

CHAPTER 2

REVIEW OF THE FEASIBILITY STUDY

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2.1 Background of the Study

2.1.1 General Description

This section reviews the prevailing Socio-Economic and transportation conditions in Oman as well as in the Batinah Region using the latest reported statistics in the 1994 Yearbook of Statistics published by the Ministry of Development. The discussion is made with reference to what was reported in the Feasibility Study so that any discrepancies can be discussed and their effects if any on the future traffic demand forecasting be examined.

Information on traffic demand on the existing road network has been gathered from both on-site survey of the Batinah Highway by the Study Team in January 1996 and by DGR at fixed traffic census locations.

2.1.2 Socio-Economic and Transportation Conditions

(1) Economic Conditions

Table 2.1 shows an updated table of the GDP of Oman by sector for the last ten years from 1985 to 1994. Total GDP output has increased from 3,454 million RO in 1985 to 4,346 million RO by 1994, an increase of about 30% over the last 10 years. Except for 1986 and 1988 which had registered a decline in total GDP, there has been positive growth in total GDP in Oman since 1985. This increasing trend can be better seen in the graphical representation in Figure 2.1.

The GDP growth rates over the last 10 years have been rather erratic, registering negative growth in 1986, 1988, 1991 and 1993. These 4 years corresponded to years where oil revenue dropped due to lower market prices for crude oil. The year 1990 on the other hand registered a very high annual growth rate of as much as 25%. 1993 had a negative growth of -1.2%, but 1994 began to show a positive growth of 1.2%. Examining the average annual growth rate over the last 10 years from 1985-1994, (Table 2.1) the GDP has achieved an average growth of 3.62% a year. The average annual growth rate for the last 5 years (1990-1994) being faster at 6.03% than that of the previous 5 years (1985- 1989) at 1.26%.

Oman's national output was made up of 3.3% from the primary sector, 47.4% from the secondary sector and 49.3% from the tertiary sector in 1994. (See Table 2.1) The secondary sector is chiefly contributed by petroleum and other mining activities. As can be seen in Figure 2.1, the primary sector remains a lesser contributor to the GDP, while the secondary sector is growing but rather unevenly due to dominance of oil sub-sector. The tertiary sector shows a fairly steady growth over the last ten years.

Table 2.1: Gross Domestic Product in Current Prices in Oman, 1985-1994

| Sector | (Unit: Million RO) | | | | | | | | | |
|--|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 1. Primary Sector | 93.7 | 95.9 | 105.4 | 125.6 | 117.1 | 133.8 | 143.9 | 143.7 | 143.9 | 147.1 |
| - Agriculture & Fishing | 93.7 | 95.9 | 105.4 | 123.6 | 117.1 | 133.8 | 143.9 | 143.7 | 143.9 | 147.1 |
| 2. Secondary Sector | 2,045.2 | 1,456.6 | 1,705.0 | 1,490.8 | 1,769.5 | 2,557.6 | 2,054.7 | 2,253.8 | 2,105.4 | 2,094.5 |
| - Crude Petroleum & Natural Gas/Mining | 1,683.9 | 1,072.4 | 1,413.0 | 1,202.1 | 1,478.6 | 2,002.2 | 1,669.2 | 1,826.8 | 1,634.2 | 1,629.4 |
| - Manufacturing | 82.3 | 103.1 | 111.5 | 122.7 | 141.0 | 152.4 | 168.3 | 188.4 | 220.2 | 229.6 |
| - Electricity & Water | 36.8 | 40.3 | 43.5 | 40.0 | 43.9 | 59.7 | 62.7 | 57.3 | 59.2 | 60.5 |
| - Construction | 242.2 | 220.8 | 137.0 | 126.0 | 106.0 | 123.3 | 154.5 | 181.3 | 191.8 | 175.0 |
| 3. Tertiary Sector | 1,314.9 | 1,267.9 | 1,192.2 | 1,305.3 | 1,356.3 | 1,579.3 | 1,706.8 | 1,950.3 | 2,044.6 | 2,104.2 |
| - Wholesale/Retail | 428.0 | 383.2 | 327.3 | 388.8 | 405.1 | 468.5 | 540.6 | 614.8 | 661.3 | 661.7 |
| - Transport/Comm. | 99.6 | 103.4 | 97.7 | 108.3 | 113.5 | 129.3 | 146.7 | 160.8 | 174.4 | 205.3 |
| - Banking/Finance/ & Real Estate | 295.9 | 281.2 | 260.3 | 269.4 | 291.5 | 354.7 | 343.5 | 374.1 | 411.1 | 437.8 |
| - comty/personal services | 36.0 | 38.5 | 40.4 | 45.7 | 49.1 | 57.1 | 71.5 | 75.5 | 84.6 | 89.1 |
| - Government Services | 477.9 | 495.8 | 509.9 | 535.2 | 548.7 | 658.6 | 669.5 | 772.5 | 767.6 | 784.1 |
| - Adjustment for Duties | (22.5) | (34.2) | (43.4) | (42.1) | (51.6) | (88.9) | (65.0) | (47.4) | (54.4) | (73.8) |
| Total | 3,453.8 | 2,800.4 | 3,002.6 | 2,919.7 | 3,242.9 | 4,050.7 | 3,905.4 | 4,347.8 | 4,293.9 | 4,345.8 |
| Growth Rate | | -18.9% | 7.2% | -2.8% | 11.1% | 24.9% | -3.6% | 11.3% | -1.2% | 1.2% |
| Share of Primary Sector | 2.7% | 3.4% | 3.5% | 4.2% | 3.6% | 3.3% | 3.7% | 3.3% | 3.4% | 3.4% |
| Share of Secondary Sector | 59.2% | 51.3% | 56.8% | 51.1% | 54.6% | 57.7% | 52.6% | 51.8% | 49.0% | 48.2% |
| Share of Tertiary Sector | 38.1% | 45.3% | 39.7% | 44.7% | 41.8% | 39.0% | 43.7% | 44.9% | 47.6% | 48.4% |
| Oil Sector | 48.8% | 38.3% | 47.1% | 41.2% | 45.6% | 49.4% | 42.7% | 42.0% | 38.1% | 37.5% |
| Non-Oil Sector | 51.2% | 61.7% | 52.9% | 58.8% | 54.4% | 50.6% | 57.3% | 58.0% | 61.9% | 62.5% |

