

A Metropolitan Case Study
Subscriber and Traffic Forecasting
MAIN DOCUMENT

Mr. H. Leijon, ITU



UNION INTERNATIONALE DES TELECOMMUNICATIONS
INTERNATIONAL TELECOMMUNICATION UNION
UNION INTERNACIONAL DE TELECOMUNICACIONES



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1. **Introduction**

1.1 *Geographical position and national context*

Rijeka is the Yugoslavia's largest port and an important economic center of Croatia.

In the last thirty years, Rijeka has become a major shipping and trading center with highly developed industry (shipyards, oil refinery, numerous factories manufacturing a wide range of goods).

Here is the center of mighty shipping organizations, agencies and banks. Good rail, road and air communications, numerous shipping and ferry boat services, the proximity of the East Istrian coast, the Crikvenica Riviera and Kvarner Islands provide the basis for the intensive development of Rijeka as a summer resort and transit center for tourists, too. It has many cultural and educational institutions (theaters, museums, art galleries, grammar schools and university). Above the Rjecina river is the ancient castle of Trsat which provides a pleasant view of Rijeka and the Kvarner bay.

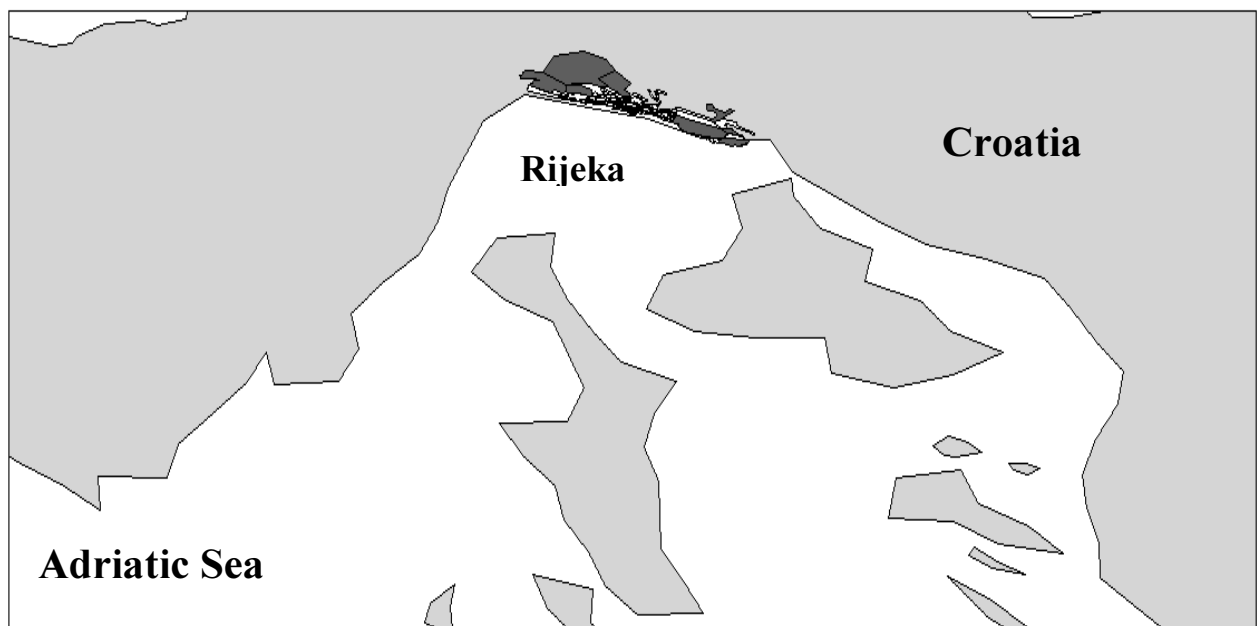
The area under investigation belongs to the North Adriatic area where both Mediterranean and continental attributes of all kinds meet.

1.2 *PTT Rijeka service area*

RO PTT Rijeka covers with its activities 14 of totally 19 districts of the region of Istra, Hrvatsko Primorje and Gorski Kotar (see Figure 1.2). This region belongs to the economically more developed regions of Yugoslavia and, regarding tourism, to the most developed one.

