

CHAPTER 8

FUTURE LAND USE PLAN AND SOCIO-ECONOMIC FRAMEWORK

8.1 FUTURE URBAN DEVELOPMENT VISIONS AND STRUCTURE

8.1.1 Possible Future Development Patterns

As described before, the existing physical urban structure of Metro Cagayan de Oro is a necklace of beads pattern focused to the metropolitan center, Cagayan de Oro City. This urban structure is giving rise to traffic congestion on the Iligan-Cagayan-Butuan Highway and on streets within the central part of Cagayan de Oro City.

For dealing with this problem, "Cagayan de Oro-Iligan Corridor Highway Expansion Project" is promoted by DPWH and LGUs. This project intends to widen the existing highway from two to four lanes (excluding the existing four-lane section within Cagayan de Oro City) and to construct new bridges parallel to the existing two-lane bridges. When this project is completed, the traffic conditions of sections Tagoloan-Jasaan and Opol-Gitagum will be greatly improved. However, the road condition between Opol and Tagoloan (mainly within Cagayan de Oro City) is remained as it is, and traffic condition there will be worsened due to the general increasing number of vehicles, housing developments in Opol and the development of PIE-MO in Tagoloan and Villanueva.

For dealing with the existing and future urban problems anticipated, the following three development patterns are presented as shown in Figure 8.1-1.

- a. Local Community Development Pattern
- b. Coastal Urban Corridor Development Pattern
- c. Piedmont Urban Corridor Development Pattern

2) Local Community Development Pattern

This development pattern intends every city/municipality to make efforts independently to improve the road network under its jurisdiction and to render better public services to the local residents. All barangays are connected with the poblacion or the market place by a paved road network. By-pass construction will be carried out where necessary. Public service facilities with enough manpower and equipment are located at main barangay centers. For the inter-city/municipality transportation, the completion of "Cagayan de Oro-Iligan Corridor Highway Expansion Project" is inevitable.

Cagayan de Oro City will make efforts to complete the planned city road network and construct the bridges, in order to alleviate the present and anticipated traffic congestion within the City.

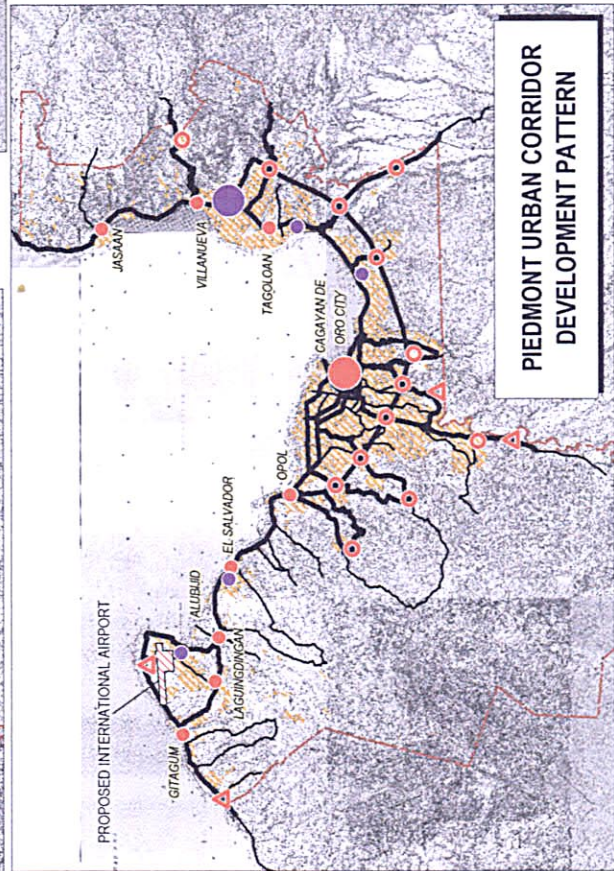
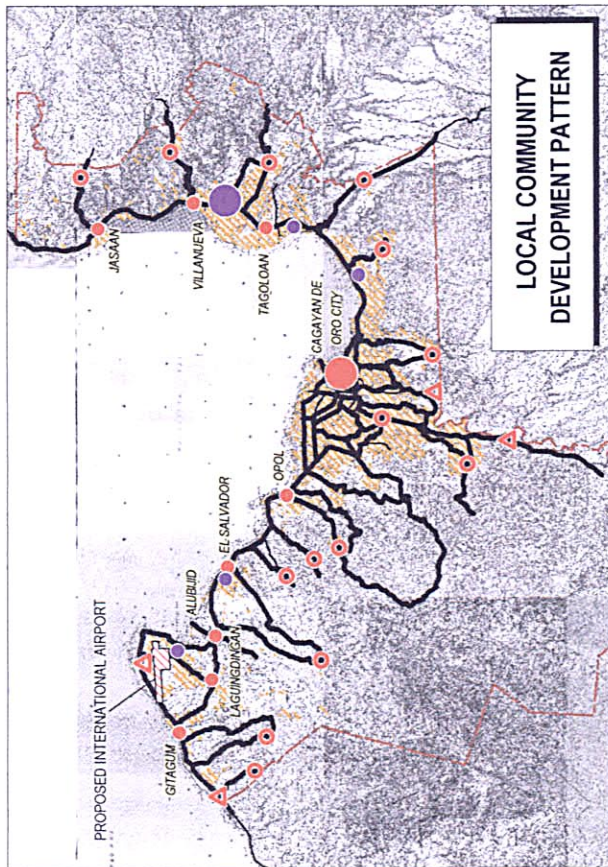
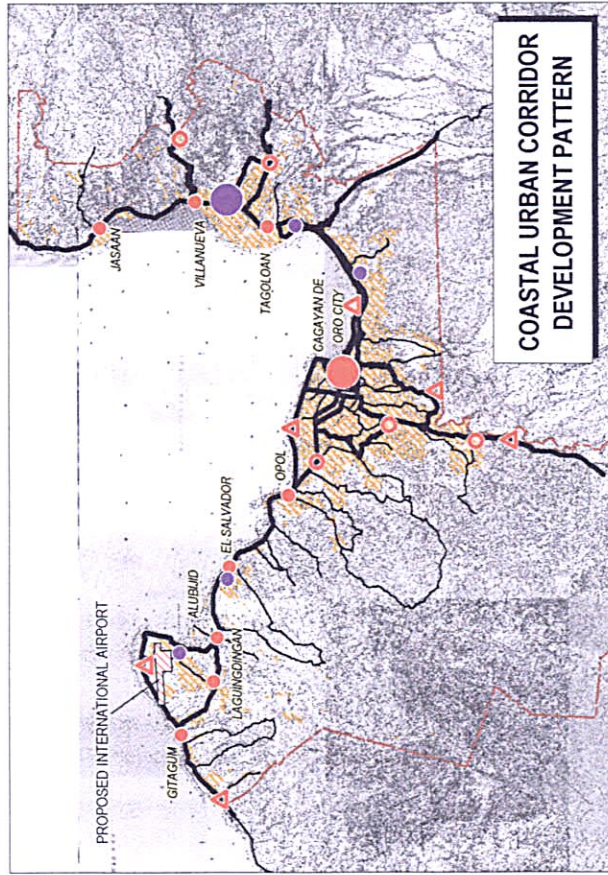


FIGURE 8.1-1 FUTURE URBAN STRUCTURE ALTERNATIVES

Other municipalities try to attract industrial or commercial investments, intending to expand job opportunities of local residents and to reduce dependence on Cagayan de Oro City. .

2) Coastal Urban Corridor Development Pattern

This development pattern is to develop a coastal urban corridor between Opol and Tagoloan through Cagayan de Oro City. The corridor will be separated into two parts: one between Opol coastal zone and Cagayan Base Port (West Coastal Corridor), the other between Cagayan Base Port and Mindanao Container Terminal (MCT) in Tagoloan (East Coastal Corridor).

The objectives of this development pattern is to develop a new coastal tourist zone facing the Majacalar Bay with a tree-planted wide boulevard, such as the area along Roxas Boulevard in Manila. This will contribute to attract tourists and to alleviate traffic congestion on the existing iligan-Cagayan-Butuan Highway.

Along this corridor, high-rise condominiums, hotels, restaurants, shopping centers, convention facilities, etc. will be located. The planned boulevard will be forced to go around the existing industrial firms with private port, such as Del Monte Philippines, but by connecting with the present Highway it can introduce traffic going to and from the CBD and the Base Port of Cagayan de Oro City.

The Metro Cagayan de Oro is not rich enough in natural resources to attract domestic and foreign tourists. However, by developing a new coastal urban corridor, Cagayan de Oro City will become more equipped as a convention city to attract business and tourism customers, and its economic effects will spread over the other municipalities. In addition, the traffic conditions between Opol and Tagoloan will be improved greatly.

3) Piedmont Urban Corridor Development Pattern

This alternative intends to construct a new highway at the piedmont areas for the alleviation of present and future traffic congestion within Cagayan de Oro City and to guide the urban development in Cagayan de Oro City, Opol and Tagoloan. The new highway will be constructed from the boundary between Opol and El Salvador to the PIE-MO in Tagoloan and Villanueva, passing the south of urbanizing areas of Opol and the piedmont areas of Cagayan de Oro City. This highway will also contribute to reduce the travel time to and from PIE-MO, residential areas in Opol and the new Laguindingan Airport.

According to the Comprehensive Land Use Plan (CLUP) of Cagayan de Oro City, many "Planned Unit Development" areas and "Future Development" areas are designated along the probable route of this highway. By coordinating the road construction with the urban development, it is expected to realize orderly developed urban areas equipped with commercial/institutional centers and open spaces in the piedmont areas of the City. In Opol, a new urban core shall be developed for the residents coming into the municipality. In the PIE-Mo, the

road network is not yet established. Considering the future industrial development, operation of MCT and residential development, it is required to establish an adequate road network connecting to the proposed new highway.

8.1.2 Selection of Future Urban Development Pattern

The presented three urban development patterns have their respective reasons for being. In this section, an evaluation result of them is shown. From the standpoint of project formation intending to achieve the respective future urban pattern under the limited financial capacity, the evaluation is carried out based on the project evaluation method used in the Project Cycle Management (PCM), which is adopted by JICA. Table 8.1-1 shows the evaluation result.

TABLE 8.1-1 EVALUATION OF THREE URBAN DEVELOPMENT PATTERNS

| | Local Community Development Pattern | Coastal Urban Corridor Development Pattern | Piedmont Urban Corridor Development Pattern |
|----------------|---|---|---|
| Relevance | In accordance with the policies for poverty alleviation and improvement of living standards in rural communities | In accordance with the policy for uplifting the attractiveness of CDO City as business and tourism center and improvement of traffic conditions there | In accordance with the policy for improvement of road network as a whole in Metro Cagayan de Oro |
| Effectiveness | It is necessary for each LGU to have enough administrative, financial and technical capacity for the road construction and creation of job opportunities | It is necessary for CDO City to take leadership for getting consensus among related agencies and the private sector. | There are some seeds such as the diversion road in CDO City. Along the proposed route, City has designated many PUD and FD areas. When road construction and PUD/FD area development is coordinated, the project purpose can be achieved. |
| Efficiency | The total length of the roads to be improved is long and costs for roads will amount to large even if at the minimum standard. So necessary inputs are too much for getting expected outputs. | Long coast reclamation is necessary. Economic effects might be large, but the costs will also be large. | The length of roads to be constructed is long and topography requires long and high bridges at several points. So, for the achievement of the objectives it is important to select the cheapest route for the highway. |
| Impact | Direct impact of by-pass construction is exclusion of through traffic from the municipal center and direct impact of improvement of municipal arterial roads is rise in transport conditions of rural communities to and from the municipal center. The efforts made by LGUs for the attainment of the goal will have politically, institutionally, socially, economically and technically good and important impacts on the local community. | Direct impact of the road construction is alleviation of traffic congestion within CDO City. Development of coastal tourist zone will create employment and have economic impacts on the LGUs in Metro CDO. | Direct impacts of the road construction are alleviation of traffic congestion within CDO City and reduction of travel time to and from PIE-MO, residential areas in Opol and the New Laguindingan Airport. Development of commercial /institutional centers along the road will contribute to raise the convenience of new residents of suburban areas. |
| Sustainability | In order for LGUs to keep up with the capacity for conducting such kind of projects, financial and technical supports by related national and provincial agencies are necessary. | After the consensus is obtained for the development, related government agencies and private sector will coordinate each other based on the ordinary rules. | The national and provincial government agencies and related LGUs will coordinate each other based on the ordinary rules. |

According to the evaluation table, the "Piedmont Urban Corridor Development Pattern" will be comparatively easier to realize and will give benefits to the areas where traffic is currently congested and it will become more severe in future. So it was selected as the best one for the future target.

8.2 FUTURE LAND USE PLAN

8.2.1 Institutional System of Land Use Planning in the Philippines

Pursuant to the Local Government Code of 1991, cities and municipalities shall continue to prepare their respective comprehensive land use plans (CLUPs) enacted through zoning ordinances. The Housing and Land Use Regulatory Board (HLURB) is the government's regulatory body responsible for land use and housing. It is mandated to formulate land use planning guidelines and standards. A city/municipality with rural areas within its jurisdiction prepares its CLUP (including General Land Use Plan and Urban Land Use Plan) based on the guidelines of HLURB. The general land use plan covers the whole area of the LGU. The urban land use plan is for the built-up area (the poblacion and its vicinity). The formulated CLUP is translated into a new zoning ordinance of the LGU. The zoning ordinance is enforced through the approval of the Planning Office of the province and the signature of the HLURB.

8.2.2 Land Use Plan for 2010

Cagayan de Oro City and municipalities comprised in Metro Cagayan de Oro have already prepared their CLUPs based on the ordinary legal and institutional procedures above mentioned. Figure 8.2-1 shows an integrated illustration of these CLUPs.