Source: 1994 Statistical Yearbook

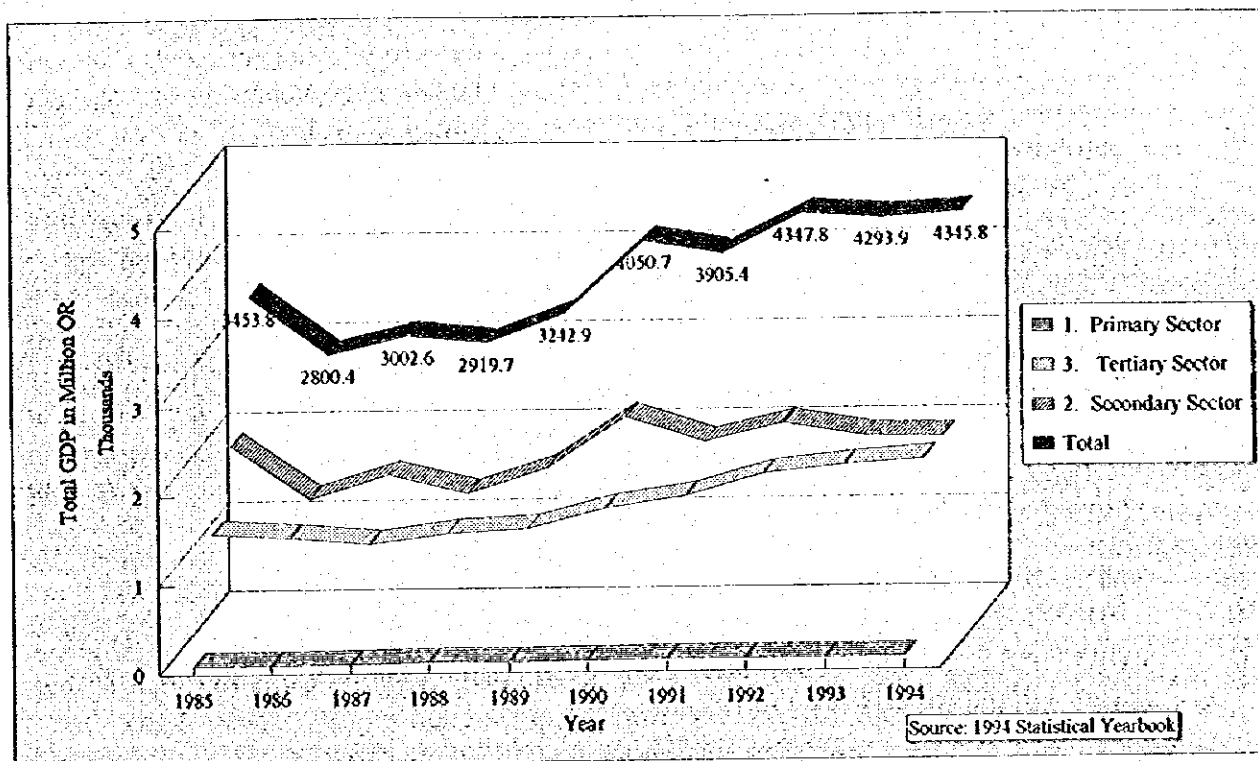


Figure 2.1: GDP Growth Trend of Oman by Sectors from 1985-1994

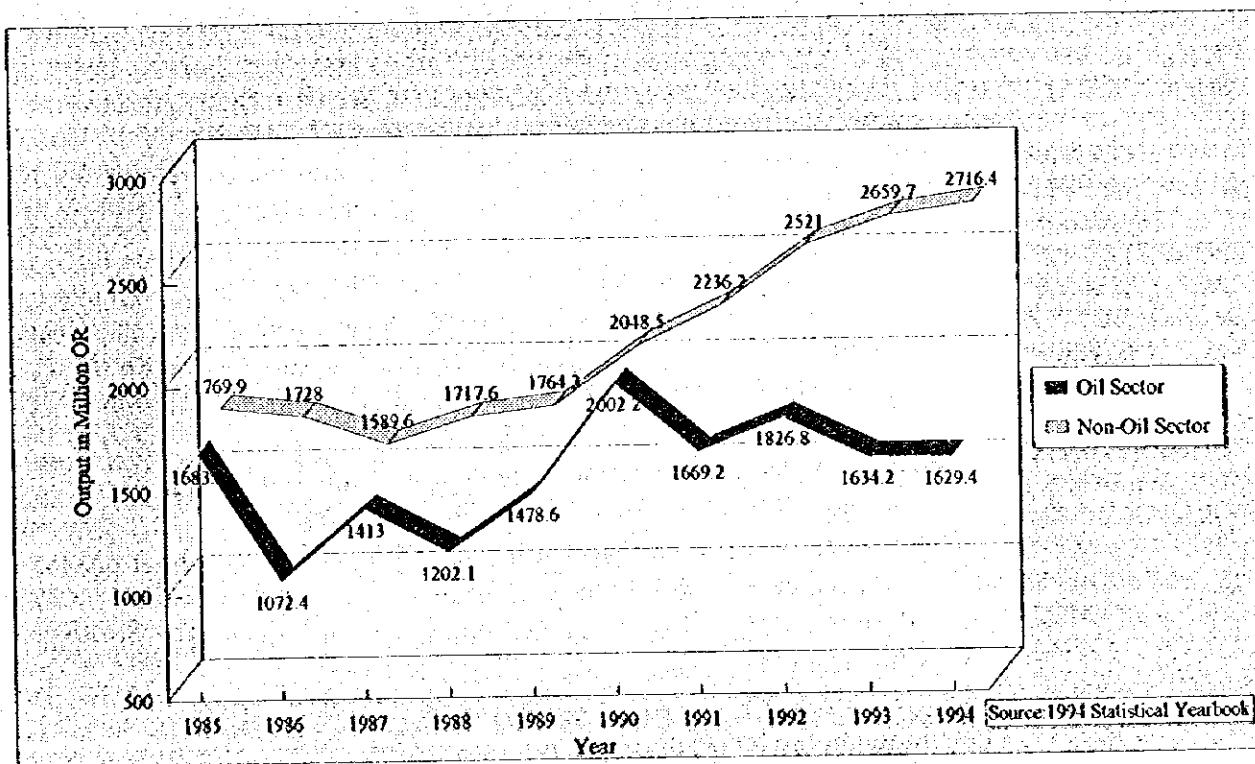


Figure 2.2: Growth Trend of Oil and Non-oil Sectors, 1985-1994

To analyze the growth performance of the other sub-sectors in the economy, the GDP outputs are divided into oil and non-oil sectors. The Omani economy has been heavily dependent on oil export since the 1970's. As shown in Table 2.1, the oil sector contributed an average of about 43% to the national economy in the last 10 years. The national policies adopted by the Sultanate in recent years have been to reduce this excessive dependency on oil while at the same time to encourage growth in other sectors of the economy, notably, the service industry and manufacturing industries.

The share of oil industry to the national economy has in fact declined since 1993. In 1994, oil industry contributed only 37.5% to the total GDP while the non-oil sector increased to a share of 62.5%. (See Table 2.1) The changing trend can be better seen in Figure 2.2. The non-oil sector has shown a steadily increase in real values from 1,589 million RO in 1987 to a high of 2,716 million RO in 1994.

The per capita GDP in 1993 (where population census figures show a total population of 2,018,074 in Oman) was 2,153.9 RO (or at US\$5,668 at a rate of 1RO=US\$2.63). Per capita GDP for Oman has increased from 1,876 RO in 1980 to 2,644 RO in 1985 but declined slightly to 2,154 RO in 1993.

At the time of this reporting the GDP figures for 1995 are not available. However, in the 4th Five Year Development Plan (1991-1995), the government estimated a GDP of 4,777 million RO for 1995. Assuming this has been achieved, it will mean a growth of about 10% from 1994's GDP of 4345.8 million RO. Considering the sluggish world economy in 1995 and the recovered growth trend for 1994 of 1.2%, the 1995 GDP in Oman may assume a more moderate rate of 5-6% rather than the 10% suggested above.

The 5th Five Year Plan has focused on a number of policies, among which are to diminish the recurrent deficit, to develop human resource, encourage private sector participation, economic diversification into non oil sectors. The oil sector is envisaged to further reduce its share to 32% from the present 36%. In the 5th Five Year Plan budget, allocation amounting to 272 million RO was set aside for human resource development programs. A further 30 million RO was allocated to provide soft loan support for sectors like industry, tourism, agriculture and fishery, education, health and handicrafts.

The future economic growth for Oman will therefore depend on the following factors:

1. A steady demand and stable price for crude oil in the global market,
2. A successful human resource development program to provide skilled labour needed to expand the other secondary sub-sectors, such as manufacturing,
3. A steady growth in the tertiary sector, to be encouraged by the government for more active participation from the private sector.

(2) 1993 Population in the Sultanate

The 1993 National Population and Housing Census was the first national scale census in Oman. The Feasibility Study conducted in 1994 has used the preliminary population census results announced in December 1993 when the final census results were still being

processed at that time. The final results of this important census were finally published in the Statistical Yearbook of 1994.

The 1993 Census reported a total national population of 2,018,074 persons in Oman as of December 1993. Out of these, 73% are Omani and 27% are foreign nationals. Population is not evenly distributed, as can be expected. The capital region of Muscat and Batinah Region alone accounted for 55.2% of the total population. The distribution of the 1993 population by region is shown in Figure 2.3 below. The Batinah Region has in fact overtaken the Muscat Region with a higher population of 564,677 persons. With a much larger land area, 12,500 sq.km compared to only 3,500 sq.km in Muscat, the population density in Batinah is however only 45.2 pp/sq.km compared to 156.9 pp/sq.km in Muscat.