Regarding telephone traffic, the above-mentioned activities are very communication intensive in the national as well as the international level. This is the reason for the high average total traffic per subscriber in comparison to other regions. Seasonal characters of the telephone traffic, characterized by high offered traffic from the coastal (tourist resorts) exchanges during summer, as well as the mixture of islands and mountain regions, are typical features of the area.

Fig. 1.2 Croatia and Neighbours



1.3 *Socio-economic activities over the area under investigation*

Very important geographical positions of the area defined the past as well as present characteristics and economical functions. Until the end of the Second World War, Rijeka did not influence its suburbs and neighbouring rural areas; in that time explicit distinction between the urban city center and the rural background of Rijeka existed. After the War, according to the fast socio-economic development of Rijeka, the town outskirts expanded with some rural areas by changing its face in the fast lane into the urban one.

The present urban agglomeration has already crossed the Rijeka district border, including Opatija Riviera on the west and Crikvenica Riviera on the east side. Intensive touristic and industrial build-up on the western seaside of the Island of Krk encircles the wide metropolitan complex of Rijeka (Figure 1.3).

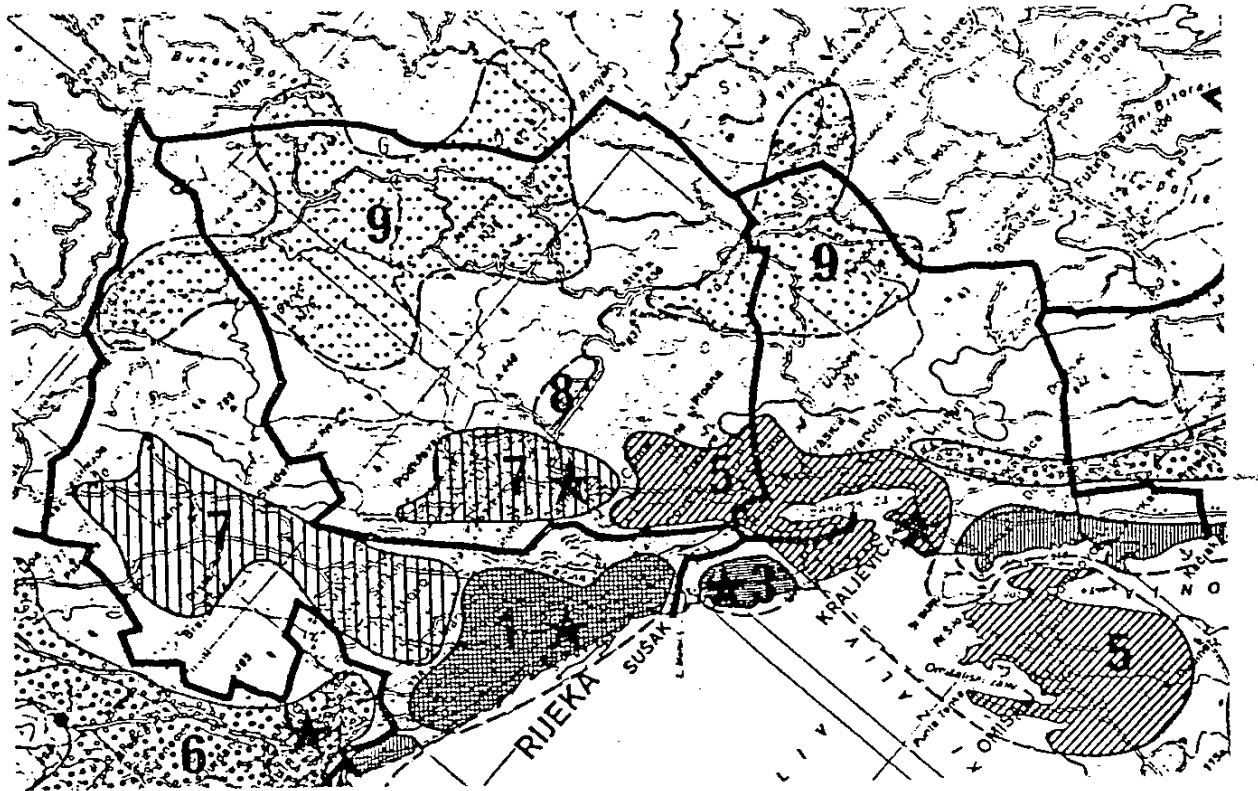













Figure 1.3
Definition of the service area according to the town planning authority plans