8.2.3 Land Use Plan for 2022

Figure 8.2-2 shows a land use plan for Metro Cagayan de Oro for 2022 based on the projected population and employment distribution described in the following sections. For the formulation of the land use plan, the targeted urban development pattern of the "Piedmont Urban Corridor Development Pattern" is basically considered.

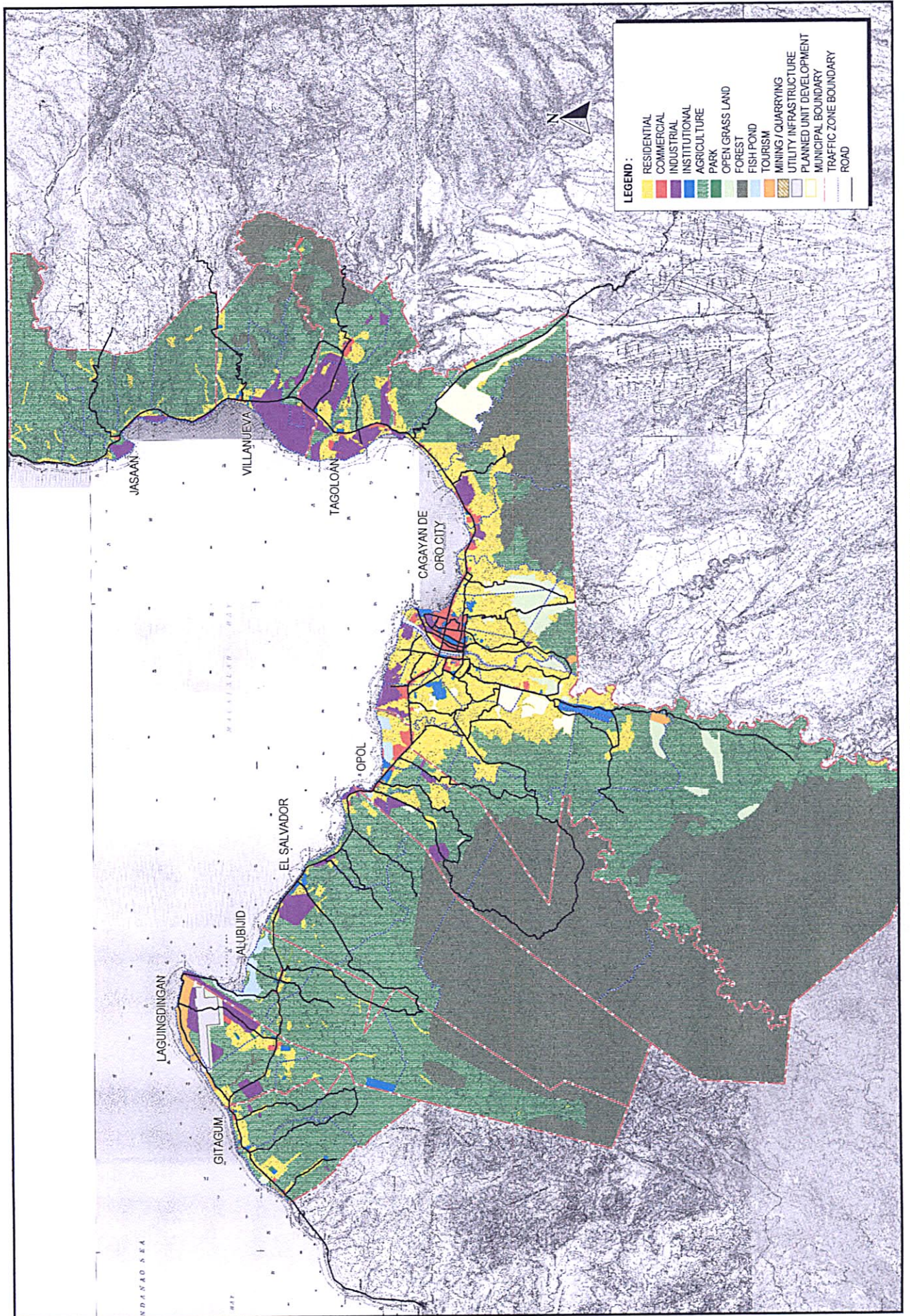


FIGURE 8.2-1 FUTURE LANDUSE MAP : 2010

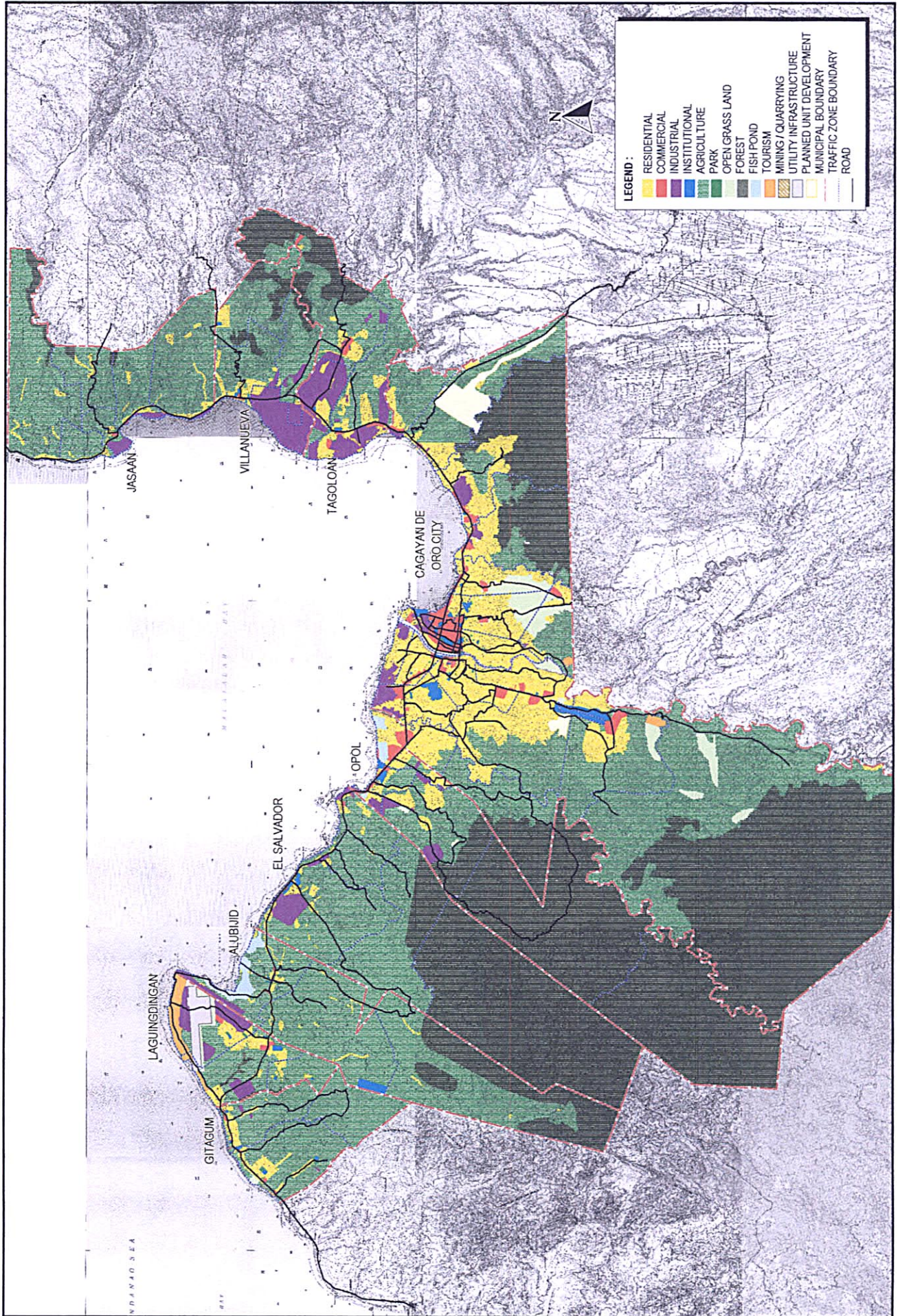


FIGURE 8.2-2 FUTURE LANDUSE MAP : 2022

8.3 FUTURE SOCIO-ECONOMIC FRAMEWORK

8.3.1 Population

Future population projection for Metro Cagayan de Oro is carried out as a revision of the NSO projections (Medium Series) for the national, provincial and city/municipality levels based on the 1995 Census. The medium series (moderate pace of fertility decline) assumes that the Net Reproduction Rate (NRR) = 1 will be realized in 2020. Projection results are shown in Table 8.3-1.

TABLE 8.3-1 FUTURE POPULATION PROJECTION BY CITY/MUNICIPALITY

| | Projected Population | | | | | Annual Average Growth Rate (%) | | | |
|-------------------|----------------------|------------|------------|-------------|-------------|--------------------------------|---------|---------|---------|
| | 2000 | 2003 | 2010 | 2016 | 2022 | 2000-03 | 2003-10 | 2010-16 | 2016-22 |
| Philippines | 76,794,212 | 82,175,792 | 94,525,517 | 104,543,133 | 113,660,368 | 2.28 | 2.02 | 1.69 | 1.40 |
| Region X | 2,757,838 | 2,945,064 | 3,381,901 | 3,742,847 | 4,074,620 | 2.21 | 2.00 | 1.70 | 1.43 |
| P. of Misamis Ori | 1,131,217 | 1,221,541 | 1,431,261 | 1,601,960 | 1,754,646 | 2.59 | 2.29 | 1.90 | 1.53 |
| Metro C. de Oro | 703,402 | 769,902 | 931,422 | 1,069,760 | 1,199,159 | 3.06 | 2.76 | 2.33 | 1.92 |
| C. de Oro City | 464,248 | 507,748 | 608,525 | 691,927 | 770,741 | 3.03 | 2.62 | 2.16 | 1.81 |
| Tagoloan | 46,893 | 51,296 | 63,479 | 75,094 | 86,383 | 3.04 | 3.09 | 2.84 | 2.36 |
| Villanueva | 25,019 | 27,779 | 35,116 | 41,843 | 48,150 | 3.55 | 3.40 | 2.96 | 2.37 |
| Jasaan | 40,176 | 43,823 | 52,910 | 60,547 | 67,041 | 2.94 | 2.73 | 2.27 | 1.71 |
| Opol | 36,735 | 43,214 | 60,724 | 77,242 | 93,261 | 5.56 | 4.98 | 4.09 | 3.19 |
| El Salvador | 34,796 | 37,372 | 44,113 | 50,025 | 55,201 | 2.41 | 2.40 | 2.12 | 1.65 |
| Alubijid | 23,464 | 24,604 | 27,478 | 29,834 | 31,695 | 1.59 | 1.59 | 1.38 | 1.01 |
| Laguindingan | 18,503 | 19,738 | 22,928 | 25,664 | 27,989 | 2.18 | 2.16 | 1.90 | 1.46 |
| Gitagum | 13,568 | 14,328 | 16,148 | 17,584 | 18,698 | 1.83 | 1.72 | 1.43 | 1.03 |

- 1) Projections at the national to provincial level to 2020 are based on the revision results of the NSO's "1995 Census-Based National, Regional and Provincial Population Projections", taking into account of the results of 2000 Census.
- 2) From 2020 to 2022, the changing trends from 2015 to 2020 are extended.
- 3) Projections at the city/municipality level to 2010 are based on the revision results of the NSO's "1995 Census-Based City/Municipality Population Projections", taking into account of the results of 2000 Census.
- 4) From 2010 to 2022, the changing trends of the percentages to the provincial projections from 2000 to 2010 are extended and applied.

For the preparation of CLUP, cities/municipalities adopted the constant population growth rate method based on their respective population growths during the 1990s. Accordingly, the projected future population in this Study is lower than those used in CLUPs.

The future populations of city/municipalities are broken down to the traffic zones, considering the past trend and population density. The results are shown in Figure 8.3-1.