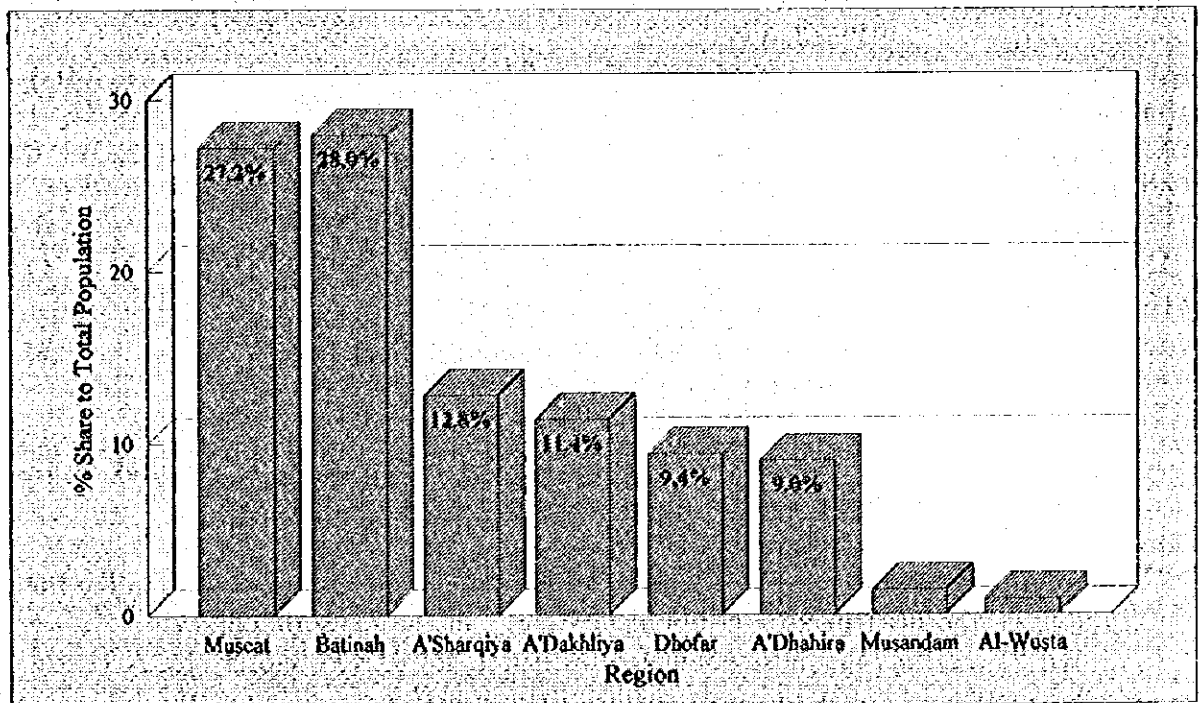


Figure 2.3: Population Distribution by Region in Oman, 1993.

The total population of Oman as of 1993 is reported as 2,018,074 compared to the figure of 2,017,591 reported in the initial estimate and used in the Feasibility Study. This discrepancy for the total population however is too negligible, at only 0.02%, to cause any concern.

Examining the population distribution pattern by region, however, there is a slight over-estimation of 3.7% for the Muscat Region while under-estimations for the other regions in the country. (Table 2.2)

Nevertheless, the discrepancies of population by region between the final census results and the initial estimates are within the acceptable limit of about 5%. For the Batinah Region, the discrepancy is very small at only 1.2%.

Table 2.2: Population in the Sultanate By Region, 1993

| Region | 1993 Census Population** | % Share | Initial Estimates* | % Share (discrepancy) |
|------------|-----------------------------|---------|-----------------------|--------------------------|
| Muscat | 549,150 | 27.2% | 622,506 | 30.9%(-3.7%) |
| Batinah | 564,677 | 28.0% | 538,763 | 26.7%(+1.3%) |
| A'Sharqiya | 258,344 | 12.8% | 247,551 | 12.3% (+0.5%) |
| A'Dhahira | 181,224 | 9.0% | 169,710 | 8.4% (+0.6%) |
| Musandam | 28,727 | 1.4% | 27,669 | 1.4% (0.0%) |
| Al-Wusta | 17,067 | 0.8% | 16,101 | 0.8% (0.0%) |
| Total | 2,018,074 | 100.0% | 2,017,591 | 100.0% |

Source: **Statistical Yearbook 1994, Ministry of Development,
*JICA Feasibility Study 1994

Within the Batinah Region, there are also discrepancies on the final census figures by wilayat against the preliminary estimates used in the Feasibility Study.

Examining Table 2.3 on the population distribution pattern by wilayat in the Batinah Region, the discrepancies in population are in the range of only 2%- 5%. Sohar Wilayat remains the most populated district, followed very closely by A'Suweiq and Saham Wilayat. In terms of % share of Batinah Region's population, the differences are negligible at 0.1 to 0.2%. These discrepancies between wilayats will not affect too drastically to the distribution of trips by zones in the forecasting procedure.

Table 2.3: Population By Wilayat in Batinah Region, 1993

| Wilayat | 1993 Census Population (% share) | Initial Estimate (% share) | Discrepancy | Change (% Share) |
|----------------|--|-------------------------------|-------------|------------------|
| Sohar | 90,809 (16.1%) | 85,857(15.9%) | + 5.45% | +0.2% |
| A'Suweiq | 85,025 (15.1%) | 81,165(15.1%) | + 4.54% | - |
| Saham | 74,904 (13.3%) | 71,671(13.3%) | + 4.32% | - |
| Barka | 64,526 (11.4%) | 61,164(11.4%) | + 5.21% | - |
| A'Rustaq | 61,984 (11.0%) | 59,379(11.0%) | + 4.20% | - |
| Al Masnaah | 47,560 (8.4%) | 45,414(8.4%) | +4.51% | - |
| Shinas | 44,313 (7.8%) | 42,533(7.9%) | + 4.02% | -0.1% |
| Al Khaburah | 40,760 (7.2%) | 38,429(7.1%) | +5.71% | +0.1% |
| Liwa | 22,667 (4.0%) | 21,463(4.0%) | + 5.31% | - |
| Nakhal | 13,080 (2.3%) | 12,570(2.3%) | + 3.90% | - |
| Wadi Al Maawil | 10,423 (1.8%) | 10,630(1.9%) | - 2.0% | -0.1% |
| Al Awabi | 8,626 (1.5%) | 8,488(1.6%) | + 1.60% | -0.1% |
| Total | 564,677 (100%) | 538,763(100.0%) | + 4.59% | - |

Source: Ibid.

The average household size in the Batinah Region is in fact the highest at 6.3 persons per household (pp/hh) compared to the national figure of 5.9pp/hh. Both the Muscat region and Batinah region have higher household sizes. This will in fact reflect a relatively higher proportion of younger population in these regions which explain the fact that there are more learning institutions in these areas.

The population of Oman is very young 51.6% of the total population are in the 0-14 age group or economic non-active age groups. This is a very high percentage compared to many other countries (only 33% for Asia and 32% for the world). The present population age group distribution means that the dependency ratio (ratio of economic non-active group to active group) is rather high in Oman.

The high percentage of the lower age groups means that the country will have to spend a substantial amount of resource on education and training at present, and to follow up by creating employment as these young cohorts advance to the economic active age groups and joining the labour force in another 10 to 15 years time.

Table 2.4: Average Household Size by Region, 1993

| Region | Total Population | Number of Households | Average HH Size (persons) |
|--------------|------------------|----------------------|------------------------------|
| Muscat | 549,150 | 89,106 | 6.2 |
| Al-Batinah | 564,677 | 89,259 | 6.3 |
| Musandam | 28,727 | 7,942 | 3.6 |
| A'Dhahira | 181,224 | 30,685 | 5.9 |
| A'Dakhliya | 229,791 | 38,317 | 6.0 |
| A'Sharqiya | 258,344 | 54,085 | 4.8 |
| Al-Wusta | 17,067 | 3,342 | 5.1 |
| Dhofar | 189,094 | 32,110 | 5.9 |
| Total | 2,018,074 | 344,846 | 5.9 |

Source: Ibid.

Table 2.5: Age Group Distribution in Oman, 1993

| Category | Age Group | % Share |
|------------|-----------|---------|
| Omani | Below 15 | 51.6% |
| | 15-64 | 45.4% |
| | Above 64 | 3.0% |
| Total Pop. | Below 15 | 41.0% |
| | 15-64 | 56.7% |
| | Above 64 | 2.3% |

Source: 1994 Statistical Yearbook

There were a total of 670,275 active persons in the labour force in 1993. Since there were 1,144,248 persons in the economic active age group, the labour force hence represented a participation rate of 58.6%. This participation rate is low in comparison with other countries, but should see a gradual increase in future as Oman modernizes further and more women joined the labour force.

The major sectors of employment in Oman are government/public service, construction, wholesale and retail. These three sectors accounted for 53.2% of the total employment in 1993. (Table 2.6) Agriculture and manufacturing are also important sectors, employing 8.1% and 8.8% of the population respectively.

More than half of the Omani nationals in the labour force were employed in the government/public service sector (55.7%). While the non-Omani nationals in the labour

force were found mostly in construction (24.0%), wholesale and retails (18.0%) and manufacturing (13.0%).

Table 2.6: Percentage Share of Employment by Sector, 1993

| Sector | Omani Labour Force | Non Omani Labour | Total |
|-------------------------------|-------------------------|-------------------------|-------------------------|
| Agriculture/fishing | 9.3% | 9.4% | 9.4% |
| Mining/quarrying | 3.3% | 1.4% | 2.1% |
| Manufacturing | 1.8% | 13.0% | 8.8% |
| Construction | 1.9% | 24.0% | 15.8% |
| Wholesale/retails | 4.7% | 18.0% | 13.1% |
| Electricity/gas supply | 0.4% | 0.8% | 0.7% |
| Transportation/comm. | 4.7% | 3.0% | 3.6% |
| Finance/real estate | 2.4% | 2.6% | 2.6% |
| Public admin./defense | 55.7% | 6.0% | 24.3% |
| Education/Health/com services | 13.6% | 9.9% | 11.2% |
| Others | 1.8% | 8.8% | 6.2% |
| Total | 100.0% (239,980) | 100.0% (430,295) | 100.0% (670,275) |

Source: Ibid.