Types of activities over the service area to be investigated:

- 1  Polyfunctional
- 2  Residential, public works, recreation, tourism
- 3  Residential, public works, recreation
- 4  Agriculture, residential, recreation, tourism
- 5  Industry, transport, public works, residential
- 6  Residential, industry, agriculture
- 7  Residential, public works, agriculture
- 8  Sports center (automobile and flight)
- 9  Hilly sports-recreational areas
-  Border of the gravity areas
-  Centers of the gravity areas

1.4 *Basic statistical data*

Statistical data concerning the number of inhabitants, households and employees for the area under investigation and the year 1986 is given in Table 1.1.

| Traffic Area | 1986 | | |
|--------------|-------------|------------|-----------|
| | Inhabitants | Households | Employees |
| Susak | 44208 | 16277 | 19745 |
| S Kostrena | 3021 | 1305 | 3361 |
| Bakar | 1723 | 628 | 1127 |
| Total | 48952 | 17940 | 24233 |
| C | 35746 | 13088 | 48510 |
| K | 36594 | 12762 | 5330 |
| Z | 43735 | 14989 | 13462 |
| TOTAL | 166029 | 58779 | 91535 |

(N.B.: Unknown source; doubtful values)

Table 1.1 : Basic statistical data for the area under investigation

Comparative figures for subscriber main lines for selected European countries, Yugoslavia, Croatia, area covered by PTT Rijeka and area under investigation, are presented in Table 1.2.

| Object | Main telephone lines / 100 inhabitants | | |
|-----------------------|--|-------|----------|
| | 1983 | 1985 | 1990 (*) |
| Austria | 33.7 | | |
| Greece | 27.0 | | |
| Italy | 26.5 | | |
| Spain | 27.1 | | |
| Sweden | 58.2 | | |
| Switzerland | 47.1 | | |
| West Germany | 38.8 | | |
| Yugoslavia | 9.1 | 10.78 | 17.55 |
| SR Croatia | | 11.38 | 18.40 |
| PTT Rijeka | | 16.70 | 23.90 |
| Rijeka (City + Bakar) | | 24.85 | 28.90 |
| (*) planned | | | |

Table 1.2 : Comparative figures for main telephone lines (DEL)

| Traffic Area | Year 1971 | | Year 1981 | | Year 1990 | | Year 2005 | |
|--------------|-----------|-------|-----------|-------|-----------|-------|-----------|-------|
| | Inh. | Empl. | Inh. | Empl. | Inh. | Empl. | Inh. | Empl. |
| Center | 33429 | 18334 | 34602 | 22066 | 32800 | 24060 | 35500 | 25630 |
| Kozala | 26717 | 6372 | 39076 | 8113 | 44500 | 9530 | 58500 | 11510 |
| Susak | 49698 | 14209 | 52439 | 18122 | 60000 | 21460 | 90500 | 27600 |
| Zamet | 35715 | 13837 | 51219 | 17954 | 62560 | 20830 | 83200 | 22250 |

Table 1.1.(a) : Number of inhabitants and employees for the traffic areas in four points of time

General information about the development of selected entities for Yugoslavia and the District of Rijeka was depicted from appropriate Statistical Yearbooks, and presented in Table 1.3.