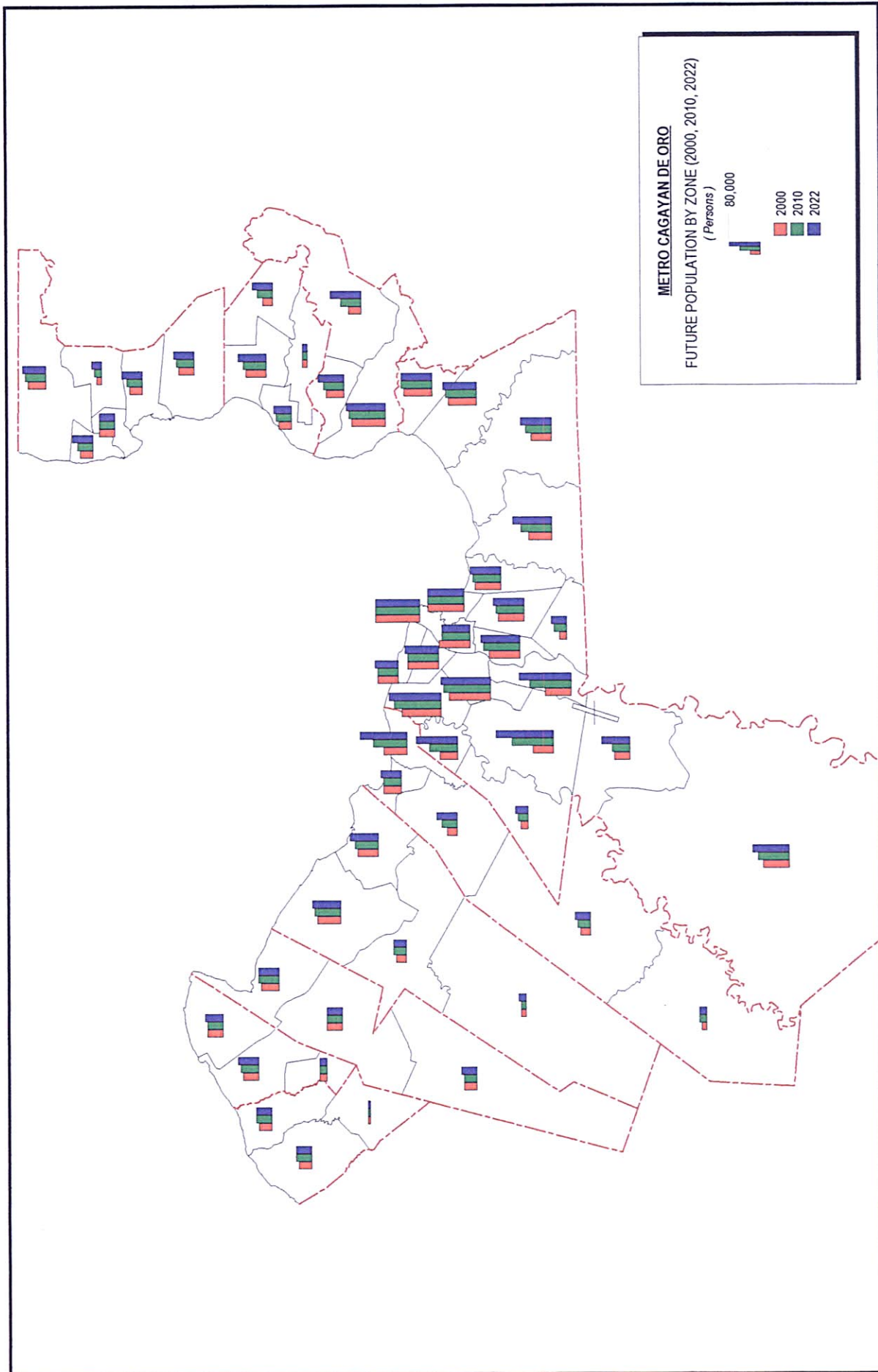


FIGURE 8.3-1 FUTURE POPULATION BY ZONE

8.3.2 GRDP

The GRDP of Region X has steadily grown during the past three years after the financial crisis with an annual average growth rate of 4.33%, considerably higher growth rate than the GDP. This is mainly attributed to the rapid recovery and further growth in the agriculture sector as well as the manufacturing sector including agro-industries. As described in Chapter 1, Region X re-integrated the Province of Lanao del Norte including Iligan City in 2001. For the future projection of GRDP of Region X, however, the area composed of four provinces of Bukidnon, Camiguin, Misamis Occidental and Misamis Oriental (including Cagayan de Oro City) is assumed to be a virtual Region X.

According to the Northern Mindanao Medium Term Regional Development Plan, 2002-2004, the region's development effort will be focused on the industry, supported by agriculture, and tourism. It may have positive influences on the service sectors. On the other hand, the Region's economy is inevitably depending on the national economic growth, since the domestic market has the predominant share in these sectors.

In November 2001, the National Economic Development Authority (NEDA) published the Medium Term Development Plan for 2001 – 2004, including the Philippines economic growth targets till the year 2006, which were recently revised slightly downward based on the actual economic growth rate in the year 2001.

Table 8.3-2 shows the GDP projection for the coming 20 years by making use of the revised target growth rates developed by NEDA. For the years from 2001 to 2004, NEDA has projected the annual economic growth as 4.3%, 5.2% and 5.5%. According to the latest National Accounts of the Philippines published by National Statistical Coordination Board (NSDB), the actual economic growth in 2002 was 4.56%, which was slightly higher than the NEDA's projection. Therefore, the NEDA's projection for the years 2003 and 2004 seems to be attainable target, even though the growth rate is increasing year by year. In the long run, however, it may be difficult to keep high economic growth continuously, judging from the past trend during the last two decades: only 1% for the 1980's and 3.3% for 1990's in terms of average annual growth rate.

TABLE 8.3-2 GDP PROJECTION (AT 1985 PRICES)

| Sector | | GDP (million pesos) | | | | | | Average Annual Growth Rate | | | | | | |
|-----------|------|---------------------|---------|-----------|-----------|-----------|-----------|----------------------------|---------|---------|---------|---------|---------|---------|
| | | 1991 | 2001 | 2002 | 2003 | 2004 | 2010 | 2022 | '91-'01 | '01-'02 | '02-'03 | '03-'04 | '05-'10 | '11-'22 |
| Primary | High | | | | | | 233,274 | 508,901 | | | | | 4.7% | 4.7% |
| | Med | 162,937 | 197,737 | 204,690 | 212,694 | 222,635 | 281,704 | 418,330 | 2.0% | 3.9% | 3.9% | 4.7% | 4.0% | 3.4% |
| | Low | | | | | | 270,518 | 343,082 | | | | | 3.3% | 2.0% |
| Secondary | High | | | | | | 534,536 | 1,016,264 | | | | | 5.5% | 5.5% |
| | Med | 248,718 | 336,607 | 348,906 | 367,545 | 367,670 | 513,606 | 651,220 | 3.1% | 3.6% | 5.3% | 5.5% | 4.8% | 4.3% |
| | Low | | | | | | 496,213 | 715,768 | | | | | 4.2% | 3.1% |
| Tertiary | High | | | | | | 759,857 | 1,528,981 | | | | | 6.0% | 6.0% |
| | Med | 304,867 | 454,824 | 478,051 | 505,533 | 535,669 | 740,706 | 1,337,823 | 4.1% | 5.1% | 5.7% | 6.0% | 5.5% | 5.1% |
| | Low | | | | | | 721,369 | 1,169,268 | | | | | 5.1% | 4.1% |
| Total | High | | | | | | 1,587,667 | 3,054,146 | | | | | 5.6% | 5.6% |
| | Med | 716,822 | 989,258 | 1,031,647 | 1,065,772 | 1,145,974 | 1,536,016 | 2,607,373 | 3.3% | 4.3% | 5.2% | 5.5% | 5.0% | 4.5% |
| | Low | | | | | | 1,488,690 | 2,228,138 | | | | | 4.5% | 3.4% |

Note: The figures in 1991 and 2001 are actual, those from 2002 to 2004 and others are projected by NEDA and Study Team respectively.

Accordingly, the growth rates by industry for 2003-2004 projected by NEDA are employed as a high case for the years 2005 – 2022. As a low case, the growth rate is assumed to eventually approach to the average growth rate in the past 10 years.

As for the GRDP of the Region X, the above-mentioned Medium Term Regional Development Plan, 2002-2004 (MTRDP 2002-2004) sets target growth rates by sector for 2002, 2003 and 2004 as shown in Table 8.3-3. Based on these target growth rates, a high case using the highest growth rates by sector and a low case using the lowest growth rates are prepared for the period 2002-2004. The average of two cases is considered as the medium case. The total of GVAs by sector (GRDP) of this medium case occupies 4% of GDP projected for the period 2002-2004, almost the same share of 3.9% during the past three years. Accordingly, GRDP of Region X is assumed to keep this share after 2005 (see Table 8.3-4). Table 8.3-5 shows the results of projected GRDP of Region X until 2022. As a result, the GRDP of Region X is expected to grow from about 39 billion pesos in 2001 to 122 billion pesos as the high growth case and 89 billion pesos as the low growth case in the year 2022.

TABLE 8.3-3 TARGET GROWTH RATES BY SECTOR, 2002-2004

| | Actual 2001 | 2002 | 2003 | 2004 | Average |
|-----------|-------------|---------|---------|---------|---------|
| Primary | 6.8 | 5.0-5.5 | 6.0-6.5 | 6.0-6.5 | 5.5-6.6 |
| Secondary | 3.8 | 4.0-4.5 | 4.5-5.0 | 5.0-5.5 | 6.5-7.2 |
| Tertiary | 4.7 | 5.0-6.0 | 6.0-7.0 | 7.0-8.0 | 6.0-7.0 |
| Total | 5.0 | 5.0-5.5 | 5.5-6.0 | 6.0-6.5 | 5.5-6.0 |

Source: MTRDP 2002-2004

TABLE 8.3-4 SHARE OF GRDP OF REGION X TO GDP

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2010 | 2022 |
|-----------|------|------|------|------|------|------|------|------|------|
| Primary | 5.3% | 4.9% | 5.1% | 5.3% | 5.3% | 5.5% | 5.5% | 5.5% | 5.6% |
| Secondary | 3.5% | 3.8% | 3.7% | 3.8% | 3.8% | 3.8% | 3.8% | 3.8% | 3.9% |
| Tertiary | 3.5% | 3.5% | 3.4% | 3.4% | 3.4% | 3.5% | 3.5% | 3.5% | 3.6% |
| Total | 3.9% | 3.9% | 3.9% | 3.9% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |

Source: NSCB, Study Team

TABLE 8.3-5 PROJECTED GRDP OF REGION X (AT 1985 PRICES)

| Sector | | GRDP (million pesos) | | | | | | | Annual Growth Rate | | | | | |
|-----------|------|----------------------|--------|--------|--------|--------|--------|---------|--------------------|---------|---------|---------|---------|---------|
| | | 1998 | 2001 | 2002 | 2003 | 2004 | 2010 | 2022 | '98-'01 | '01-'02 | '02-'03 | '03-'04 | '05-'10 | '11-'22 |
| Primary | High | | | 10,961 | 11,674 | 12,433 | 16,250 | 28,466 | | 5.5% | 6.5% | 6.5% | 4.6% | 4.8% |
| | Med | 9,134 | 10,390 | 10,935 | 11,619 | 12,345 | 15,622 | 23,485 | 4.4% | 5.2% | 6.3% | 6.3% | 4.0% | 3.5% |
| | Low | | | 10,910 | 11,564 | 12,258 | 15,016 | 19,332 | | 5.0% | 6.0% | 6.0% | 3.4% | 2.1% |
| Secondary | High | | | 13,399 | 14,069 | 14,843 | 20,464 | 39,275 | | 4.5% | 5.0% | 5.5% | 5.5% | 5.6% |
| | Med | 11,071 | 12,822 | 13,367 | 14,002 | 14,737 | 19,679 | 33,017 | 5.0% | 4.3% | 4.8% | 5.3% | 4.9% | 4.4% |
| | Low | | | 13,335 | 13,935 | 14,632 | 19,060 | 27,866 | | 4.0% | 4.5% | 5.0% | 4.5% | 3.2% |
| Tertiary | High | | | 16,554 | 17,713 | 19,130 | 26,793 | 54,425 | | 6.0% | 7.0% | 8.0% | 5.8% | 6.1% |
| | Med | 13,987 | 15,617 | 16,476 | 17,547 | 18,864 | 26,140 | 47,794 | 3.7% | 5.5% | 6.5% | 7.5% | 5.6% | 5.2% |
| | Low | | | 16,398 | 17,382 | 18,598 | 25,502 | 41,928 | | 5.0% | 6.0% | 7.0% | 5.4% | 4.2% |
| Total | High | | | 40,914 | 43,456 | 46,405 | 63,507 | 122,166 | | 5.4% | 6.2% | 6.8% | 5.5% | 5.6% |
| | Med | 34,192 | 38,829 | 40,778 | 43,168 | 45,947 | 61,441 | 104,295 | 4.3% | 5.0% | 5.9% | 6.4% | 5.0% | 4.5% |
| | Low | | | 40,642 | 42,881 | 45,488 | 59,548 | 89,126 | | 4.7% | 5.5% | 6.1% | 4.4% | 3.4% |

Note: The figures in 1998 and 2001 are actual, those from 2002 to 2004 and others are projected by NEDA and Study Team respectively.

With regard to the provincial GRDP, there is no published data available. Assuming that the labor productivity is proportionally reflecting the average income level, the GRDP of the Province of Misamis Oriental is estimated as shown in Table 8.3-6, where the medium economic growth rates by sector of the Region X are employed for the future projection.

Consequently, the GRDP of Misamis Oriental will increase from 18,451 million pesos in 2001 to 29,523 million pesos in 2010 and 55,804 million pesos in 2022 in terms of 1985 prices. The per capita GRDP will grow approximately 1.3 times the current value in 2010 and 2.0 times in 2022.

