers (employees: 20 persons per group) in Nain Island. The seaweed in the area is reputed to be of good quality. There are also seaweed farms in Bali, East Java (Madura), Lombok, South Sulawesi and South-east Sulawesi in Indonesia.

The species of seaweed for cultivation is *Kappaphycus alvarezii* (commercially marketed as Eucheuma Cottonii) and group of red algae. The types of uses of seaweed are as follows:

- diet food;
- stabilizer for wastewater treatment;
- paste;
- medical paper; and
- raw material for cosmetics.

Production of seaweed culture is exported to other countries such as Denmark, France, Spain, the USA and Hongkong at present. For instance, the market route of seaweed exported to Denmark is as follows:

Seaweed farmers ⟶ Buyer ⟶ Bitung ⟶ Denmark
via Jakarta
Via Singapore

c) Fish pond

The major fish ponds are found in four locations, i.e., Molas – Wori, Likupang, Bitung – Kauditan and Belang districts (see Figure 3.1). Most of these fish ponds are located in mangrove forest. They produce milkfish, tilapia, mullets (*Mugil cephalus*), shrimps and other fishes. The highest recorded in pond productions are milkfish (29.9 tons), tilapia (14 tons), mullets (0.8 tons), tiger prawns (22,7 tons) and the one with the highest value was tiger prawns (Rp. 206 million), according to the data in "Master Plan for Protection of Coastal Areas of the North Sulawesi 1997/98 (Department of Public Works)". The potential fish pond areas in the study area are also given in the table below.

Table 3.3 Locations and Potential Areas of Aquaculture in the Study Area

Regency/Municipality	District	Potential Area (ha) *1)	
		Fish pond	Seaweed culture
Minahasa- Manado - Bitung	Tenga	0	150
	Belang	170	50
	Langowan	0	50
	Tombasian	0	20
	Tumpaan	130	100
	Tombariri	0	250
	Kakas	0	150
	Lembean Timur	0	100
	Kombi	0	100
	Kauditan	70	150
	Wori	650	3,000
	Likupang	1,410	1,750
	Central Bitung	30	15
	South Bitung	0	235
Bolaang Mongondow	Pinolosian	1,310	100
	Kotabunan	560	100
	Poigar	0-	50

Source: Master Plan for Protection of Coastal Areas of the North Sulawesi

Notes: *1) Potential area is estimated area of the existing used area + the area suitable for the purposes.