| Yugoslavia | | | | | | District of Rijeka | | | | | |
|------------|------------|-----------|------------|-----------|-----------|--------------------|------------|--------|------------|--------|--------|
| Year | Population | RTV | Telephones | Cars | HH | Year | Population | RTV | Telephones | Cars | HH |
| 1974 | 21,164,000 | | 1,143,000 | 1,132,799 | | 1974 | 168,800 | | 21,100 | 23,321 | |
| 1977 | 21,780,000 | | | | | 1977 | 178,100 | | | | |
| 1978 | 21,974,000 | | 1,733,000 | 2,132,327 | | 1978 | 181,300 | | 26,030 | 37,744 | |
| 1979 | 22,167,000 | | 1,913,000 | 2,259,966 | | 1979 | 184,600 | | 30,558 | 42,772 | |
| 1980 | 22,304,000 | 4,242,000 | 2,133,000 | 2,433,922 | | 1980 | 187,900 | 54,732 | 32,425 | 45,196 | |
| 1981 | 22,471,000 | 4,278,000 | 2,304,000 | 2,567,961 | 6,195,826 | 1981 | 193,000 | 54,812 | 34,656 | 43,274 | 68,224 |
| 1982 | 22,642,000 | 4,698,000 | 2,542,000 | 2,702,628 | | 1982 | 195,400 | 55,016 | 38,245 | 49,534 | |
| 1983 | 22,801,000 | 4,689,000 | 2,796,000 | 2,770,739 | | 1983 | 197,800 | 55,745 | 40,660 | 45,635 | |
| 1984 | 22,963,000 | 4,669,000 | 3,031,000 | 2,874,010 | | 1984 | 200,000 | 55,217 | 43,693 | 45,705 | |

Table 1.3 : General information of the development of population, radio-TV sets, telephone sets, passenger cars and households for Yugoslavia and the District of Rijeka

1.5 Present telecommunication network structure

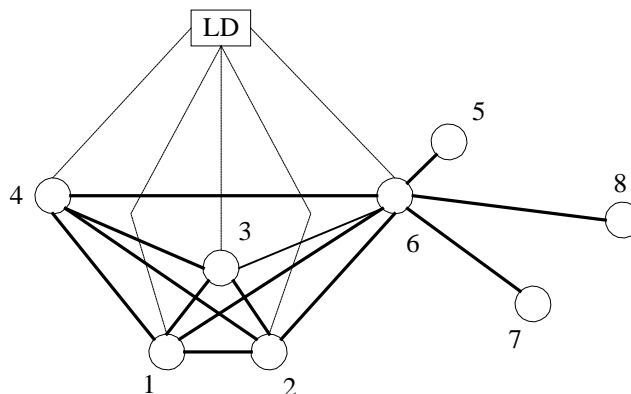
The city of Rijeka has today about 45000 subscribers connected to eight urban exchanges: Rijeka1 (R1), Rijeka2 (R2), Kozala (K), Zamet (Z), Susak1 (S1), Susak2 (S2), Kostrena (KOS), Bakar (B) and the transit exchange. All the urban exchanges are almost fully interconnected and some of them connected to the long distance transit exchange (Figure 1.4).

Exchanges R1 (step by step exchange) and R2 (ARF 50 type) are located at the same building and belong to traffic area Center (C).

Exchanges S1 (ARF 50 type) and S2 (ARE 11 type) are physically situated close to one another, both exchanges together with exchange KOS (ARK 522 type) and exchange B (ARF 102 type) constitute the traffic area Susak (S).

Exchange K (ARE 11 type) and transit exchange (ARM 201/2, ARM 201/4) are situated in the same building. Special services and manual service are provided in the above-mentioned building. Exchange K belongs to traffic area Kozala (K).