TABLE 8.3-6 GRDP OF THE PROVINCE OF MISAMIS ORIENTAL (AT 1985 PRICES)

| Sector | GRDP million pesos | | | | | | Average Annual Growth Rate | | | | |
|--------------------|--------------------|--------|--------|--------|--------|--------|----------------------------|---------|---------|---------|---------|
| | 2001 | 2002 | 2003 | 2004 | 2010 | 2022 | '01-'02 | '02-'03 | '03-'04 | '04-'10 | '10-'22 |
| Primary | 2,045 | 1,967 | 2,030 | 2,115 | 2,511 | 3,377 | -3.8 | 3.2 | 4.2 | 2.9 | 2.5 |
| Secondary | 7,694 | 7,503 | 7,983 | 8,502 | 12,476 | 25,104 | -2.5 | 6.4 | 6.5 | 6.6 | 6.0 |
| Tertiary | 8,712 | 9,172 | 9,759 | 10,423 | 14,536 | 27,323 | 5.3 | 6.4 | 6.8 | 5.7 | 5.4 |
| Total | 18,451 | 18,642 | 19,772 | 21,040 | 29,523 | 55,804 | 1.0 | 6.1 | 6.4 | 5.8 | 5.4 |
| Population ('000) | 1,161 | 1,191 | 1,222 | 1,252 | 1,431 | 1,755 | 2.6 | 2.6 | 2.5 | 2.3 | 1.7 |
| Per Capita (pesos) | 15,892 | 15,652 | 16,180 | 16,805 | 20,631 | 31,797 | -1.5 | 3.4 | 3.9 | 3.5 | 3.7 |

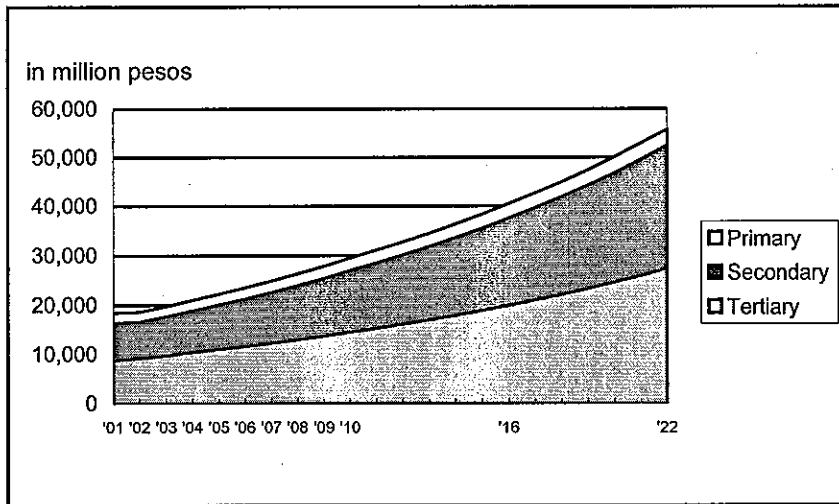


FIGURE 8.3-2 FUTURE TREND OF PROVINCIAL GRDP BY SECTOR

8.3.3 Employment

Based on the projected provincial GRDP, population, labor force participation rates, employment rates and labor productivity by sector, future employment by sector at the provincial level is first estimated. Then, it is broken down to the city/municipality level considering the ratios of city/municipal employment by sector to that of the province on residence base. Applying the ratios of employment on workplace base to that on residence base obtained from 2000 Census, the employment on workplace base is estimated. The results are shown in Figure 8.3-3.

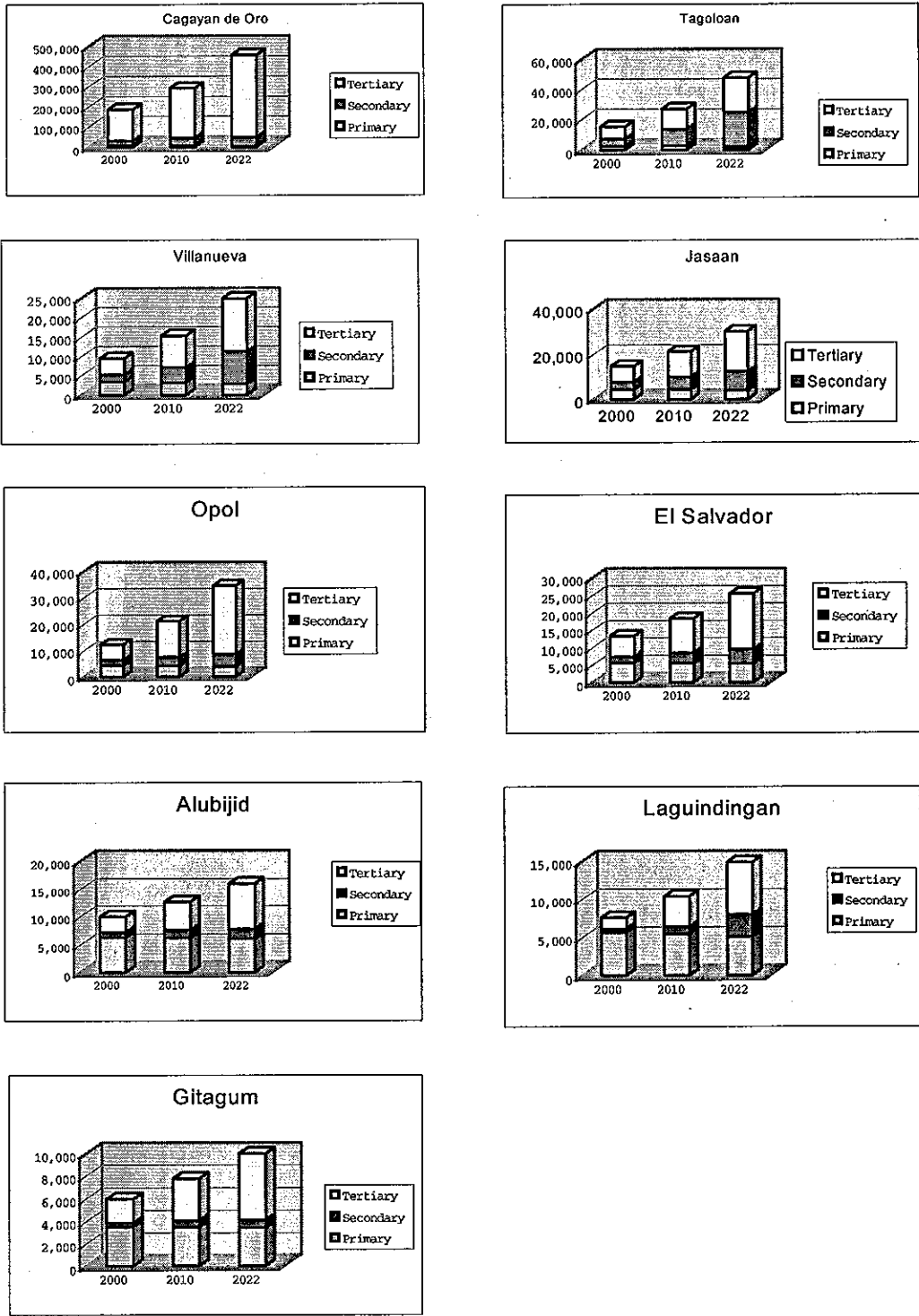


FIGURE 8.3-3 FUTURE NO. OF EMPLOYED PERSONS BY SECTOR (Workplace Base), METRO CDO

Employment by traffic zone is estimated based on the following assumptions:

- a. The number of employed persons in the primary sector on workplace base is the same as that on residence base.
- b. Employment of the primary sector will reduce parallel to reduction in agricultural land
- c. The secondary and tertiary sector employment is classified into two categories: barangay level service (for example, bakeries in the secondary sector and sari-sari store in the tertiary sector) and city/municipality level and above
- d. The barangay level employment on workplace base is the same as that on residence base.
- e. The secondary sector employment at the city/municipality level is divided into two categories: construction and manufacturing (mining and electric/gas/water are negligible).
- f. Employment in the construction industry is distributed to the poblacion and commercial zones.
- g. Employment in the manufacturing industry is distributed to the industrial zones.
- h. The tertiary sector employment at the city municipality level is distributed to the poblacion, commercial/institutional zones.

The results are shown in Figure 8.3.4

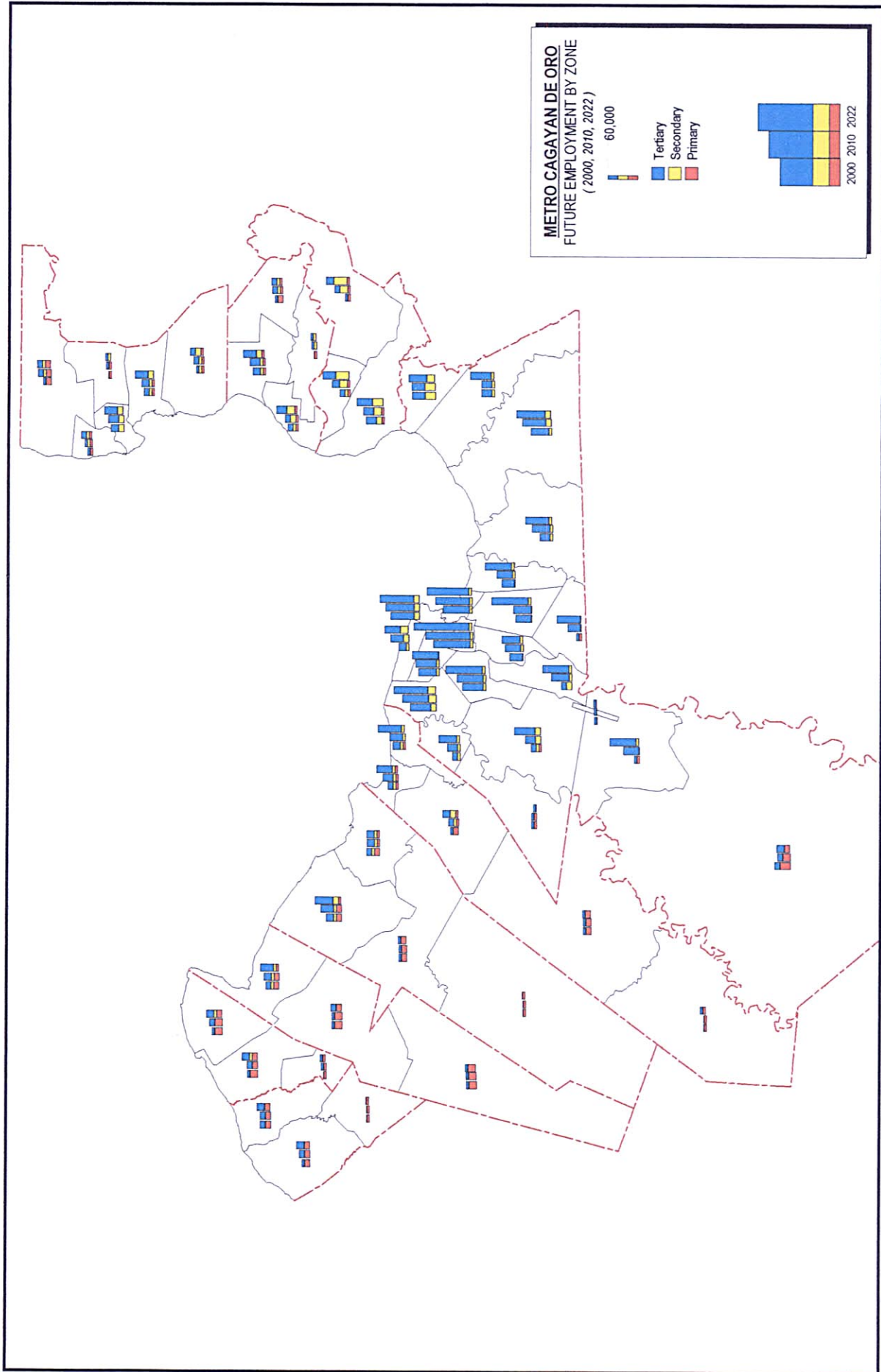


FIGURE 8.3-4 FUTURE EMPLOYMENT BY ZONE

8.3.4 Vehicle Ownership Projection

Future vehicle ownership is estimated by using the relationship between family income and vehicle ownership, which has been already explained in Chapter 1. Future family income growth can be obtained by using the growth rate in the per capita GRDP of Region X and the changes in the number of household members.

As a result, the number of vehicles in the Metro Cagayan de Oro is forecasted to grow 1.97 times the current number of vehicles in 2010 and 2.89 times in 2022. Therefore, the vehicle ownership will increase from 33 vehicles /1000 persons in 2001 to 48 vehicles/1000 persons in 2010 and 55 vehicles/1000 persons in 2022.

It indicates that the vehicle ownership will be one vehicle per 14 persons in Metro Cagayan de Oro and one vehicle per 1.8 persons in Cagayan de Oro City in 2022.

TABLE 8.3-7 FUTURE VEHICLE OWNERSHIP IN METRO CAGAYAN DE ORO

| City/Municipality | 2001 | | 2010 | | 2022 | |
|---------------------|-----------------------|------------------------|--------------------|------------------------|--------------------|------------------------|
| | Number of Vehicles(A) | Vehicles/ 1000 Persons | Number of Vehicles | Vehicles/ 1000 Persons | Number of Vehicles | Vehicles/ 1000 Persons |
| Cagayan de Oro City | 19,937 | 43.2 | 37,847 | 62.2 | 53,863 | 69.9 |
| Tagoloan | 250 | 5.4 | 640 | 10.1 | 1,433 | 16.6 |
| Villanueva | 235 | 9.5 | 590 | 16.8 | 1,012 | 21.0 |
| Jasaan | 231 | 5.8 | 768 | 14.5 | 1,594 | 23.8 |
| Opol | 1,366 | 37.5 | 3,182 | 52.4 | 4,884 | 52.4 |
| El Salvador | 291 | 8.4 | 723 | 16.4 | 1,254 | 22.7 |
| Alubijid | 179 | 7.7 | 388 | 14.1 | 624 | 19.7 |
| Laguindingan | 194 | 10.5 | 487 | 21.2 | 652 | 23.2 |
| Gitagum | 104 | 7.7 | 258 | 16.0 | 447 | 23.9 |
| Total | 22,787 | 32.6 | 44,883 | 48.2 | 65,763 | 54.8 |

Note: Excluding vehicles for hire and motorcycles/tricycles

CHAPTER 9

TRAFFIC DEMAND FORECAST

9.1 DEMAND FORECAST MODELS

9.1.1 Traffic Generation/Attraction Models

After examining various explanatory variables, the most appropriate ones were selected. Consequently, the traffic generation/attraction models were established as follows:

TABLE 9.1-1 GENERATION / ATTRACTION MODELS

| | Generation/ Attraction Models |
|----------------|--|
| Person Trips | $G_i, A_i = a_1 X_i + a_2 D_i$ Where G_i, A_i : Trip Generation/Attraction in Zone i X_i : Total Employment at Working Place in Secondary and Tertiary Sectors in Zone i D_i : Dummy Variable a_1 : 3.649 a_2 : 103,600 R^2 : Multiple Correlation Coefficient: 0.935 |
| Cargo Movement | $G_i, A_i = a_1 X_i + a_2 D_i$ Where G_i, A_i : Cargo Generation/Attraction in Zone i X_i : Total Employment at Working Place in Secondary and Tertiary Sectors in Zone i D_i : Dummy Variable a_1 : 0.04876 a_2 : 376.9 R^2 : Multiple Correlation Coefficient: 0.982 |

9.1.2 Trip Distribution Model

As a trip distribution model, the gravity model was employed, taking into account that the current distribution pattern among zones will remain in the future. Simultaneously, new linkage pattern was created reflecting the development of new growth centers located along new highways.