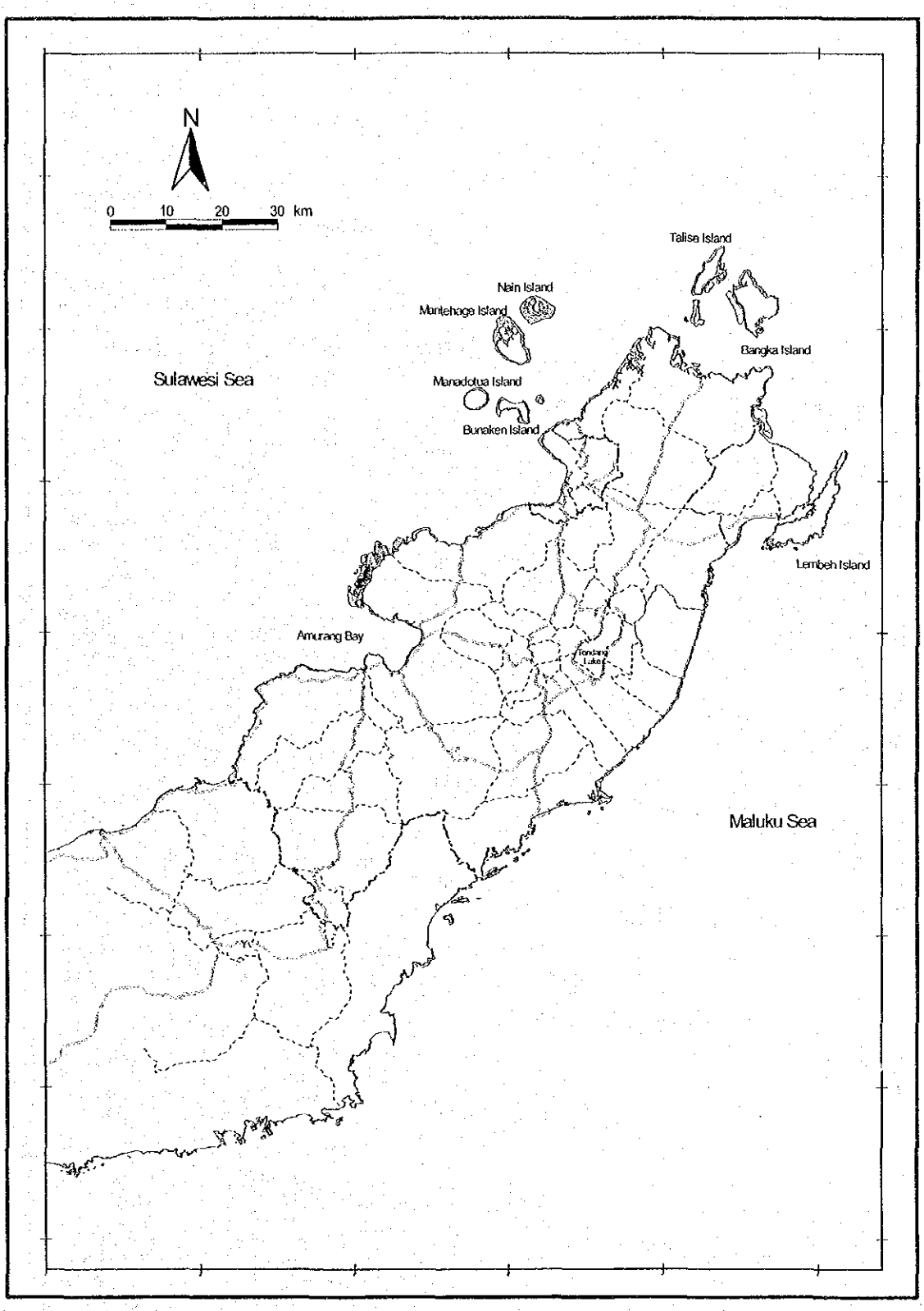


Figure 3.1 Fishing Grounds and Aqaculture

3.2 Existing Coastal Resource Use

3.2.1 Classification of Coastal Resources

Coral reefs and their surrounding environment boast two types of resources: natural resource and spatial resource. Strictly speaking, coral reefs cannot be utilized as natural resources directly except mined corals however, coral reefs and their surrounding environment can be utilized indirectly as a natural resource, for example, coral reef environment can be used as tourism resources. Therefore, coral reefs and their surrounding environment can be included in natural resources in this sense. There are several types of natural resources existing in coral reefs and their surrounding environment, namely, mineral resources (as coral mining), fishery resources, mangrove forest resources, and tourism resources.

As a spatial resource, coral reef environment has two functions: prevention of coastal disasters and nursing place for marine life.

Regarding natural resource of coral reef environment, mineral resource use was studied in detail because this type of resource use is giving a big impact on conditions of coral reef environment. Also, fishery resource and tourism resource use of coral reefs in the study area were reviewed.

Further, the resources can be divided into sub-categories, and those resources can be grouped by renewable or non-renewable resources, as shown in Table 3.4. In this study, coral rock and sand are categorized as non-renewable resources, because the time span for coral rock and sand reproduction is slower than exploration speed. The table also shows the main users or markets of the coastal resources as follows:

a. Export use (for world-wide markets, such as Japan, Europe, ASEAN countries);
b. National use (for nation-wide market, especially Surabaya, Jakarta);
c. Regional use (provincial-wide market, such as Manado, Bitung); and
d. Local use only (district and/or community market).