(3) Assessment of Effects of Updated Socio-Economic Indicators on Future Traffic Demand Forecasting

The above sections have shown that the discrepancies between the initial population estimates as reported in 1992 as a whole as well as for the Batinah Region are not significant.

In the Feasibility Study, the future projected populations up to the year 2010 were estimated based on information published in the Statistical Yearbook of 1992 as well as cross-examination in other regional studies conducted in the Sultanate. For the Sultanate, the Statistical Yearbook of 1992 reported an estimated annual population growth rate of 3.5%. In the "Batinah Regional Plan" prepared by the Ministry of Housing 1991, the population growth rate was given as 3.3% per year for the Batinah Region up to the year 2010, to a total estimated figure of 808,100.

In the Feasibility Study, the population in the Batinah Region was estimated to grow at an average annual rate of 2.4% to 808,000 person by the year 2010. With the fact that the 1993 population figure remains valid, the future estimated population will therefore not significantly affected. The future population distribution by wilayat adopted in the Feasibility Study will remain as the future population for this study.

2.1.3 Existing Transportation and Traffic Conditions

(1) Road Network

Road length in the Sultanate has steadily increased with the paved roads growing above the 4,000 km mark in 1987 and then above the 5,000 km mark in 1991. The total length of paved roads in the Sultanate in 1994 was 5,884 km. Of these, 436 km or 7.4% are dual carriageway roads. Likewise, the graded or unpaved roads network has also expanded over the years touching the 20,000 km mark by 1992 and was 23,939 km as of 1994. The percent share of paved road to the total road length remains fairly constant around 19-21%. Graded roads have continuously been upgraded to paved roads and in the capital region, doubling of number of lanes has also been conducted.

Table 2.7: Total Road Length by Type in Oman, 1986-1994

| Type of Road | (Unit:Km) | | | | | | | | |
|----------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| Paved | 3,938 | 4,127 | 4,280 | 4,611 | 4,966 | 5,203 | 5,553 | 5,753 | 5,884 |
| a.Single | 3,538 | 3,729 | 3,878 | 4,209 | 4,548 | 4,785 | 5,127 | 5,327 | 5,448 |
| b.Dual | 400 | 400 | 402 | 402 | 418 | 418 | 426 | 426 | 436 |
| Unpaved | 14,608 | 15,046 | 15,616 | 18,535 | 18,686 | 18,918 | 20,660 | 23,371 | 23,939 |
| Total | 17,546 | 19,173 | 19,896 | 23,146 | 23,652 | 24,121 | 26,213 | 29,124 | 29,823 |
| %of Paved Road | 22.4% | 21.5% | 21.5% | 19.9% | 21.0% | 21.6% | 21.2% | 19.8% | 19.7% |

Source: Ibid.

Of importance to road transportation in the capital region is the recently finished section of the Rusayl-Nizwa road (Route No.15) improvement project to a dual carriageway road from Rusayl to Fanjan for a distance of about 15 km.

There is no major new road construction in the Batinah Region since the Feasibility Study in 1994, except for some road upgrading work and the current pavement rehabilitation work of the older carriageway (coastal side) of the Batinah Highway from Bait Al Barakah to Al Khaburah.

In the Feasibility Study, the future road network used for the future trip assignment was prepared to include expected future new road constructions and road improvements. The future road network has included the expected new road links from Ibri in A'Dhahira region to A'Rustaq and Al Khaburah. It also has included road widening from A'Rustaq to Muladdah Junction (Route No.11).

Although the exact expected completion dates for the Ibri-Rustaq and Ibri-Al Khaburah Links cannot be confirmed at the moment, the feasibility study of these road links have already been completed and the detailed design works for these new roads will commence soon. It is therefore safe to assume that these two roads will be completed before 2010 as adopted in the Feasibility Study. Road widening work on some section of Route

No.11 has already been completed.

Other road facility development that will affect the detailed design of flyovers is the construction of a roundabout at Muladdah Junction currently underway and expected to be completed by next year. In the Feasibility Study, an interchange was proposed for this T-junction.

A new monument has been completed in the A'Naseem Garden Roundabout. This newly completed structure will therefore affect the type of flyover to be proposed in this Detailed Design Study. A simple type "A" flyover was proposed for this roundabout in the Feasibility Study since there was no monument at the time of study.

A pedestrian underpass facility at Al Bidayah which was proposed in the Feasibility Study has been completed. This pedestrian underpass was among the most urgent ones identified by the Feasibility Study. These are further discussed in section 2.3.

(2) Vehicle Registration

Vehicle registration or vehicle ownership has a direct bearing on trip making and hence traffic demand in a particular region. Overall, the total number of vehicles registered in the Sultanate has steadily increased from 215,266 in 1990 to 254,914 vehicles in 1992 and then to 272,843 vehicles in 1993 and 287,082 vehicles in 1994. This represented an annual increase of 7.5% over the last four years.

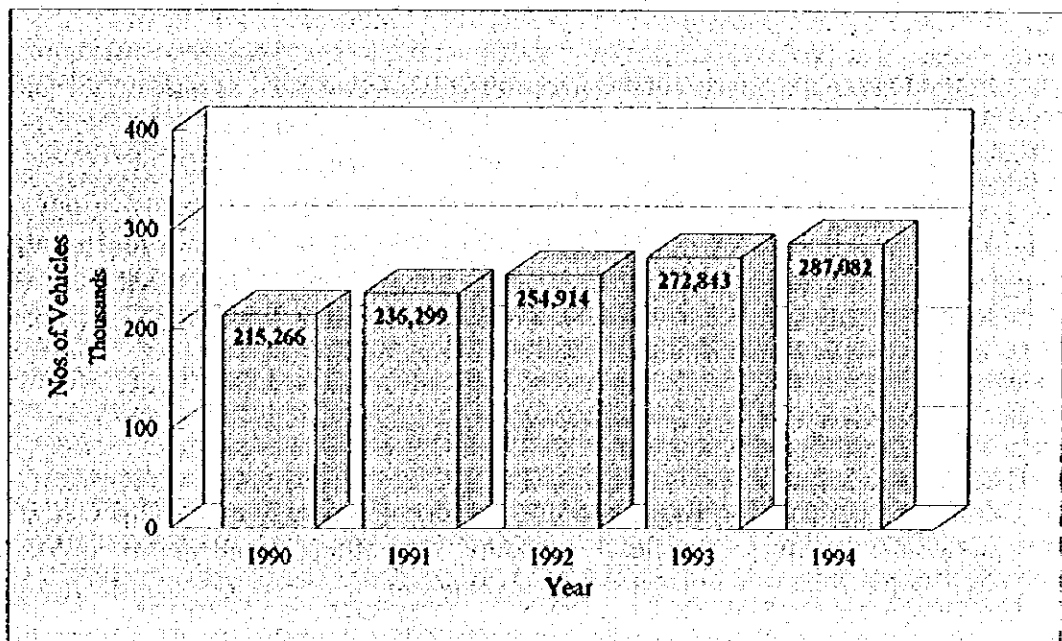


Figure 2.4: Growth Trend of Vehicle Registration in Oman, 1990-1994

Table 2.8: Vehicular Registration Trend by Region, 1992-1994

| Region | 1992 | 1994 | Ave. Annual Growth Rate |
|------------|------------------|------------------|-------------------------|
| Muscat | 122,867 (48.2%) | 142,026 (49.5%) | 7.8% |
| Batinah | 33,272 (13.1%) | 37,973 (13.2%) | 7.1% |
| Dhofar | 26,088 (10.2%) | 28,129 (9.8%) | 3.9% |
| A'Dakhliya | 23,596 (9.3%) | 25,176 (8.8%) | 3.3% |
| A'Sharqiya | 19,969 (7.8%) | 22,623 (7.9%) | 6.6% |
| A'Dhahira | 18,599 (7.3%) | 19,735 (6.8%) | 3.1% |
| Musandam | 10,523 (4.1%) | 11,420 (4.0%) | 4.3% |
| Total | 254,914 (100.0%) | 287,082 (100.0%) | 6.3% |

Source: Ibid.

In the Batinah Region, vehicle registration has increased from 33,272 vehicles in 1992 to 37,973 vehicles in 1994 or an average annual increase of 7.1%. (Table 2.8) This growth rate is slightly higher than the national figure of 6.3% but lower than 7.8% for the capital Muscat region.