The gravity model is expressed by the following formula:

$$T_{ij} = K \cdot G_i^\alpha A_j^\beta / d_{ij}^\gamma \cdot \exp(DM_{ga})$$

Where T_{ij} : Person Trip or Cargo Volume between Zone i and Zone j

G_i : Person Trip or Cargo Volume Generation in Zone i

A_j : Person Trip or Cargo Volume Attraction in Zone j

d_{ij} : Travel Time Distance between Zone i and Zone j

M_{ga} : Generation & Attraction Magnitudes (-1 or +1)

K, α , β , γ , D: parameters as shown in the following table
 R^2 : Multiple Correlation Coefficients

| | K | α | β | γ | D | R^2 |
|------------|--------|----------|---------|----------|-------|-------|
| Passengers | 0.0020 | 0.563 | 0.563 | 0.415 | 0.978 | 0.844 |
| Cargo | 0.0311 | 0.476 | 0.476 | 0.181 | 0.611 | 0.808 |

9.1.3 Modal Split Model

As already explained in Chapter 2 of Part A, the modal split between private vehicles and public transport is determined by the vehicle ownership and trip production rate per vehicle in the Metro Cagayan de Oro. Accordingly, the total number of future person trips by private vehicles is obtained by the following formula:

$$X_v = V \cdot r \cdot N$$

Where X_v : Total Number of Person Trips by Private Vehicles
 V : Total Number of Private Vehicles
 r : Trip Production Rate per Private Vehicle (= 3.73)
 N : Average Vehicle Occupancy (= 2.52 persons/vehicle)

The modal split between bus and jeepney was estimated by using the relationship between zones i and zone j in distance, calculated on the basis of the present OD matrices.

Figure 9.1-1 represents the modal share of public transport modes.

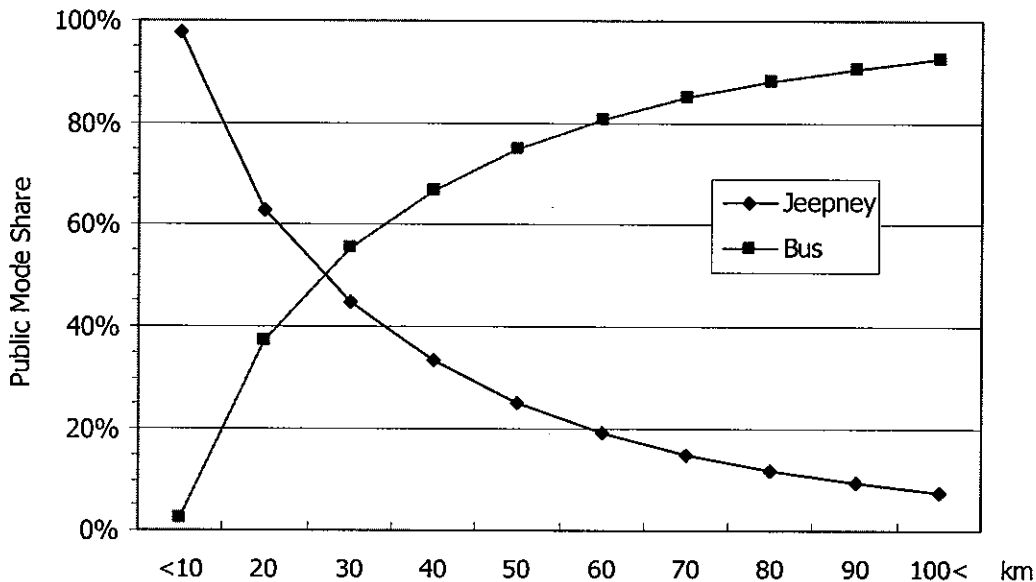


FIGURE 9.1-1 MODAL SHARE OF JEEPNEY AND BUS TRIPS TO TOTAL PUBLIC TRANSPORT TRIPS

9.2 FUTURE TRAFFIC DEMAND

The future traffic demand is estimated by using the forecast models elaborated in the previous section. The target years are assumed as 2010, 2016, and 2022.

9.2.1 Passenger Trip

(1) Total Demand

The future passenger trips related to the Metro Cagayan de Oro Area were estimated as shown in Table 9.2-1. The total passenger demand is forecasted to grow as much as 2.34 times during the coming two decades from 2.12 million trips in 2003 to 3.00 million trips in 2010, 3.82 million trips in 2016, and 4.95 million trips in 2022. Cagayan de Oro City will be functioning as the center of the Metro Cagayan de Oro Area in the future as well. The share of Cagayan de Oro City related trips to total trip production in Metro Cagayan de Oro will slightly decrease in the future, but will be continuously predominant, and making up about 90% of the total trips in the area even in 2022. It is also noted that among others, Tagoloan, Villanueva and Laguindingan show high growth during the same period. More than triple of the current demand will be expected, and it is owing to the Mindanao International Container Port (MICP) in Tagoloan, a Phividec Industrial Estate in Villanueva. In addition, the rapid increase in Laguindingan by 2010 is due to transfer of airport related traffic demand from existing airport to new airport expected to be opened by 2010. Figure 9.2-1 shows the growth of trip generation by integrated zone.

TABLE 9.2-1 PASSENGER TRIPS IN METRO CAGAYAN DE ORO AREA

| City/Municipality | Passenger Trips (1,000 persons/day) | | | | Growth Ratio | | Average Growth Rate | |
|----------------------|-------------------------------------|---------|---------|---------|--------------|---------|---------------------|---------|
| | 2003 | 2010 | 2016 | 2022 | '03-'10 | '03-'22 | '03-'10 | '03-'22 |
| Cagayan de Oro | 1,939.5 | 2,703.5 | 3,442.1 | 4,460.9 | 1.39 | 2.30 | 4.9% | 4.5% |
| Tagoloan | 10.3 | 17.9 | 25.2 | 35.7 | 1.74 | 3.48 | 8.3% | 6.8% |
| Villanueva | 10.3 | 18.7 | 24.5 | 32.3 | 1.82 | 3.14 | 8.9% | 6.2% |
| Jasaan | 19.5 | 31.9 | 40.7 | 52.2 | 1.64 | 2.68 | 7.3% | 5.3% |
| Opol | 24.0 | 39.8 | 51.8 | 68.2 | 1.66 | 2.83 | 7.5% | 5.6% |
| El Salvador | 15.3 | 21.2 | 26.3 | 32.8 | 1.38 | 2.14 | 4.7% | 4.1% |
| Alubijid | 12.8 | 17.2 | 20.8 | 25.4 | 1.34 | 1.99 | 4.3% | 3.7% |
| Laguindingan | 8.5 | 33.2 | 45.3 | 62.3 | 3.90 | 7.32 | 21.5% | 11.0% |
| Gitagum | 8.6 | 13.3 | 16.6 | 20.8 | 1.55 | 2.42 | 6.5% | 4.8% |
| Metro Cagayan de Oro | 2,048.8 | 2,896.7 | 3,693.4 | 4,790.5 | 1.41 | 2.34 | 5.1% | 4.6% |
| External Area | 72.1 | 100.2 | 127.3 | 163.7 | 1.39 | 2.27 | 4.8% | 4.4% |
| Total | 2,120.9 | 2,996.9 | 3,820.7 | 4,954.3 | 1.41 | 2.34 | 5.1% | 4.6% |

(2) Transport Mode

The passenger trips by transport mode in the Metro Cagayan de Oro Area are shown in Table 9.2-2. The share of private vehicles is almost constant, due to rapid increase of total passenger trips which will not be handled by just only the increase of private car ownership. Therefore, increase of passenger demand of first decade will be handled by public mode, such as jeepney and bus, then after economic growth are achieved, share of private vehicles will increase gradually.

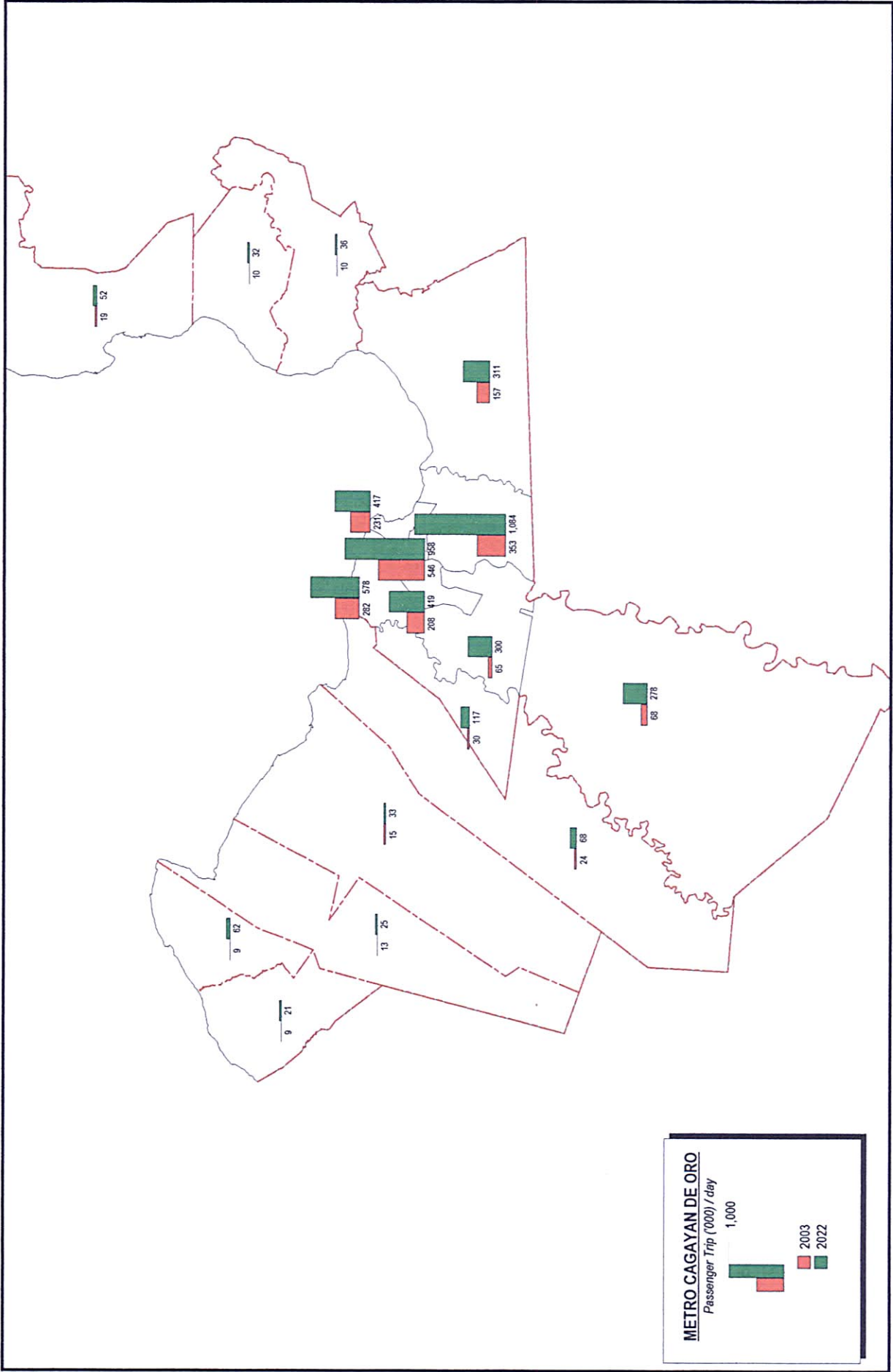


FIGURE 9.2-1 PASSENGER TRIP GROWTH BY INTEGRATED ZONE

TABLE 9.2-2 PASSENGER TRIP BY TRANSPORT MODE

| Transport Mode | 2003 | | 2010 | | 2016 | | 2022 | |
|------------------|--------------|-------|--------------|-------|--------------|-------|--------------|-------|
| | Trips ('000) | % | Trips ('000) | % | Trips ('000) | % | Trips ('000) | % |
| Private Vehicles | 448.2 | 21.1 | 596.1 | 19.9 | 807.0 | 21.1 | 1,082.8 | 21.9 |
| Jeepney | 1,581.7 | 74.6 | 2,275.7 | 75.9 | 2,863.1 | 74.9 | 3,687.5 | 74.4 |
| Bus | 91.0 | 4.3 | 125.1 | 4.2 | 150.7 | 3.9 | 184.0 | 3.7 |
| Total | 2,120.9 | 100.0 | 2,996.9 | 100.0 | 3,820.7 | 100.0 | 4,954.3 | 100.0 |

(3) Desired Line of Passenger Trips

The desired line of passenger trips in 2022 is shown in Figure 9.2-2, which represents a quite similar pattern of 2003, except traffic demand from/to the New Cagayan de Oro (Laguindingan) Airport. The predominant passenger movement is still found among the sub-district zones inside the Cagayan de Oro City. For instance, traffic demand crossing the Cagayan de Oro River will become around 240,000 pcu per day in 2022, compare to the present condition of around 100,000 pcu per day. Although the growth rate in the Cagayan de Oro City will be lower than the average growth rate of the Metro Cagayan de Oro, the incremental volume is substantially large. Other prominent characteristics are radial pattern movements focusing to the Cagayan de Oro City center from the surrounding municipalities and city's suburban area. Most of the OD pairs in the radial direction will become double or triple the present demand.