Table 3.4 Types of Existing Resources Use in the Study Area

Category	Sub-categories	Resource Types	Types of use	Main users (market)			
				Export	National	Regional	Local
Marine Fishery (Fishing)	Off-shore fishes	●	Food	■	■	■	□
	Coastal fishes	●	Food			■	■
			Ornamental	□	■		
	Lobster, prawns, shrimp and crabs	●	Food		□	■	■
	Mollusks and others	●	Food		□	■	■
(Mariculture)	Shrimps	●	Juvenile		■	■	
	Seaweed	●	Food				□
			Cosmetics and pharmaceutical	■			
Forestry	Mangrove	●	Fuels			■	■
			Material for post and mariculture			■	■
			Material for furniture				■
			Dyestuff, Medicine, etc.			■	■
Mining	Coral rock	○	Material for septic tank			■	■
			Material for civil works and building construction			■	■
	Coral sand	○	Material for civil works, building construction and cement			■	■
			Material for building decoration			■	■
Tourism	Diving sites	○	Coral reefs and fishes	■	■	□	
	Beach resort areas	○	Sandy beaches	□	■	■	■
	Eco-tourism forests	○	Hiking and trekking (mountain, forest)		□	■	■

Source: JICA Study Team

Note: ● Renewable ○ Non-renewable, ■ Major users/markets □ Minor users/markets

3.2.2 Fishery Resources

(1) Types of resources

Fishery resources in the study area can be distinguished into coastal pelagic fishes, lobster, prawns and crabs, mollusks, and seaweed. These are characterized as renewable resources. Majority of the production of fishery resources are used for human consumption; only a few species are used for ornamental fish and for cosmetics and pharmaceutical purposes (seaweed).

Fisheries industry

It is often quoted that there are over 7,000 species of fish that live in coral reef lagoons and surrounding waters and, according to the Bunaken National Park Natural History Book, 1999, there are at least 2,000 species of fish found in the waters of the park. General

impression of the public is that the coral reef areas are endowed with very rich resources of aquatic life that could support development of fisheries in coastal waters in the same or similar perception that the vast expanse of the seas and oceans hold rich resources with overflowing potential, much of which have been left untapped. In planning development in fisheries, such imaginary expectations should be shaken out of the mind and precise scientific assessment should be conducted for evaluation of resource availability and potential. A publication by DGF in 1990, *Pedoman Pengenalan Sumber Perikanan Laut Janis Uikan Ekonomis Penting*, states that in Indonesia, there are in approximate numbers altogether 4,000 fish species recorded for fisheries administrative purposes, comprising 3,000 marine, and 1,000 brackish water and freshwater species. It also states that out of total marine fish species, only 137 species are considered as important species worth consideration in fisheries resource economics.

In this context, fish resources in coral reefs and their surrounding areas are assessed and considered as very limited and in no way substantial to support coastal population or economic growth in coastal areas. The coral lagoon fish species have generally limited, low regenerating capacities, and are highly sensitive and vulnerable to changes in environmental conditions and to human activities in resource harvesting or spatial use of the sea.

Fisheries in the study area are dominated by fishing in marine and pond fisheries, according to statistics shown below.

Table 3.5 Fishery Production by Category

Fishery Catch	145, 990 tons (96.7%)
Aquaculture	4,895 tons (3.2%)
Fishpond	110 tons (0.1%)
Total	150,995 tons (100%)

Source : Fishery office North Sulawesi Province

Following the landing of marine catch by fishermen, there are several routes of fish trading they can choose from, a process that is depicted in Figure 3.2. From fishermen to consumers, some related persons such as wholesale buyers or retailers are involved.