This trend in vehicle ownership will most likely to continue as the capital and Batinah regions continue to enjoy increased accessibility and improved road facilities, in addition to the steadily increase in population. The Omani economy in 1993 registered a negative growth but recovered in 1994. With expected further positive economic growth in the coming years, vehicle ownership may in fact increase slightly from the 1992-1994 average annual growth rate figure of 7.1% for Batinah Region. The region can expect to experience a rate of about 7.0-8.0% a year to the year 2000.

In the Feasibility Study, the vehicle growth trend was used as one of the major indicator for estimating future traffic demand. The future vehicle ownership was estimated to increase gradually up to the year 2000 and then rapidly to 2010 before stabilizing off to form an "S" curve. For Batinah Region, an average annual growth rate of 7.9% in vehicle growth rate was assumed in the Feasibility Study for estimating the upper limit of future traffic demand. The 1992-1994 average growth rate of 7.1% for the Batinah Region as given in the above table is therefore within the expected rate of growth as assumed in the Feasibility Study.

(3) Existing Traffic Situation in Batinah Region

Judging from the site reconnaissance survey along the Batinah Highway, there is no noticeable abrupt or significant escalation of traffic demand at any of the proposed flyover locations. Although there are some variations in the rates of increase among the eight locations, generally, the increase is judged to be gradual. Traffic conditions along the highway are smooth and free-flowing. Traffic on the cross roads at Sohar in particular, however, are observed to be slightly congested during the peak hours.

Travel speed along the highway remains high except for the sections where rehabilitation work is being carried out.

Supplementary traffic surveys were conducted in this study to measure the growth in traffic demand, particularly at the 8 proposed flyover locations, in comparison to traffic demand in 1994. Supplemented with traffic census data obtained from DGR, the traffic demand in 1996 on the road network in the northern region of Oman, is shown in Figure 2.5.

2.1.4 Road Development and The Fifth Five Year Plan

The Fifth Five Year National Development Plan (1996-2000) was unveiled by the Ministry of National Economy on the 6th of January 1996. The 5th Five Year Plan is to be implemented with an increase budget of RO10,630 million over the period of 1996-2000. This is an increase of RO1,180 million from the 4th Five Year Plan. Table 2.9 shows the breakdown of this expenditure.

Table 2.9 : Budgetary Allocation in 5th Five Year Development Plan

| Category | 4th Plan | 5th Plan | Change |
|--------------------------------|--------------|---------------|---------------|
| A. Recurrent Exp. | 7,214 | 8,696 | +20.5% |
| Defense | 2,904 | 3,299 | +13.6% |
| Civil Ministries | 3,336 | 4,310 | +29.2% |
| Interest on Loans | 532 | 600 | +12.8% |
| Govt. share in PDO | 442 | 487 | +10.2% |
| B. Investment Exp. | 2,107 | 1,854 | -12.1% |
| Civil Development | 1,279 | 675 | -47.2% |
| Exploration of Gas | 42 | 42 | Unchanged |
| Govt. share in PDO | 761 | 865 | +13.67% |
| Contingency | 25 | 0 | -100% |
| Human Resource Devt. | 0 | 272 | new |
| C. Contribution Support | 129 | 80 | -37.9% |
| Private Sector | 129 | 30 | -76.7% |
| Support for soft loan | 0 | 30 | new |
| Reserve | 0 | 20 | new |
| Total | 9,450 | 10,630 | +12.5% |

Source: Ministry of Development

Due to the need to reduce the budget deficits, the Government of Oman has decided to slow down the increase in budgetary expenditure. Emphasis is also given to human resource development for the first time.

Road and other infrastructure development is being carried out under the civil development expenditure category. This category however has been reduced in the 5th Five Year Plan from a total of RO 1,279 million to RO 675 million over the next 5 years or a decrease of more than 47%. Detailed allocation by Ministry of this RO675 million is not available at present. Road development will continue in Oman as it is an important infrastructure for further economic development in the country, but its development may somehow slow down in the 5th Five Year Period.

In the 4th Plan, out of the total of RO1,279 million allocated to civil development, 30.24% or RO389.9million were spent on the infrastructure sector. Within this infrastructure sector, the Ministry of Communications (roads) received an allocation of RO60.225 million, or equivalent to 4.68% of the total infrastructure sector development expenditure for the plan period.

Assuming the allocation of 4.68% remains the same, the Ministry of Communications (roads) can only expect to receive a sum of RO33.750 million for the 5th Five Year Plan Period.

The projects to be undertaken by the Ministry of Communications (roads) in the 4th Five Year Plan report were listed as:

| | | |
|----|---|----------------|
| 1. | Dualization of certain sections of Rusail-Nizwa Road | 16.736 million |
| 2. | Muscat area flood mitigation | 5.000 million |
| 3. | Construction of 14 local roads in Muscat | 8.102 million |
| 4. | Construction of Izki and Wadi Andam local roads | 2.000 million |
| 5. | Local roads in Liwa and Shinas | 4.500 million |
| 6. | Local roads in Ibri | 2.000 million |
| 7. | Improvement and safety measures for Al Jebel Al Akhdar Road | 5.000 million |
| 8. | Major Maintenance for Seeb-Al Aqr Road | 10.580 million |

The DGR has decided to carry out repairs to all the bridges based on the findings and recommendations from the JICA Feasibility Study conducted in 1994. This is due to the urgency of such repairs to ensure safety to all the bridges as pointed out by the JICA Study.

Other infrastructure improvement projects such as construction of pedestrian underpass at Al Bidayah and improvement of Al Muladdah Junction to a roundabout are currently being carried out by DGR in recognizing their urgency on traffic safety at these two locations on the Batinah Highway. DGR has emphasized its concerns for traffic safety and improvement to all roads including the Batinah Highway.

On the implementation of the proposed flyovers and pedestrian underpasses, DGR has clarified to the study team that although the allocation in the Fifth Five Year Plan for road development has been decreased, the implementation of the flyovers may be carried out with special funding from MOC due to the scale of the project. Moreover, the proposed flyovers will be implemented in stages and this allows for MOC to implement them in accordance to their priority.

2.1.5 Land and Urban Development along the Batinah Region

In the Feasibility Study, industrial developments at Majees and A'Naseem Garden were noted and taken into account in estimating future trip generations from these two areas. Enquiries with the various ministries concerned on land development in the Batinah

Region revealed that development plans are being implemented to meet the expected increase in population in the various wifayats. However, no large scale development such as a new township or industrial estate are being planned at the moment.

2.1.6 Summary and Conclusion

In reviewing the various Socio-Economic indicators used in the Feasibility Study and those reported in the latest Statistical Yearbook 1994 by the Ministry of Development, there is no evidence of any unexpected changes.

- (1) Discrepancies in the final census population figures against the preliminary or initial estimates used in the Feasibility Study are too negligible to cause any major concern.
- (2) Economic outlook since 1992 has been on the positive side with a positive GDP growth rate of 1.2% registered for 1994. The future economic prospects for Oman should be better.
- (3) The recent reported vehicle ownership growth trend of 7.1% per year for the Batinah Region is lower than the upper limit estimate of 7.9% but comparable to the actual 7.2% used for forecasting in the Feasibility Study.
- (4) Traffic volumes obtained from actual survey reveal an average annual increase of 6.7% - 7.5% since 1994. This annual increase rate falls within the assumed future growth trend assumed in the Feasibility Study of between 4.7% to 7.9% per annum.

It is therefore safe to conclude that the various future projections or estimates on population, economic, vehicle ownership and hence future traffic demand carried out in the Feasibility Study are still valid and no major adjustment is necessary for this Detailed Design Study.

2.2 Technical Analysis and Data Collection

2.2.1 Design Standard of Highway and Bridge for Technical Analysis

Prior to the commencement of the detailed design for highway, bridges and structures, documents on design standards were collected and classified in addition to those collected in the previous feasibility study.

- (1) New design standards for Highway, Bridges and Structures by Directorate General of Roads, Sultanate of Oman.
 - a) Highway Design Manual
 - Volume - 1 (February 1994)
 - Volume - 2 (January 1994)
 - b) General Specification for Roads (April 1994)
 - (2) Existing Design Standards for Highway, Bridges and Structures
 - a) American Association of State Highway and Transportation Officials (hereinafter referred to as "AASHTO").
 - Standard Specification for Highway Bridges (Fifteenth Edition 1992)
 - A policy on Geometric Design of Highways and Streets (1990)
 - b) American Society for Testing and Materials (hereinafter referred to as "ASTM").
 - Section 1 -Iron and Steel Products
 - Section 4 -Construction by Annual Book 1995
 - c) Building Code Requirements for Reinforced Concrete (ACI 318-83, by American Concrete Institute)
 - d) Japan Road Association for Structural Analysis (February 1994)
 - I Common
 - II Super structure(Steel Bridge)
 - III Super structure (Concrete Bridge)
 - IV Sub structure
 - V Earthquake-proof
- Road Geometric Guide Line for Box Culvert

-Reinforced Earth Method

-Technical Standard for Pedestrian Over/Under Passes

(3) Reference Sources (As-built Drawing, Catalogue and Accessories, etc.)