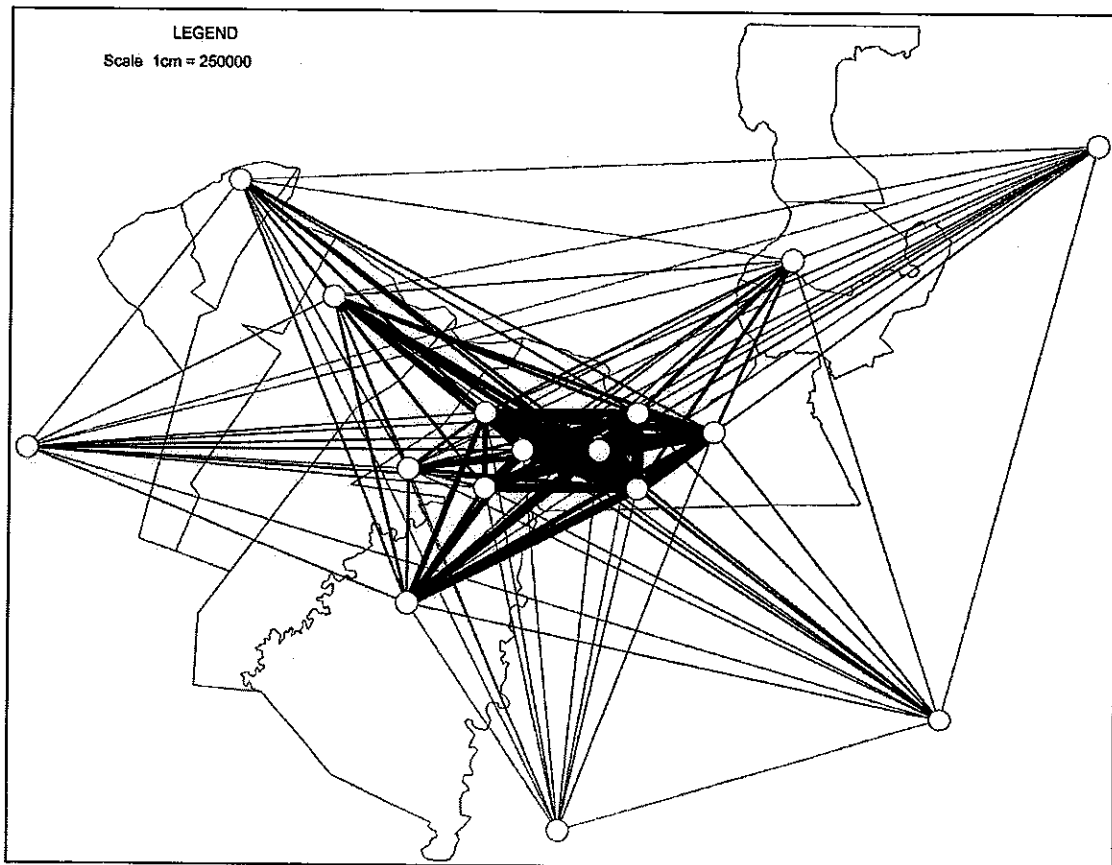


FIGURE 9.2-2 DESIRED LINE FOR PASSENGER TRIP: 2022

9.2.2 Cargo Flow

Table 9.2-3 shows the total generation of cargo demand in the Metro Cagayan de Oro Area. The total cargo volume related to the Metro Cagayan de Oro is expected to increase from 112 kilo ton (k.t.) per day in 2003 to 163 k.t. in 2010, 218 k.t. in 2016, and 288 k.t. in 2022.

TABLE 9.2-3 CARGO DEMAND GENERATION IN METRO CAGAYAN DE ORO AREA

| City/Municipality | Cargo Demands (ton/day) | | | | Growth Ratio | | Average Growth Rate | |
|----------------------|-------------------------|---------|---------|---------|--------------|---------|---------------------|---------|
| | 2003 | 2010 | 2016 | 2022 | '03-'10 | '03-'22 | '03-'10 | '03-'22 |
| Cagayan de Oro | 82,120 | 109,982 | 145,526 | 192,066 | 1.34 | 2.34 | 4.3% | 4.6% |
| Tagoloan | 7,554 | 22,182 | 32,576 | 44,248 | 2.94 | 5.86 | 16.6% | 9.8% |
| Villanueva | 1,340 | 1,922 | 2,562 | 3,460 | 1.43 | 2.58 | 5.3% | 5.1% |
| Jasaan | 1,014 | 1,270 | 1,562 | 1,922 | 1.25 | 1.90 | 3.3% | 3.4% |
| Opol | 2,122 | 3,276 | 4,496 | 6,214 | 1.54 | 2.93 | 6.4% | 5.8% |
| El Salvador | 1,798 | 2,458 | 3,080 | 3,862 | 1.37 | 2.15 | 4.6% | 4.1% |
| Alubijid | 290 | 446 | 572 | 734 | 1.54 | 2.53 | 6.3% | 5.0% |
| Laguindingan | 270 | 450 | 612 | 846 | 1.67 | 3.13 | 7.6% | 6.2% |
| Gitagum | 88 | 130 | 158 | 196 | 1.48 | 2.23 | 5.7% | 4.3% |
| Metro Cagayan de Oro | 96,596 | 142,116 | 191,144 | 253,548 | 1.47 | 2.62 | 5.7% | 5.2% |
| External Area | 15,116 | 21,028 | 26,594 | 34,128 | 1.39 | 2.26 | 4.8% | 4.4% |
| Total | 111,712 | 163,144 | 217,738 | 287,676 | 1.46 | 2.58 | 5.6% | 5.1% |

The total cargo movements generated from and/or attracted to Cagayan de Oro City will remain the largest, although the share of cargo related trips of Cagayan de Oro City in the area will drop from about three quarters to two thirds. The demand from/to Tagoloan will become triple of present conditions in 2010, and continue its relatively rapid growth, then reach almost six times of present condition in 2022, which owing its newly opened container port activities.

(Unit: Metric Ton per Day)

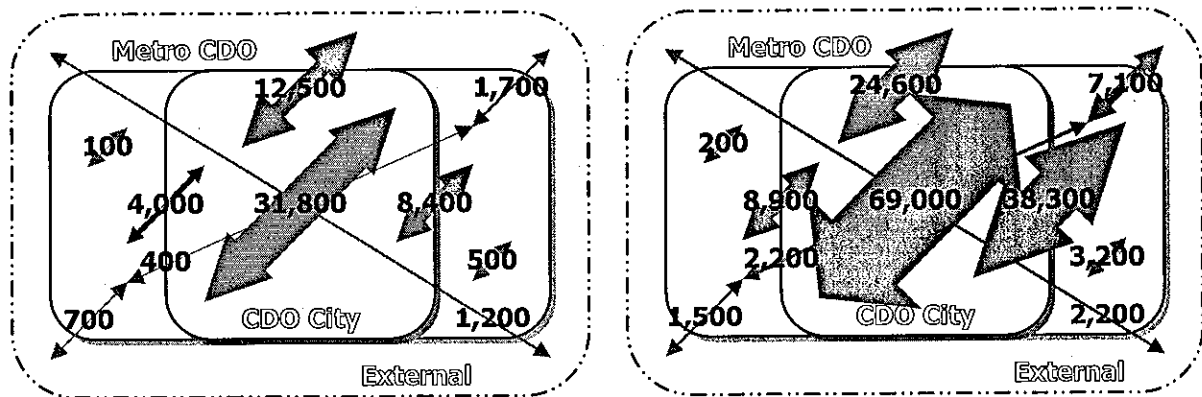


FIGURE 9.2-3 OUTLINE OF CARGO MOVEMENTS IN THE METRO CAGAYAN DE ORO AREA

Figure 9.2-3 illustrates the outline of cargo flow in the Metro Cagayan de Oro Area. The cargo movements inside the Cagayan de Oro City will be continuously dominant in 2022. However, a higher growth is expected for the demand between Cagayan de Oro City and the surrounding municipalities of the Metro Cagayan de Oro Area as well as the external area.

As seen in Figure 9.2-4, the desired line shows that the cargo flows are expressed by a radial pattern with the focus at Cagayan de Oro City. The cargo transport demand related to Tagoloan and Villanueva will be the other hub of cargo flows in the Metro Cagayan de Oro Area, owing to the development of Phividec Industrial Park and Mindanao International Container Port in those areas.

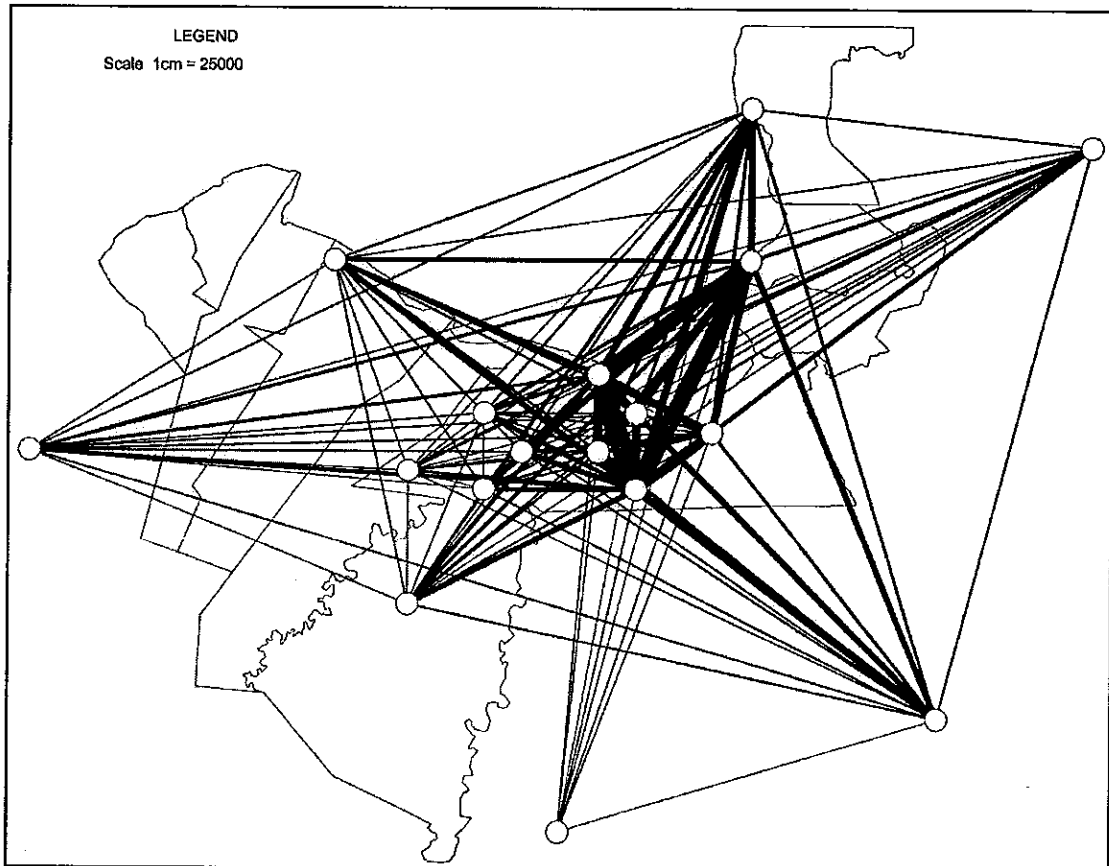


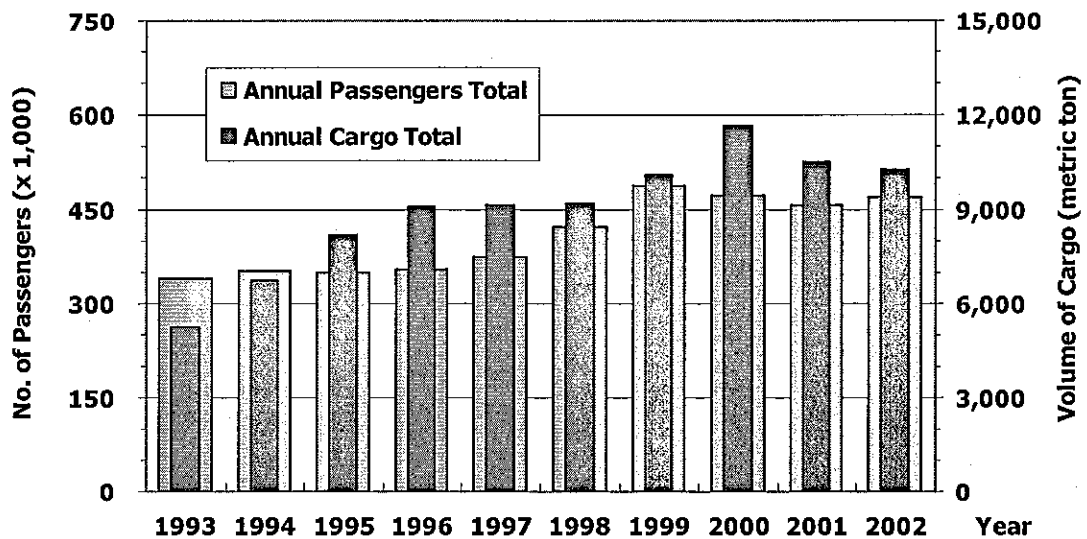
FIGURE 9.2-4 DESIRED LINE FOR CARGO FLOW: 2022

9.2.3 Airport Related Traffic

Figure 9.2.3 shows the past trend of air passengers and cargoes in Cagayan de Oro Airport (CDOAP)¹. In the Iligan - Cagayan de Oro Corridor, there was the Iligan Airport before. However, this airport has stopped its operation since 1993. As for the future passengers and cargo volume related to the CDOAP, the projection made by the Study Team is employed².