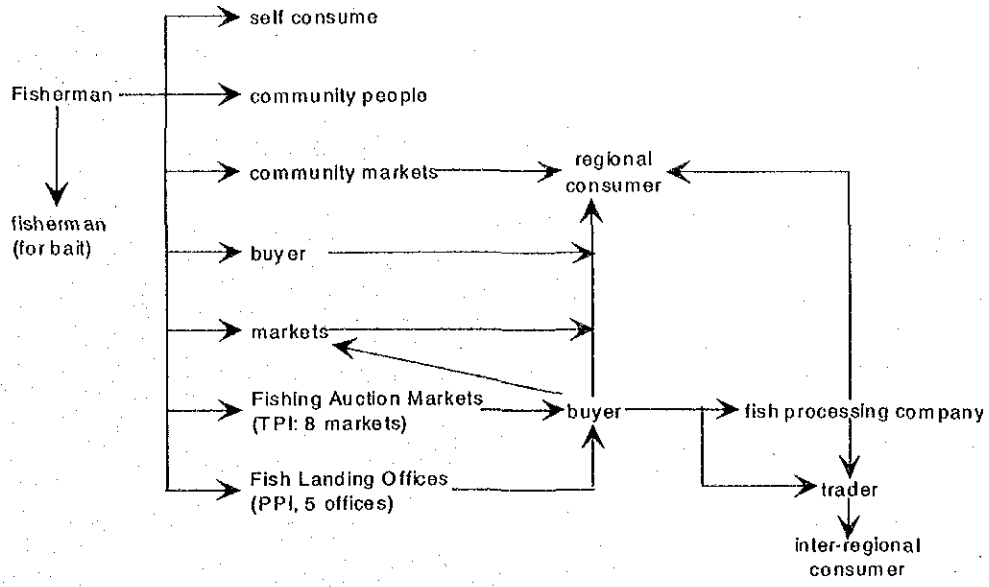


Figure 3.2 Overall Flow of Marine Fish Catch

Available data on fishery production is limited. Only data of the Fishery Landing Office (*Pangkalan Pendaratan Ikan*: PPI) and the Fishing Auction Market (*Tempat Pelelangan Ikan*: TPI) are available. It seems that total fishery production is more than three to five times the recorded data of PPI and TPI. According to PPI, the production of fishery catch is dominated by Bitung (more than 50,000 tons every year), followed by Minahasa (16,000 tons/year) and Manado and Bolaang Mongondow (6,000 to 8,000 tons/year).

The five major fishes are Skipjack tuna (*Cakalang*), Tunas (*Tuna*), Scads (*Layang*), Eastern litteli tunas (*Tongkol*), Travallies (*Selar*), with a collective share of 90% of the total fishery production in the study area.

Fishery catch can be divided into coastal fishing and offshore fishing from spatial zone point of view. Figures 3.3 and 3.4 show the production and value of fishery catch by spatial zones. Target fishes of coastal fishery such as grouper depend on coral reefs unlike those of offshore fishing which are migratory fishes.