In addition to the above design standards and specifications, as-built drawings and catalogue on structures which were constructed in Oman recently, were provided by DGR as below :

- a) Rehabilitation of Batinah Highway
 - Tender Drawings
 - Al Bidayah Pedestrian Underpass
- b) As Built Drawings
 - AQR - SEEB (Carriageway Plan & Section)
 - Rusayl - Nizwa Road Dualization Tender Drawings (Muscat Municipality)
 - Mughsayl to Dhalgut Road in Southern Region
- c) Proposal to use "COB" unit and "WEBSOL" walls (Reinforced Earth Method).
- d) Catalogue (Shoe pad, expansion joint , etc.)

2.2.2 Geological, Topographic and Flood Data

(1) Geological Data

Geological data gathered in this study include the following geological maps from the Directorate General of Minerals of Ministry of Petroleum and Minerals:

- Geological Map of the Sultanate of Oman (Scale: 1/1,000,000)
- Geological maps on Batinah Highway area
- Geological Map of Muscat (Scale: 1/250,000)
- Geological Map of Seeb (Scale: 1/250,000)
- Geological Map of Ibri (Scale: 1/250,000)
- Geological Map of Buraimi (Scale: 1/250,000)

(2) Topographical Data

Topographical data and information collected include the survey control points details from the National Survey Authority, coefficient of correction for Clarke 1880 grid system to WGS84 grid system, and underground utilities data on electricity and telephone cables.

a) **Survey Control Points Details of the National Survey Authority**

Three survey control points, namely NSA 1001, NSA 1006 and NSA 1009 of the National Survey Authority are found to be with in the study area. These survey control points are surveyed in accordance with WGS84 datum, Zone 40 UTM, CM57 grid system by the National Survey Authority , Ministry of Defense. Details of these survey control points are given in the following Table 2.10.

Table 2.10: Details of NSA's Survey Control Points

| Control Points | Latitude | | | | Longitude | | | | Ellipsoidal Height |
|----------------|----------|----|----|----------|-----------|----|----|----------|--------------------|
| NSA1001 | N | 24 | 17 | 40.23200 | E | 56 | 31 | 53.63000 | 252.370 |
| NSA1006 | N | 23 | 45 | 27.17900 | E | 57 | 34 | 31.31800 | -20.290 |
| NSA1009 | N | 23 | 35 | 0.88800 | E | 58 | 17 | 42.32100 | -11.730 |

| Control points | Northing | Easting | Orthometric Height (MSL) | OSU91A Geoid Hight |
|----------------|---------------|-------------|--------------------------|--------------------|
| NSA1001 | 2,686,913.350 | 452,463.563 | 280.789 | -28.419 |
| NSA1006 | 2,627,502.943 | 558,630.890 | 4.806 | -25.096 |
| NSA1009 | 2,608,721.920 | 632,153.001 | 16.218 | -27.948 |

Note: - Final control coordinates, WGS84 datum, Zone 40 UTM, CM57
 - OSU91A geoid height obtained by using geolab's geoid manager

b) **Coefficient of Correction for Clarke 1880 Grid System to WGS84 Grid System**

A roundabout is currently under construction at Al Muladdah for converting the junction to new roundabout as a part of the Rehabilitation Project on Batinah Highway. Topographical data of the above project are based on Clarke 1880 datum and Zone 40 Grid System. Coefficient of correction to convert the Clarke 1880 grid system to WGS84 grid system are obtained from supervising consultants for the rehabilitation project.

The Northing and Easting of Clarke 1880 grid will be changed to WGS84 grid using the following expressions:

- (Northing of WGS84) = Cn + (Northing of Clarke 1880)
 - (Easting of WGS84) = Ce + (Easting of Clarke 1880)

* Cn (Correction of northing) : +242.523

* Ce (Correction of easting) : +273.699

c) **Underground Utilities Data**

Underground utilities data are needed for preparing the survey plan and for designing diversions or protections to the existing underground utilities.

Utilities drawings on electricity supply cables are collected from the Directorate General of Electricity, Ministry of Electricity and Water. The drawings gathered cover the proposed study areas of 8 roundabouts (but except Al Aqr R/A) and 12 pedestrian underpass locations.

Telephone cables drawings are collected from the General Telecommunications Organization (GTO), Ministry of Posts, Telegrams and Telephones. Three different kind of cables are shown in these drawings, namely secondary cable, coaxial cable and fiber optic cable. These drawings also cover the proposed study areas at 8 roundabouts and 12 pedestrian underpass locations.

(3) **Flood Data**

Flood data gathered for this study include such information as the catchment area, rain gauge stations list and wadi gauge stations list from the Directorate of Surface Water, Ministry of Water Resources. The following documents were obtained:

- Catchment areas map of each wadi in Batinah plain
- Rain gauge stations list in Muscat, Southern Batinah and Northern Batinah
- Wadi gauge stations list in Muscat Governorate, Southern Batinah Region and Northern Batinah Region

2.2.3 Construction Materials Sources

For the purpose of updating and reviewing the data on material resources which had been studied in feasibility study stage, a survey on construction material resources was carried out through the first stage of this detailed design study.

Construction materials resources include:

- 1) Materials resources for construction of flyovers and pedestrian underpasses
- 2) Machinery resources for construction of flyovers and pedestrian underpasses
- 3) Contractor capability and their performances

(1) Necessary Materials for Construction of Flyovers and Pedestrian Underpasses

Necessary materials for the construction of flyover and pedestrian underpass are listed in the next table below :

Table 2.11: Necessary Materials for Construction of Flyover and Pedestrian Underpass

| No | Items | Description | Supplier |
|----|----------------------|--|--|
| 1 | Cement | Ordinary Portland Sulfate Resisting | Al Fayha Sanitary Al Kalf Trading Asian Trading Baheed Al Mardoor Cement Marketing Co. LLC Central Trading Co. LLC General Trading Co. Oman Cement LLC Oman Construction Raysut Cement Co. Salf Said Al Rashdy Salem Al Barani Building Suhail & Saud Bahwan |
| 2 | Ready Mixed Concrete | Class 16 Class 24 Class 32 Class 40 | Al Turki Cement Prod Arabian Trading Cement Marketing Co. LLC Hamdan Trading Int'l Equip & Cont Co. Nasr Arabian Co. Premix LLC Readymix Muscat LLC Saeed Al Barwany Ready Mix LLC Shanfari Trdg & Contr |

(continued on next page)

Table 2.11: Necessary Materials for Construction of Flyover and Pedestrian Underpass

| No | Items | Description | Supplier |
|----|------------------------------------|---|--|
| 3 | Aggregate for Concrete and Asphalt | | Nasr Arabian Co. Oman Concrete Products |
| 4 | Sand for Concrete | | Oriental Crusher Oriental International Co. Quorum Contractors |
| 5 | Reinforcing Bar | High-yield Mild Steel Mesh Reinforcement | Al Badriyah Trading Arab Building Materials Elco Ind & Tradg Metro Trading Oman Construction Technical Parts Technical Trdg |
| 6 | Bitumen | Prime Coat and Tack Coat, Wearing Course, etc. | Al Kahf Trading Altraest Est Khimji Ramdas Building Nasr Arabian Co. Nasser Alserkal Natco-Gulfcon Nnorthern Batna Trdg Oman Bitumen R & N Khimji LLC Shanfari Trdg Shell Mktg Suhail & Saud Bahwan Tawoos Waterproofing Wimpey Alawi |
| 7 | Form | for Concrete (wooden) for Concrete (steel) | Cement Marketing Co LLC GETCO Poly Products LLC Salalah Ents Tawoos Waterproofing |
| 8 | Bridge Equipment | Shoe (rubber) Expansion Joint Drainage (pipe put) Hand Rail Lighting (pole light) | Orient prestressing Co. United Construction Co. Mediterranean Bldg Materials Munaaoor, Amiamtit Assarain Enterprise Modern Lights & Electro Mech |

(continued on next page)