¹ Existing airport is located at Lumbia in Cagayan de Oro City, and it will be relocated to Laguindingan by 2010

² Projection made for the New Airport Project assumed the demand from/to the Iligan Airport, which has been closed since 1993, will also convert to the new airport, as if the Iligan Airport is still in operation by estimating its "potential" demand from the trend data before 1992. On the other hand, past data of the Cagayan de Oro Airport showed a sudden increase of passengers in 1993. As a result, Cagayan de Oro Airport is assumed to be handling so-called "potential" demand from/to the Iligan Airport since its closure. In addition, the data utilized for above-mentioned projection seemed to be contaminated by abnormal data in 1997 and 1998, which are different from the data provided by the Cagayan de Oro ATO (Air Transport Office), Department of Transport and Communications, during the Study, and those newly obtained past data show much logical trend. Therefore, the Study Team judged that the projection applied for the New Airport Project, which including biased demand from/to the Cagayan de Oro Airport and the Iligan Airport, will not be appropriate to utilize for the traffic demand forecast in this Study to avoid overestimation of the airport related traffic demand



Data Source: Before 1996: Air Transport Statistics, Civil Aviation Bureau, DoTC
 1997: Interpolated by the Data in 1996 & 1998
 After 1998: Annual Report, Air Transport Office, Cagayan de Oro, DoTC

FIGURE 9.2-7 PAST PASSENGERS AND CARGO MOVEMENTS AT CAGAYAN DE ORO AIRPORT

(1) Air Traffic Generation Model

Number of passengers and cargoes at CDOAP is forecasted by using the elasticity of air traffic growth to the GDP growth in the Philippines as following formula:

$$AT^t = AT^{02} \times \alpha \times GGR$$

Where,

AT^t : Air Traffic Demand in Target Year t

AT^{02} : Air Traffic in 2002

α : Elasticity of Air Traffic Growth to Growth Rate of GDP

GGR : GDP Growth Rate

(2) Air Traffic Allocation Model

Air traffic demand both air passengers and air cargoes in each traffic zone is estimated from the projected air traffic demand in the influence area by applying air traffic allocation model. This model is expressed as follows:

$$PA_i^t = PA^t \times GZP_i / \Sigma GZP_i$$

Where,

PA_i^t : Number of Passenger or Cargo Volume in Target Year t and Zone i

PA^t : Number of Passenger or Cargo Volume in Target Year t

GZP_i : Gross Zonal Product in Zone i

(3) Input Data

a. Elasticity Value³

Passenger : 1.205

Cargo : 1.875

b. Growth Rate of GDP

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|---------------|-----------|-----------|-----------|-----------|
| Annual Growth | 4.2% | 4.0% | 3.8% | 3.6% |

c. Growth Rate of Passenger

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|---------------|-----------|-----------|-----------|-----------|
| Annual Growth | 5.1% | 4.9% | 4.6% | 4.4% |

d. Growth Rate of Cargo

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|---------------|-----------|-----------|-----------|-----------|
| Annual Growth | 7.9% | 7.6% | 7.2% | 6.8% |

(4) Gross Regional Product by Zone

| | 2002 | | 2010 | | 2022 | | AAGR (%) | |
|---------------------|--------|-------|--------|-------|---------|-------|----------|-------|
| | GRDP | % | GRDP | % | GRDP | % | 00-10 | 10-22 |
| Misamisi Oriental | 18,642 | 40.3 | 29,523 | 42.4 | 55,804 | 46.6 | 5.8 | 5.4 |
| Cagayan de Oro | 10,116 | 21.9 | 21.9 | 21.9 | 22.8 | 22.8 | 5.0 | 5.0 |
| Remaining Area | 8,526 | 18.4 | 20.5 | 20.5 | 23.8 | 23.8 | 6.6 | 5.9 |
| Bukindon | 13,889 | 30.0 | 20,577 | 29.5 | 33,720 | 28.2 | 5.0 | 4.2 |
| Camiguin | 950 | 2.0 | 1,339 | 1.9 | 2,041 | 1.7 | 4.4 | 3.6 |
| Misamisi Occidental | 6,269 | 13.5 | 8,523 | 12.2 | 12,827 | 10.7 | 3.9 | 3.5 |
| Lanao Del Norte | 6,532 | 14.1 | 9,725 | 14.0 | 15,394 | 12.9 | 5.1 | 4.7 |
| Total | 46,262 | 100.0 | 69,687 | 100.0 | 119,786 | 100.0 | 5.2 | 4.6 |

Note: AAGR (Average Annual Growth Rate), Data Source: JICA Study Team

(5) Results of Forecast

According to this projection, the number of passengers will grow from 0.47 million persons per annum (or 1,560 persons per day) in 2002 to 1.18 million persons per annum (or 3,920 persons per day) in 2022. Air cargo will be also expected to increase from 34 tons per day in 2002 to 140 tons per day in 2022.

In addition, airport related trip productions will grow from 2.28 thousand vehicle-trips per day (5.80 thousand person-trips per day) in 2002 to 5.73 thousand vehicle-trips per day (14.58 thousand person-trips per day) in 2022, when sending-off and welcoming individuals or airport employees movements are taken into account as same level as present (Refer section 4.2.3).

³ Average Annual Growth Rate during '93-'02: GDP=3.75% (R²=0.983), Passenger=4.52%(R²=0.844), Cargo=7.03%(R²=0.761)

TABLE 9.2-4 PROJECTION OF FUTURE PASSENGERS AND CARGO MOVEMENTS AT CAGAYAN DE ORO AIRPORT

| Departure / Arrival Total | | 2002 | 2004 | 2010 | 2016 | 2022 | Annual Growth Rate | |
|---------------------------|---------------|---------|---------|---------|---------|-----------|--------------------|---------|
| | | | | | | | '02-'10 | '10-'22 |
| Passengers (persons) | Annual Total | 468,880 | 519,000 | 690,000 | 906,000 | 1,176,000 | 4.9% | 4.5% |
| | Daily Average | 1,560 | 1,730 | 2,300 | 3,020 | 3,920 | | |
| Cargo (tons) | Annual Total | 10,200 | 11,900 | 18,500 | 28,200 | 42,000 | 7.7% | 7.1% |
| | Daily Average | 34.0 | 39.8 | 61.8 | 94.0 | 139.9 | | |
| Daily Trip Production | Vehicle Trip | 2,280 | 2,530 | 3,360 | 4,410 | 5,730 | 1.46 veh/pax | |
| | Person Trip | 5,800 | 6,440 | 8,560 | 11,230 | 14,580 | 3.72 pax/pax | |

Data Source: Projection from 2004 to 2022: Projected by the Study Team from the Statistics Data obtained from DOTC

Daily Vehicle & Person Trip Productions are based on the Airport Related Traffic Survey (See Table 4.2-12)

9.2.4 Seaport Related Traffic

(1) Past Trend

Table 9.2-5 and Figure 9.2-8 shows the past trend of passengers embarked and disembarked as well as cargo volume loaded and unloaded at Cagayan de Oro Seaport (CDOSP).

TABLE 9.2-5 PAST TREND OF PASSENGERS AND CARGO HANDLED AT CAGAYAN DE ORO SEAPORT

| Disembark / Embark Total | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | Ave. Growth ('97-'02) |
|-----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------------------|
| Passengers (persons) | | | | | | | |
| Annual Total | 1,421,700 | 1,375,200 | 1,280,700 | 1,273,200 | 1,269,300 | 1,407,900 | -0.8% |
| Daily Average | 4,740 | 4,580 | 4,270 | 4,240 | 4,230 | 4,690 | |
| Cargo (metric tons) | | | | | | | |
| Annual Total | 2,474,200 | 2,576,800 | 2,691,400 | 2,646,300 | 2,717,300 | 2,962,800 | 3.0% |
| Daily Average | 8,250 | 8,590 | 8,970 | 8,820 | 9,060 | 9,880 | |

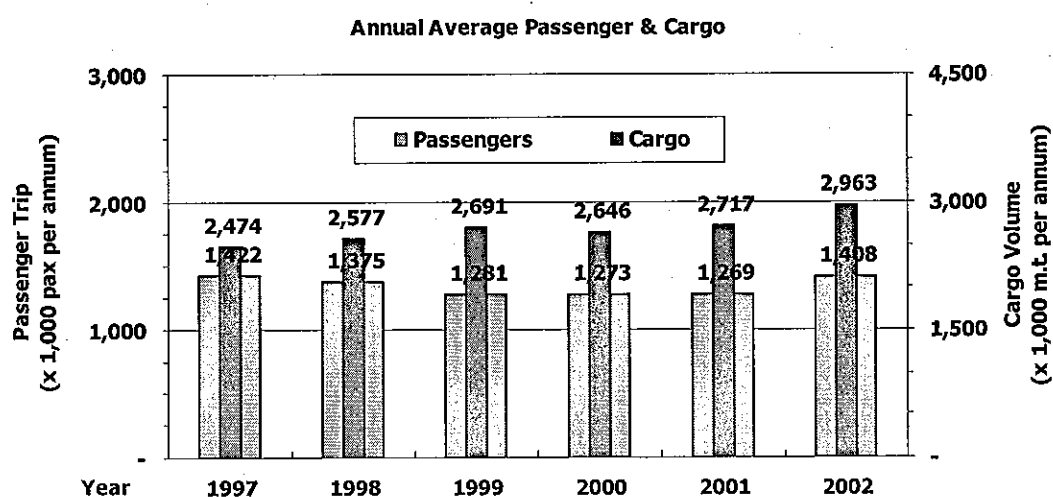


FIGURE 9.2-8 PAST TREND OF PASSENGERS AND CARGO HANDLED AT CAGAYAN DE ORO SEAPORT

According to these data, number of passengers utilized CDOSP decreased by 10% from 1997 to 1999. Then it stagnated between 1999 and 2001. After 2001, the trend turned to increase before 1998's level. It is assumed that this increase trend of passengers will continue from now on.

For cargo movement, there are gradual increases observed, although there is an on-going project, namely Mindanao International Container Port (MICP), which will affect the volume of cargo handled at CDOSP. Therefore, future cargo demands handled at two seaports are examined in following section.

(2) Seaport Passenger Forecast Model

i. Passenger Generation Model

Number of passengers at CDOSP is forecasted by using the elasticity of passenger growth to the GDP growth in the Philippines as following formula:

$$PA^t = PA^{02} \times \alpha \times GGR$$

Where

PA^t : Number of Passenger in Target Year t

PA^{02} : Number of Passenger in 2002

α : Elasticity of Passenger Growth to Growth Rate of GDP

GGR : GDP Growth Rate

ii. Passenger Allocation Model

Passenger demand in each traffic zone is estimated from the projected passenger demand in the influence area by applying passenger allocation model. This model is expressed as follows:

$$PA_i^t = PA^t \times GZP_i / \sum GZP_i$$

Where

PA_i^t : Number of Passenger in Target Year t and Zone i

PA^t : Number of Passenger in Target Year t

GZP_i : Gross Zonal Product in Zone i

iii. Input Data

a. Elasticity Value⁴

Disembarked Passenger : 0.757

Embarked Passenger : 0.569

Passenger Total : 0.664

⁴ Average Annual Growth Rate in '99-'02: Disembark=3.25% (R²=0.577), Embark=2.44%(R²=0.432), Both=2.85%(R²=0.527)

b. Growth Rate of GDP

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|---------------|-----------|-----------|-----------|-----------|
| Annual Growth | 4.2% | 4.0% | 3.8% | 3.6% |

c. Growth Rate of Passenger

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|-----------|-----------|-----------|-----------|-----------|
| Disembark | 3.2% | 3.0% | 2.9% | 2.7% |
| Embark | 2.4% | 2.3% | 2.2% | 2.0% |
| Total | 2.8% | 2.7% | 2.5% | 2.4% |

d. Results of Forecast

As a result, total number of passengers is expected to grow from 1.40 million in 2002 to 1.74 million in 2010, 2.02 million in 2016, and 2.34 million in 2022.

TABLE 9.2-6 PROJECTION OF PASSENGERS AT CAGAYAN DE ORO PORT

| Term | 2002 | 2010 | 2016 | 2022 |
|---------------|-----------|-----------|-----------|-----------|
| Disembark | 713,500 | 908,500 | 1,077,100 | 1,265,700 |
| Embark | 694,400 | 833,200 | 947,200 | 1,069,800 |
| Annual Total | 1,407,900 | 1,741,700 | 2,024,300 | 2,335,500 |
| Daily Average | 4,690 | 5,810 | 6,750 | 7,790 |

Data: 2002=Philippine Ports Authority, 2010/16/22=Study Team Estimates

(3) Cargo

i. General

The seaport cargo can be classified into the following cargo types:

- Domestic Cargo - Inbound
- Outbound
- Foreign Cargo - Import
- Export

The cargo can be further subdivided into cargo types:

- Bulk
- Container

The past trend of cargo handling is shown in Figure 9.2.3-4. The domestic inbound and outbound cargo volume gradually increases from 1997 to 2002, while the foreign import cargo volume has a rather stagnant trend and the export one has increasing trend.