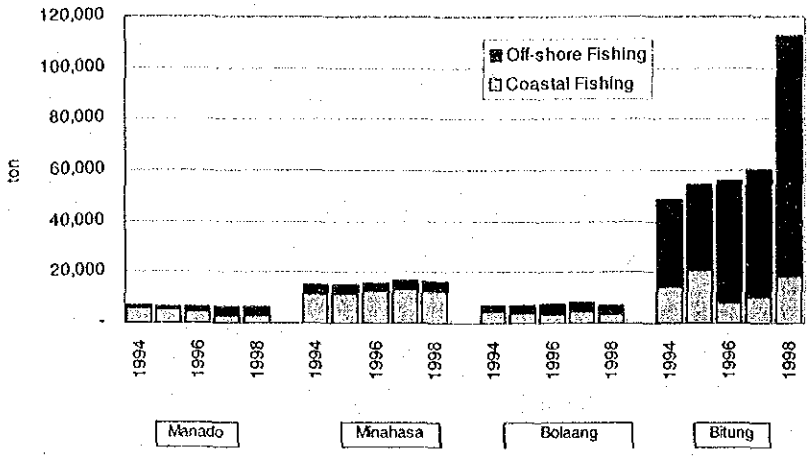


Figure 3.3 Production of Fishery Catch by Fishing Zone

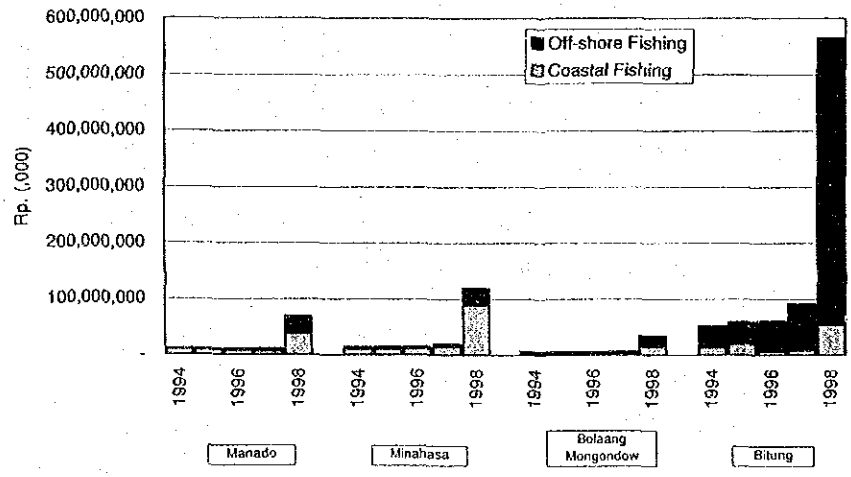


Figure 3.4 Value of Fishery Catch by Fishing Zone

It is observed that the share of coastal fishing decreased yearly from 1994 to 1998. In terms of production, around 50% of the total production was from coastal fishing in 1994; however, the share became 30% in 1998 in the study area, and 30% in 1994 and 10% in 1998 in the share to the total value of fishery catch in the study area. Those decreasing trends can be seen in Manado, Bitung and Bolaang Mongondow, except Minahasa regency. The coastal fishing in Minahasa regency was still dominant and recorded an 80% share in production and 75% in value in 1998.

Focusing on the fishes in the coastal sea zone, coastal sea zone is classified by fishing

ground as follows:

- Reef fish-1: The major grounds are on the reef flat;
- Reef fish-2: The major grounds are close to reef edge; and
- Non-reef fish: The major grounds are close to reef but outside coral reefs.

Generally, the fishery production is higher in the outer area than in the inner area, i.e. the non-reef fish is higher than that of reef fish-2 and reef fish-1 is lowest in terms of production and value. The shares of production and value by these types of fish in the study area in 1998 were as follows:

Table 3.6 Categories by Fishing Grounds in 1998

Type of fish	Production	Value
Reef fish-1	6%	18%
Reef fish-2	18%	23%
Non-reef fish:	76%	59%

Note : Figures calculated by JICA Study Team

Figures 3.5 and 3.6 depict the production and value of coastal fishes.