Table 2.11: Necessary Materials for Construction of Flyover and Pedestrian Underpass

| No | Items | Description | Supplier |
|---------|-----------------------------|--|--|
| 9 10 | Scaffolding Pipe Support | | Ahmed Mohsin Trdg Al Dastoor Contracting Aitraest Est Arab Equipment Cement Marketing Co. LLC GET Co. KYY Co. LLC Khinji Ramdas Mazoon United Middle East Trad Oman Holdings Int'l Co. R & N Khinji Service & Trade Suhail & Saud Bahwan Bldg |
| 11 | Prestressing | Prestress Wire, Strand Anchor Sheath | Mediterranean Bldg Materials Strabag Ag Consolidated Contractors Co. |
| 12 | Water stop | | GETCO Al-Kahf Trading |
| 13 | Water Proof Sheet | | Khinji Ramdas Tawoos Eatwproofing SPECOM |
| 14 | Sign board | | International Enterprise Voltamp Manufacturing ESSACO Enterprise Mazovn Establishment |
| 15 | Road Facility Equipment | Gird Rail Delineator Road Stud | International Enterprise Voltamp Manufacturing Mazovn Establishment |
| 16 | Underpass Equipment | Lighting Drainage | Modem Lights Electro Mechanics Tanfizat |

Borrow Pit

Borrow pits for earth materials for the construction of road is commonly established by the contractor; earth-fill materials suppliers are therefore not listed in the above table. A borrow pit can be secured at the foot of the Hajar Al Gharbi mountain range within a distance of 20 km from each project area. According to the contractor for previous road rehabilitation project along the Batinah Highway, they have tried to establish borrow pits along the highway at an interval of 10 km, however, such recommendation was refused by the Ministry of Environment due to possible damage to natural resources and disturbance to inhabitants. Therefore, at the construction stage, there is a necessity to carefully survey for an appropriate site for the borrow pit for earth materials. Existing borrow pits and possibility area for borrow pits (Distribution of Borrow Pits) are shown in figure 2.6.

Imported Materials

Imported materials include all sort of steel and metal materials, bitumen, and special equipment for constructing the bridge and underpass. Steel materials are some of the main import materials which accounted for about 15% of the total imports to Oman according to the data reported in the 1994 Statistics Year Book. Oman is an oil producing country, nevertheless, the country is importing bitumen for pavement from Saudi Arabia or Bahrain. Some contractors are importing this material directly for road construction as it is cheaper than the market price.

Tax and Duty

During the construction stage, the import of these materials is subject to Port Dues, Customs Duties, Import Duties, Landing Charges and other expenses levied by the Government of Oman. All materials cost therefore will include all the necessary tax, duties and landing cost. Priced BOQ should reflect the commercial price of each unit cost of the imported materials.

2) Machinery Resources for Construction of Flyovers and Pedestrian Underpasses

Necessary machinery for the construction of flyovers and pedestrian underpasses will depend on the construction method and scale of the individual construction items. Necessary construction machinery required for the project are selected to meet the construction planning. The principal items of construction equipment required for the project are listed in the next table.

Table 2.12: Necessary Machinery for Construction of Flyover and Pedestrian Underpass

| Work Items | Conditions | Type of Machine | Size |
|---------------------------------------|--|--|---|
| Clearing and Grubbing | Land Clearing within Right-of-way | Bulldozer Back hoe Tipper Truck | 3, 15, 21 ton 0.35, 0.6 m ³ 2t, 4, 10 ton |
| | Removal and delivery of trees | Back Hoe Crane with Truck | 0.35, 0.6 m ³ 4t 10 ton |
| Removal of Structure and Obstructions | Building | Concrete Breaker Back Hoe | 0.35, 0.6 m ³ |
| | Reinforced Concrete | Concrete Breaker Back Hoe | 0.35, 0.6 m ³ |
| | Pavement | Concrete Breaker Back hoe Tractor Shovel | 0.35, 0.6, 1.0 m ³ |
| | Safety Barrier Sign Boards Mark Post Drainage Fence Block or Masonry Wall | Back Hoe Tractor Shovel Truck with Crane Track Crane Truck Concrete Breaker | 0.35, 0.6 0.8 m ³ 0.8, 1.2, 1.5 m ³ 4, 10 ton 5, 10, 15, 20 ton 2, 4, 8, 10 ton |
| | Earth Excavation | Excavation hauling distance less than 100m Excavation hauling distance more than 100m | Bulldozer Tractor Shovel Back Hoe Tipper Truck |
| Subgrade | Embankment | Bulldozer Motor Grader Tire Roller Macadam Roller Water Sprinkler | 3, 15, 21 ton Blade W/D, 2~3m, 3~5m 8~20 ton 10~12 ton |
| | Cutting | Bulldozer Back Hoe Rock Breaker | 3, 15, 21 ton 0.35, 0.6, 1.0 m ³ |

| Work Items | Conditions | Type of Machine | Size |
|--|--------------------------------|--|---|
| Excavation and Backfiring for Structure | Foundation Excavation | Back Hoe Rock Breaker | 0.35, 0.6, 1.0 m ³ |
| | Structure Excavation | Back Hoe Rock Breaker | 0.35, 0.6, 1.0 m ³ |
| | Back Filling | Back Hoe Tractor Shovel Bulldozer Vibrator Roller Tamper | 0.35, 0.6, 1.0 m ³ 0.8, 1.2, 1.5 m ³ 3, 15, 21 ton 1, 2.5, 3~4 ton 100 kg |
| Subbase and Basecourse | | Motor Grader Tire Roller Macadam Roller Vibration Roller Water Sprinkler | B/W 2~3, 3~3.5 m 8~20 ton 10~12 ton 3~4 ton |
| Aggregate Basecourse | Class A,B,C | Motor Grader Tire Roller Macadam Roller Water Sprinkler | B/W 2~3, 3~3.5 m 8~20 ton 10~12 ton |
| Prime and Tack Coat | | Asphalt Distributor | |
| Wearing Course | Class A,B,C,D | Asphalt Finisher Macadam Roller Tire Roller | 2.4~4.0 m 10~12 ton 8~20 ton |
| Concrete for Flyover | Superstructure | Transit Mixer Ridged Crane Track Crane Concrete Vibrator Tensioning Device | 6 m ³ 15, 20 ton 20,30,80 ton |
| | Substructure | Transit Mixer Concrete Pump Concrete Vibrator Track Crane Crawler Crane | 6 m ³ 55 m ³ /h 20,30,50 ton 50,100 ton |
| Concrete for Underpass | Box culvert and Entrance | Transit Mixer Concrete Pump Track Crane Concrete Vibrator | 6 m ³ 55 m ³ /h 20,30,50 ton |
| Foundation for Substructure and Retaining Wall | Earth Pile | Earth Auger Concrete Pump Track Crane | D=0.6 m 55 m ³ /h 15,20 ton |
| Transportation | Girder Beam Heavy Equipment | Trailer Track | 20,30,50 ton 4, 8, 10,15 ton |

The above-mentioned machinery is available in the Sultanate or UAE. International contractors based in Oman have such machinery in either country. Necessary machinery will be transported to sites according to the construction schedule. The capacity and number of each machinery type are sufficient to implement the flyover and pedestrian underpass project.

3) Contractor Capability and Their Performance in the Sultanate of Oman

The total numbers of contractors who are able to construct road facilities are about ten. Six contractors out of ten are able to construct underpasses but there are actually only three contractors since there are only four pedestrian underpasses in Muscat. Regarding the construction of bridges, there are six experienced contractors in Oman. Out of these, however, only two contractors have the knowledge to construct prestressed concrete girder beams and flyovers. Most of the flyovers in Oman are constructed by two international contractors. A list of Omani contractors and their specialties are shown in the table below.

Table 2.13: List of Contractors

| Name of Company | Road | Underpass | Flyover |
|--------------------------------------|------|-----------|---------|
| Shanfari Trading & Contracting Co. | ⊙ | ○ | |
| Strabag L.L.C. | ⊙ | ⊙ | ⊙ |
| Galfar Engineering & Contracting Co. | ⊙ | ○ | |
| Consolidated Contractors Co. | ⊙ | ⊙ | ⊙ |
| Desert Line Projects L.L.C. | ⊙ | | |
| Shanfari & Partners Co. L.L.C | ⊙ | | |
| Wimpey Alawi L.L.C | ⊙ | ○ | |
| Nasr Arabian Company | ⊙ | | |
| Qurum Contractors L.L.C. | ⊙ | ⊙ | |
| Dhofar Transport Co. | ⊙ | | |