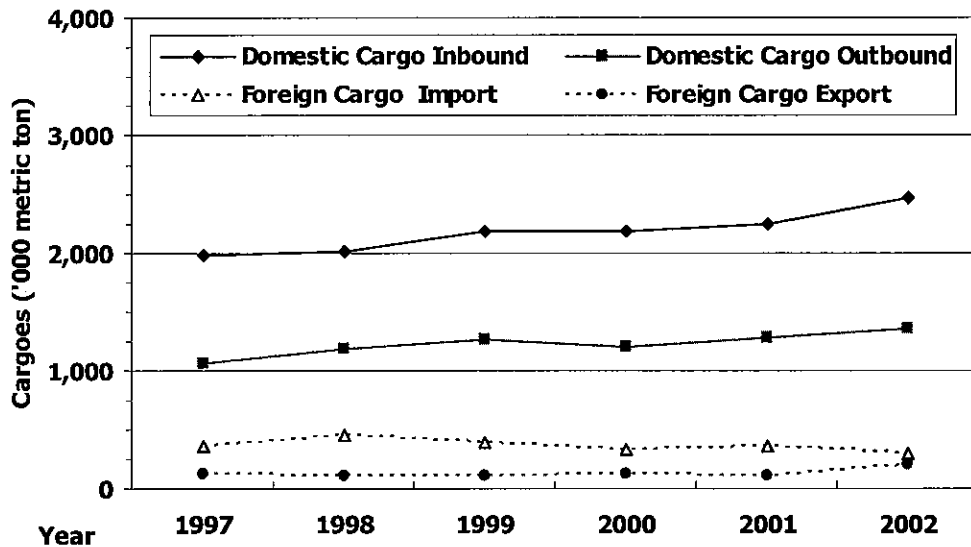


FIGURE 9.2-9 PAST TREND OF CARGO THROUGHPUT AT CDO PORT

Figure 9.2-10 shows the containerization trend at CDOSP. It is generally pointed out that containerization trend is now progressing. But containerization trend in case of the foreign cargo is still low level.

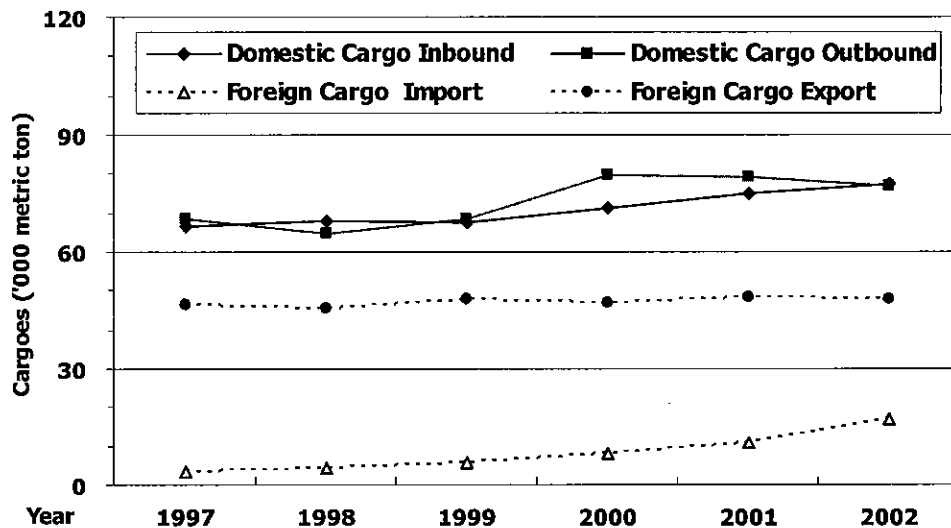


FIGURE 9.2-10 CONTAINERIZATION TREND AT CDO SEAPORT

ii. Mindanao International Container Port (MICP)

In Tagoloan, PHIVIDEC⁵ Industrial Authority (PIA) has constructed the Mindanao International Container Port (MICP) together with PHIVIDEC Industrial estate. This port will be scheduled to open in sometime January 2004 and will be fully operated at around 2010. Most of the containerized cargo at existing CDO Seaport will be transferred to the new container port, when it opens.

⁵ Philippine Veterans Investment Development Corporation

iii. Cargo Generation Model

Number of cargo at CDOSP is forecasted by using the elasticity of cargo growth to the GDP growth in the Philippines as following formula:

$$CV^t = CV^{02} \times \alpha \times GGR$$

Where

CV^t : Cargo Volume in Future Year t

CV^{02} : Cargo Volume in 2002

α : Elasticity of Cargo Growth to GRDP

GGR : GDP Growth Rate

In this study, the following input data is used for the forecast:

a. Elasticity Value⁶

| | | | |
|--------------------|----------|------------|---------|
| Domestic - Inbound | : 1.157 | - Outbound | : 1.169 |
| Foreign - Import | : -1.360 | - Export | : 2.003 |
| Both - Incoming | : 0.454 | - Outgoing | : 1.263 |

b. Growth Rate of GDP

| Term | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|---------------|-----------|-----------|-----------|-----------|
| Annual Growth | 4.2% | 4.0% | 3.8% | 3.6% |

c. Growth Rate of Cargo

| Term | | 1999-2004 | 2005-2010 | 2011-2016 | 2017-2022 |
|----------|----------|-----------|-----------|-----------|-----------|
| Domestic | Inbound | 4.9% | 4.6% | 4.4% | 4.2% |
| | Outbound | 4.9% | 4.7% | 4.4% | 4.2% |
| Foreign | Import | -5.7% | -5.4% | -5.2% | -4.9% |
| | Export | 8.4% | 8.0% | 7.6% | 7.2% |
| Both | In | 1.9% | 1.8% | 1.7% | 1.6% |
| | Out | 5.3% | 5.1% | 4.8% | 4.5% |
| Total | | 3.6% | 3.4% | 3.3% | 3.1% |

d. Results of Forecast

As a result, total number of cargo is expected to grow from 2.96 million metric ton (m.t.) in 2002 to 4.12 million m.t. in 2010, 5.33 million m.t. in 2016, and 6.88 million m.t. in 2022.

⁶ Average Annual Growth Rate in '97-'02: Domestic/Inbound=4.07% ($R^2=0.692$), Domestic/Outbound=4.11% ($R^2=0.831$), Foreign/Import=-4.78% ($R^2=0.453$), Foreign/Export=7.05% ($R^2=0.294$), Both/Incoming=1.60% ($R^2=0.808$), Both/Outgoing=4.44% ($R^2=0.855$), Total=3.03% ($R^2=0.849$)

TABLE 9.2-6 PROJECTION OF CARGO AT CAGAYAN DE ORO SEAPORT

| Item | | 2002 | 2010 | 2016 | 2022 |
|---------------|----------|-------|-------|-------|-------|
| Domestic | Inbound | 1,100 | 1,587 | 2,054 | 2,623 |
| | Outbound | 1,365 | 1,976 | 2,564 | 3,284 |
| Foreign | Import | 301 | 191 | 139 | 103 |
| | Export | 198 | 369 | 573 | 870 |
| Both | Incoming | 1,401 | 1,778 | 2,193 | 2,726 |
| | Outgoing | 1,562 | 2,344 | 3,137 | 4,153 |
| Annual Total | | 2,963 | 4,122 | 5,330 | 6,879 |
| Daily Average | | 9.9 | 13.7 | 17.8 | 22.9 |

Unit: '000 Metric Ton, Data: 2002=Philippine Ports Authority, 2010/16/22=Study Team Estimates

iv. Cargo Containerization Model

The generated cargo volume will then classified into the bulk cargo and containerized cargo. The containerization ratio is determined the following formula:

FORMULA OF CONTAINERIZATION RATIO

| Item | | Formula | Correlation Coefficient |
|----------|----------|------------------------|-------------------------|
| Domestic | Inbound | $Y = 2.251 X + 63.020$ | 0.899 |
| | Outbound | $Y = 2.780 X + 63.153$ | 0.657 |
| Foreign | Import | $Y = 2.589 X - 0.960$ | 0.903 |
| | Export | $Y = 0.475 X + 45.965$ | 0.979 |

CONTAINERIZATION RATE BY YEAR

| Item | | 2002 | 2010 | 2016 | 2022- |
|----------|----------|------|------|------|-------|
| Domestic | Inbound | 77% | 90% | 90% | 90% |
| | Outbound | 77% | 90% | 90% | 90% |
| Foreign | Import | 17% | 35% | 51% | 66% |
| | Export | 49% | 53% | 55% | 58% |

Note: Containerization rate is assumed to be not exceeding 90%

v. Containerization Cargo Sharing Model

There are two (2) ports for containerization ports: one is the existing CDOSP and the other is newly constructed MICP. According to the feasibility study of the MICP, the containerization cargo share was assumed as follows:

CONTAINERIZATION CARGO SHARING

| Year | | 2010 | | 2022 | |
|----------|----------|-------|------|-------|------|
| Port | | CDOSP | MICP | CDOSP | MICP |
| Domestic | Inbound | 50% | 50% | 50% | 50% |
| | Outbound | 50% | 50% | 50% | 50% |
| Foreign | Import | 10% | 90% | 10% | 90% |
| | Export | 10% | 90% | 10% | 90% |

This means that the foreign containerized cargos are mainly used for the MICP while the domestic containerized cargos are equally used for existing CDOSP and MICP.

vi. Diversion from Iligan Port

When the new MICP is completed, some of containerized cargoes of Iligan Port are expected to divert from Iligan Port to MICP.

According to the feasibility study for Mindanao International Container Port, about 35 % of container cargo of Iligan Port was assumed to be diverted. In this study, it is utilized same diversion rate as follows:

DIVERSION FROM ILIGAN PORT

| Year | | 2010 | | 2022 | |
|----------|----------|-------------|------|-------------|------|
| Port | | Iligan Port | MICP | Iligan Port | MICP |
| Domestic | Inbound | 65% | 35% | 65% | 35% |
| | Outbound | 65% | 35% | 65% | 35% |
| Foreign | Import | 65% | 35% | 65% | 35% |
| | Export | 65% | 35% | 65% | 35% |

vii. Conversion from Metric Ton and TEU and Empty Container Ratio

The container cargo volume can be measured both metric ton (MT) and twenty-foot-equivalent unit (TEU). In this study, it is used that one TEU is equivalent to 12 tons.

The empty container ratio is assumed to be 10 percent to laden containers.

viii. Cargo Allocation Model

Cargo demand in each traffic zone is estimated from the projected cargo demand in the influence area by applying cargo allocation model. This model is expressed as follows:

$$CV^t_i = CV^t \times GZP_i / \Sigma GZP_i$$

Where,

CV^t : Volume of Cargo in Target Year t and Zone i

CV^t_i : Volume of Cargo in Target Year t

GZP_i : Gross Zonal Product in Zone i

ix. Result of Cargo Demand

The result of cargo demand in Cagayan de Oro Seaport, Mindanao International Container Port, and Iligan Port is shown in Table 9.2-7. Detailed cargo demand of those ports is shown in the Appendixes.

TABLE 9.2-7 PROJECTION OF CARGO AT THREE MAJOR PORT

| Item | | Volume of Cargo | | | | Growth Rate (%) | |
|-------------|-----------------------------|-----------------|-------|-------|-------|-----------------|---------|
| | | 2002 | 2010 | 2016 | 2022 | '02-'10 | '10-'22 |
| CDO Port | Bulk (MT '000) | 912 | 655 | 785 | 988 | -4.1 | 3.5 |
| | Container (MT '000) | 2,051 | 1,629 | 2,117 | 2,716 | -2.8 | 4.4 |
| | Container (TEU '000) | (171) | (136) | (176) | (226) | | |
| MICP | Bulk (MT '000) ⁷ | - | 1,041 | 1,460 | 2,047 | - | 5.8 |
| | Container (MT '000) | - | 1,975 | 2,605 | 3,405 | - | 4.6 |
| | Container (TEU '000) | | (165) | (217) | (284) | | |
| Iligan Port | Bulk (MT '000) | 40 | 44 | 56 | 72 | 1.2 | 4.2 |
| | Container (MT '000) | 234 | 257 | 333 | 425 | 1.2 | 4.3 |
| | Container (TEU '000) | (20) | (21) | (28) | (35) | | |

Data: 2002=Philippine Ports Authority, 2010/16/22=Study Team Estimates (except MICP Bulk)

9.2.4 Vehicle Trip

The vehicle trips in the Metro Cagayan de Oro Area are estimated by converting the passenger trips and cargo flow into equivalent number of vehicle traffic.

As shown in Table 9.2-8, the total vehicle trips in the Metro Cagayan de Oro Area, by using average occupancy and loading weight at present, is estimated to be 753 thousand trips per day in 2022, which will be about 2.4 times of the current demand. Among them, the growth rate of the private car and cargo truck trips will be relatively high as the whole projection period considered, although growth rate of jeepney trips will be higher than private car trips in short term. Therefore, the modal share of private car to the total vehicle trips will be remained almost constant level as around 55% to 57% during the projection period.

TABLE 9.2-8 TOTAL VEHICLE TRIPS IN METRO CAGAYAN DE ORO

| Vehicle Type | Vehicle Trips | | | | Growth Ratio | | Average Growth Rate | |
|------------------|---------------|---------|---------|---------|--------------|---------|---------------------|---------|
| | 2003 | 2010 | 2016 | 2022 | '03-'10 | '03-'22 | '03-'10 | '10-'22 |
| Private Vehicles | 177,720 | 236,350 | 319,940 | 429,290 | 1.33 | 2.42 | 4.2% | 5.1% |
| Jeepney | 108,400 | 155,960 | 196,220 | 252,720 | 1.44 | 2.33 | 5.3% | 4.1% |
| Bus | 3,050 | 4,200 | 5,050 | 6,170 | 1.38 | 2.02 | 4.7% | 3.3% |
| Truck | 25,270 | 36,910 | 49,260 | 65,080 | 1.46 | 2.58 | 5.6% | 4.8% |
| Total | 314,440 | 433,420 | 570,470 | 753,260 | 1.38 | 2.40 | 4.7% | 4.7% |

⁷ MICP Bulk: MICP's Second Phase Project Feasibility Study Report