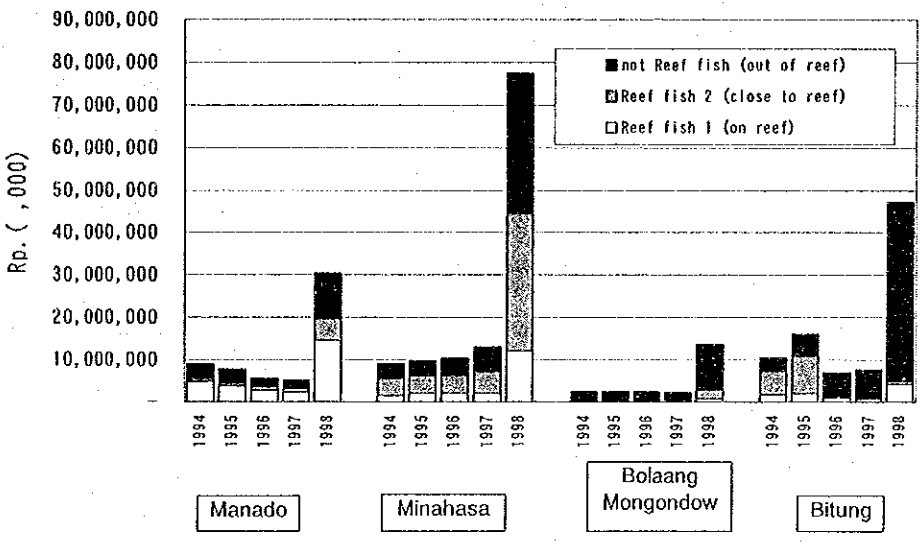


Figure 3.5 Production of Coastal Fishes

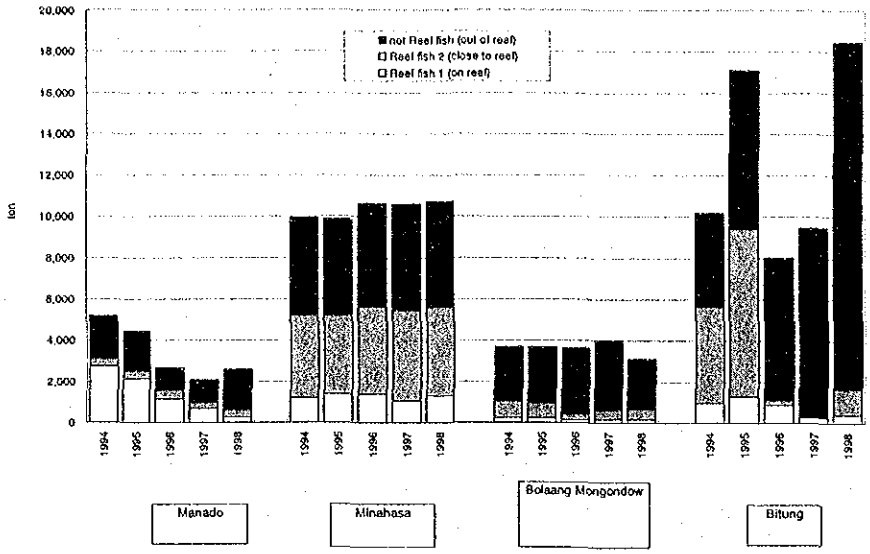


Figure 3.6 Value of Coastal Fishes

The share of the reef fish-1 and reef fish-2 in total fishing in the coastal sea area has decreased, i.e. 50 % in 1994 to 24% in 1998 in production, and 61% in 1994 to 42% in 1998, in terms of value.

The production of the reef fish-2 also decreased in production, but the value of the reef fish-2 increased in value in Manado municipality, and a similar trend can be seen in Minahasa regency.

The major species by type of the above-mentioned fishes are as follows:

Table 3.7 Major Species by Type

Reef fish-1	Reef fish-2	Non-reef fish
- Red snappers - Groupers - Yellow tail - Cuttle fishes - Goat fishes	- Travallies/yellow travallies - Jack Travallies - Sharks - Anchovies - Needle fishes - Common squids	- Flying fish - Fringescale sardinella - Indian mackerels - Scads - Narrow barred king mackerel

Source : JICA Study Team

The above analysis was made based on the information from the Fishing Landing Offices (5 offices in the study area). Consequently, the fishing production not handled by the Fishing Landing Offices are not included such as fishes directly traded between fishermen or fishermen and traders, and also fishery catch by the traditional and/or small fishery villages (refer to Figure 3.1).

The data on fishery production in Desa Basaan has been prepared for the study by the villagers through the process of the Pilot Project activity. The data involves information on their fishery activities for a period of two months (Dec. 2000 – Jan. 2001p) on the following:

- Types of fishing gear;
- Production and fish species;
- Location of fishing ground; and
- Price and value by fish species.

The analyzed production volume was for fish catch in the zones of "on reef" and "close to reef" based on initial investigation of the data of Desa Basaan.

Aquaculture and mariculture

The aquaculture sector in the North Sulawesi Province has not developed yet and remained inactive with less than 3,000 tons of annual production, accounting only for 1.5% or so of the provincial output.

Tropical Ornamental Fish Trade

The North Sulawesi Province is known as the origin of tropical ornamental fish species, marine, brackishwater or freshwater, and in fact, ornamental fish have been exported to markets overseas in Southeast Asia and Europe.

3.2.3 Mangrove Forest Resources

(1) Types of resources

Mangroves can be found in many places along the shoreline especially at the promontories and islands in the Sulawesi Sea side. A large area of mangroves exists in a few places, such as around Wori - Likupang, Arakan and Mantehage Island. Thirty-five (35) tree species can be found in Sulawesi Island. The main genera of mangrove tree species which live in the study area are *Avicennia* sp, *Rhizophora* sp, *Sonneratia* sp and *Bruguiera* sp (Written, *et al*, 1987. The Ecology of Sulawesi). Depending on the tide, salinity and mud thickness, the mangrove is ideally composed of three zones. The outer zone is dominated by *Avicennia* and *Sonneratia*, and its tree is around 1 m high. The middle zone is dominated by Rhizophora, and it is around 3 to 4 m high and the inner zone is dominated by *Bruguiera*, and it is around 5 to 10 meters high. The mangrove forest dominated by Bruguiera can be found in the above-mentioned large mangrove forests. Detailed information is presented in Chapter 2.