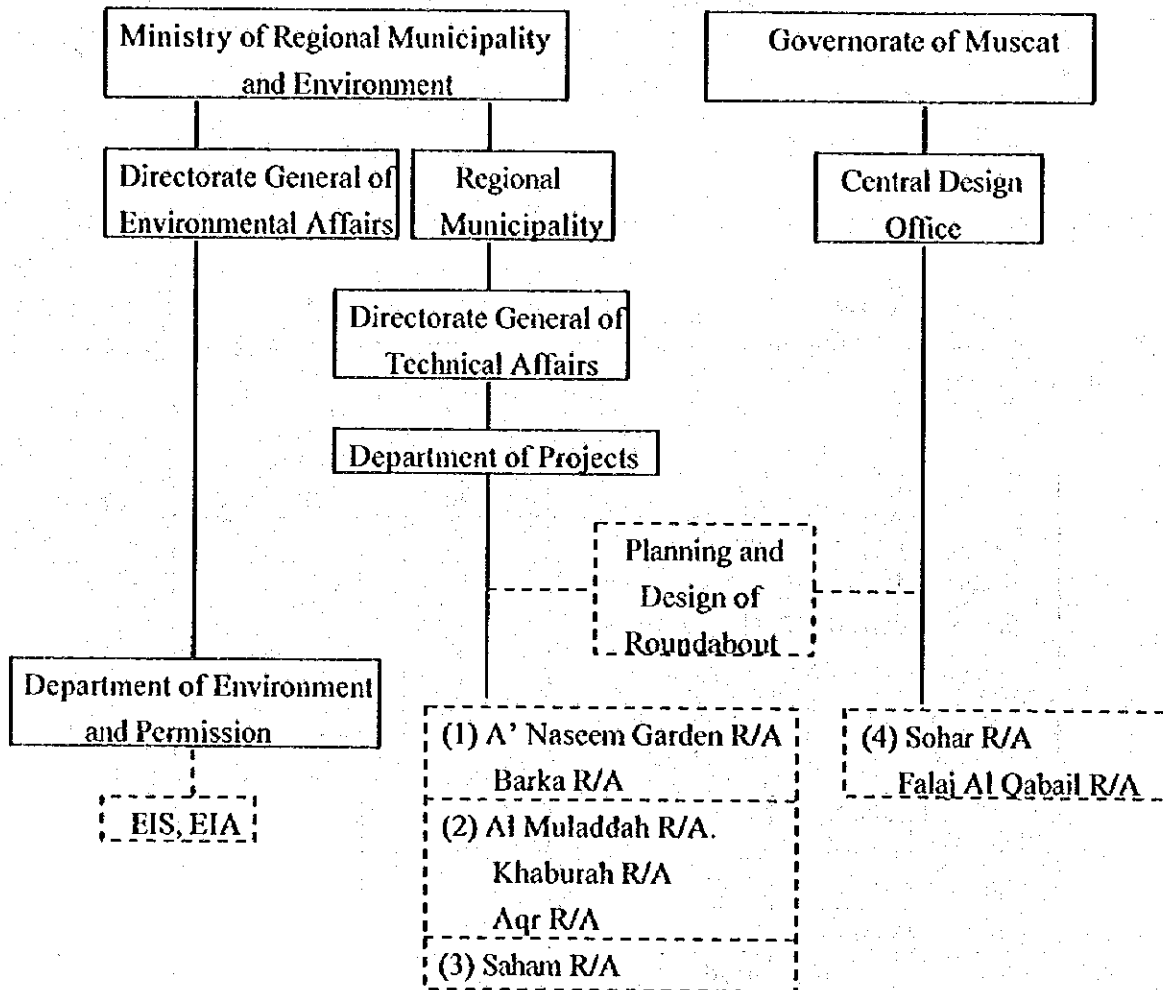
Note : ⊙ experienced
○ possible

2.2.4 Environmental Impact Assessment Study

(1) Organization Framework of Environmental Planning Authorities

The detail design study on road development projects is proceeded in the fields of aesthetic aspect and environmental considerations, so that the project indirectly involves two of the government authorities in Oman that have jurisdiction over the study roundabouts and the surrounding environment. The roundabouts along Batinah highway come under either the Technical Affairs of the Ministry of Regional municipality and Environment or Muscat

Municipality, depending on the roundabout location. The Environmental Affairs of the Ministry of Regional Municipality and Environment is given the tasks of environmental control and management for all development projects in Oman. The organization of these authorities are shown in the Figure 2-7 below:



Note: Roundabouts or Junction are maintained by (1) Barka Municipality, (2) Suweiq Municipality, (3) Saham Municipality, (4) Diwan of Royal Court, Sohar Development Office

Figure 2-7 : Organization Framework of Environmental Related Authorities

(2) Authority for the EIA on Development Projects.

The Directorate General of Environmental Affairs in the Ministry of Regional Municipality and Environment is the legal authority overseeing Environmental Impact Statement (EIS) as well as Environmental Impact Assessment (EIA) and its procedure. The Directorate has 6 departments.

The major department involved with EIA are the Department of Environment and Permission, and Department of Controlling and Monitoring. The organization of Directorate General of Environmental Affairs is given in the Figure 2-8 below:

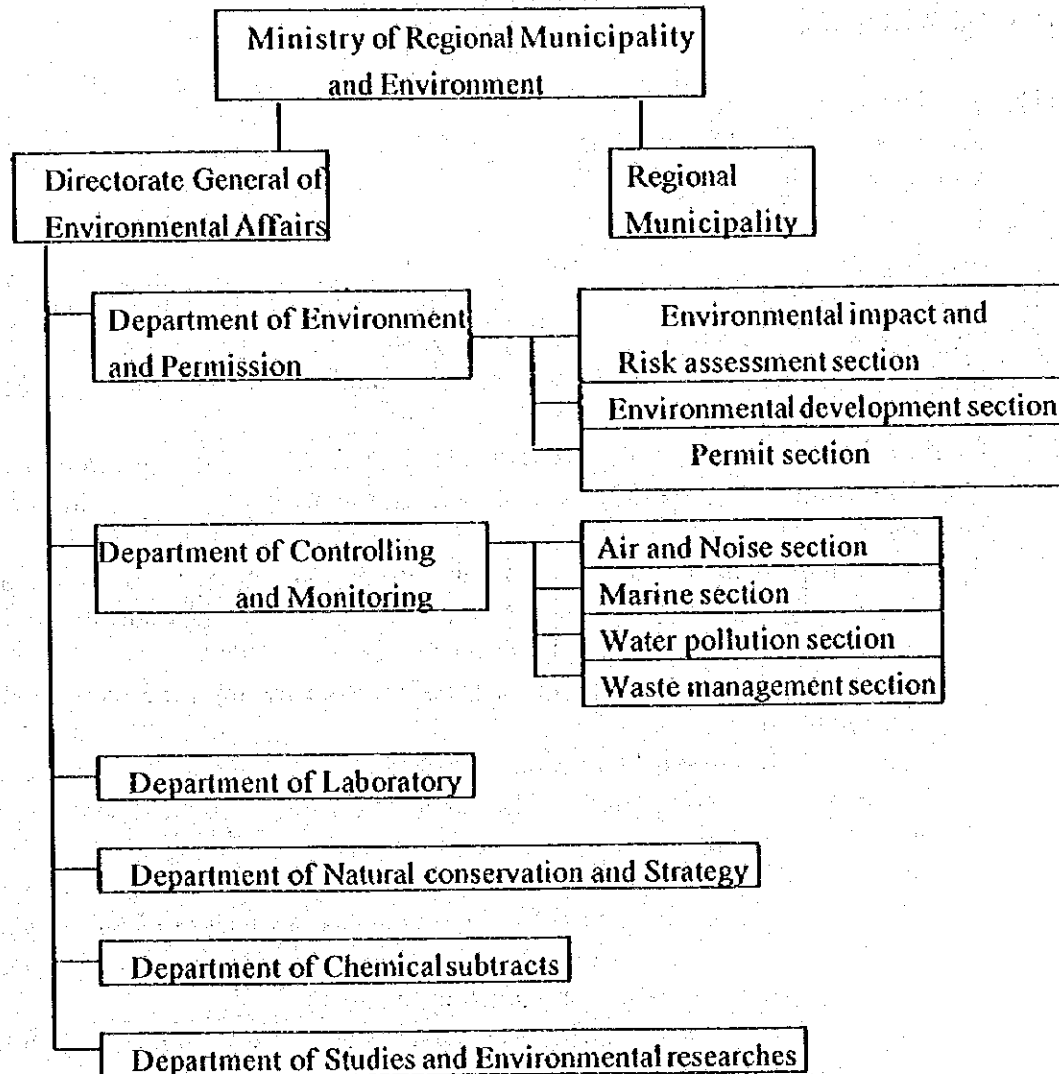


Figure 2-8 : Organization of Directorate General of Environmental Affairs

The owner of development body of a project is required to submit an Environmental Impact Statement (EIS) form to the Department of Environment and permission to obtain its approval.. The Department of Environment and Permission shall review the submitted EIS form (See Appendices IV, Table IV-2) and approved further EIA requirements if needed will be conveyed to the project development body.