(2) Uses of resources

Presidential Decree No. 32/1990, regarding Protected Area Management prescribes the designation of conservation areas for mangrove forest. According to the decree, mangrove cutting and other activities affecting mangrove areas are prohibited. However, there are actually several ways of using mangrove forests in the study area, mainly Mantehage Island, Likupang and Arakan.

Some small fish ponds can be observed in the areas behind the mangrove forests in Likupang and other areas in the study area. The ponds are made after clearing portions of the mangrove forest. The owners of the ponds are usually city dwelling people who can invest in the costs for construction and maintenance of ponds.

The uses of mangroves are as follows:

- Firewood (for daily cooking and city market);
- Post for building construction and fence; and
- Bark used for dyeing and sap for strengthening trawl nets.

Mangroves have been traditionally used as firewood for daily cooking by the neighbouring coastal communities. Other than the daily cooking of the communities, people sell mangrove firewood to the city market. In the urban areas, such as Manado and Bitung, there are several shops selling them.

The tall and thick mangroves are cut to use as post for scaffold of building construction in the urban areas. Especially if the sites are in wet condition, mangrove wood are utilized rather than bamboo. The mangrove posts are sold at mainly three (3) shops in Manado in the study area. The size of the post is 7 m long and 5 cm in diameter. According to an interview made with the shops' owners, they sell roughly 36,000 posts per year. They are calculated to correspond to around 36 ha/year of the affected areas of mangrove forest.

Bark of mangroves is harvested where a large mangrove area exists. The bark is taken from thicker (above 15 cm) trees found in the inner zone of the mangrove forests. The tree from which the bark is harvested will die for a while. The bark is used to dye and strengthen trawl nets. Trawl nets are broadly used by fishermen in the whole region, especially Bitung where lots of fishing nets are used by the fishermen. According to several interviews made with users of bark, it is estimated that 30,000 trees/year are affected by this trade, and the affected mangrove area is calculated at approximately 160 ha/year.

The activities in mangrove forests mentioned above excluding the fishpond making are practiced by local people. According to information from the Forestry Department (*Dinas*), no local people had obtained permission to engage in the above-mentioned activities. Based

on the data gathered from the traders and local people, it is estimated that the area of mangroves affected by the local people's activities, such as collecting of fire wood, cutting of trees as post, and the bark harvesting is at least 200 ha/year.

Since mangroves germinate from seeds naturally, the sustainable way of mangrove resource uses may be possible. But according to the owners of the shops, the diameter of mangroves handled by them has become smaller year-by-year. It may suggest that the mangrove resources are decreasing.

Based on the Study Team's interpretation of the aerial photographs taken in 2000, the area of existing mangrove forests are given below:

Table 3.8 Area of Mangrove Forests

Manado municipality	233 ha
Bitung municipality	17 ha
Minahasa regency	6,420 ha
Bolaang Mongondow regency	551 ha
Total in the Study Area	7,221 ha

Source : GIS database of JICA Study Team

3.2.4 Mineral Resources

There are two types of mineral resources from coral reefs as follows:

- Coral rock; and
- Coral sand.

Coral rocks are often used as material in septic tanks and for civil works and building construction. People living in urban areas such as Manado and Bitung have gathered a substantial quantity of coral rocks for construction of septic tanks for quite a long time until now. A questionnaire survey was conducted by the Study Team to estimate the amount of coral used in household toilets in Manado. The results of the survey are described in section 2.3.4. Corals are also used for the foundation of civil works and building construction including:

- road construction (including the Trans Sulawesi Highway and other coastal roads);
- jetty, breakwater structure and other coastal structures;
- public facilities; and
- coastal community houses (for decoration and for fencing).

Crushed coral rocks are also used as material to beautify homes.

Coral sand is used as raw material for civil works and building constructions. From information gathered, it was known that coral sand as well as coral rocks were used as foundation material for the construction of Trans Sulawesi Highway. Another use of coral sand is cement making.

It was also stated that the quantity of coral reefs available for coral rocks and sands have been decreasing in recent years. This may be attributed to decreasing coral mining activity, increasing costs, people's consciousness on nature protection and implementation of the government regulation for protecting coral reefs.