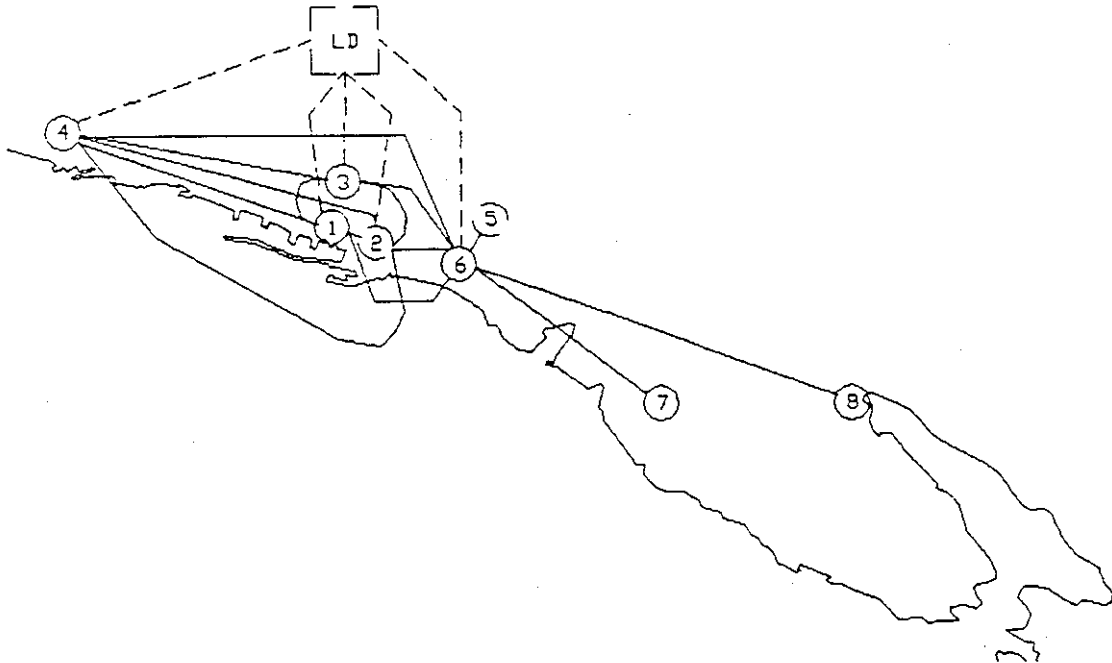
Exchange Z (ARF 102) covers the western part of the city and belongs to traffic area Zamet (Z).



(a)

Note: - Exchanges 1 (R1) and 2 (R2) are located at the same building serving the subscribers of the traffic area Center (C).

- Exchanges 5 (S1) and 6 (S2) are located close to one another, collecting all the subscribers of the traffic area Susak (S), except subscribers in zone S_AW and S_AX which are connected to exchange 7 (KOS) and subscribers in zones S_AT, S_AV which are connected to exchange 8 (B).



(b)

Note: Exchanges drawn with dashed lines (LD, 2, 5) are offset from their physical locations.

Figure 1.4 Present structure of the telecommunication network (simplified)

- Logical interconnections between exchanges (a)
- Actual geographical locations of exchanges (b)

2. **Subscriber data**

2.1 *Definition and description of the zones*

Detailed analyses concerning categories of subscribers and their distribution over the planning area dictated the identification of 125 zones characterized by homogeneous or certain mixture of different categories of subscribers.

Introduction to the planning area starts with the Figure 2.1, which defines the district of Rijeka boundary with planning zones and traffic areas defined.

The area to be investigated is situated partly along the Adriatic sea coast, including the city of Rijeka with old nucleus where a great number of subscribers' is of the business categories (offices, shops, agencies, banks, etc.), and also including the important harbour area which is near by.

Other areas are protruding into the hilly innermost regions of the district.

On the north-west, there is a fast development area characterized by small-house residential areas, mixed with small factories and workshops. This area is also tagged with the longest waiting list (see the waiting list for traffic areas Z and K).

East, north-east area from the city center is a typical residential area with only few industries.

On the other hand, the area to the south-east and far-east from the city centre is the typical industrial area with oil refinery in the S-AX and cokery in S-AV. Special attention should be paid to the zone S-AY which is the new industrial zone of Rijeka with different kinds of industries.

The area under investigation is quite large and some of the zones are pretty small, especially in the centre of the city (traffic area C), so Figure 2.2 and Figure 2.3 identify the exact shape and placement of the zones as well as the subscriber density per each zone.

2.2 *Basic subscribers' data*

The overview of the subscriber's inventory for the exchange areas over the past fifteen years is given in Table 2.1.

Table 2.2 supplements the above-mentioned graphical presentation with a list of planning zones sorted in descending order according to subscribers' density in $T = 0$. Values between 0 and 300, 301 and 600, 601 and 1000 and more than 1000 subscribers' per 6.25 HA are given in Table 2.2(a), (b) (c) and (d), respectively.

Table 2.2 is a compilation of the data base data for existing subscribers, potential subscribers (waiting list), saturation figures given by the town planning authority, area of the zones in Sq km extracted from the digitized data for the zones. The above-mentioned data are repeated in Appendix 1, in a more readable tabular form with additional information about percentages of each category of subscribers.

RIJEKA District

Villages, roads, zones

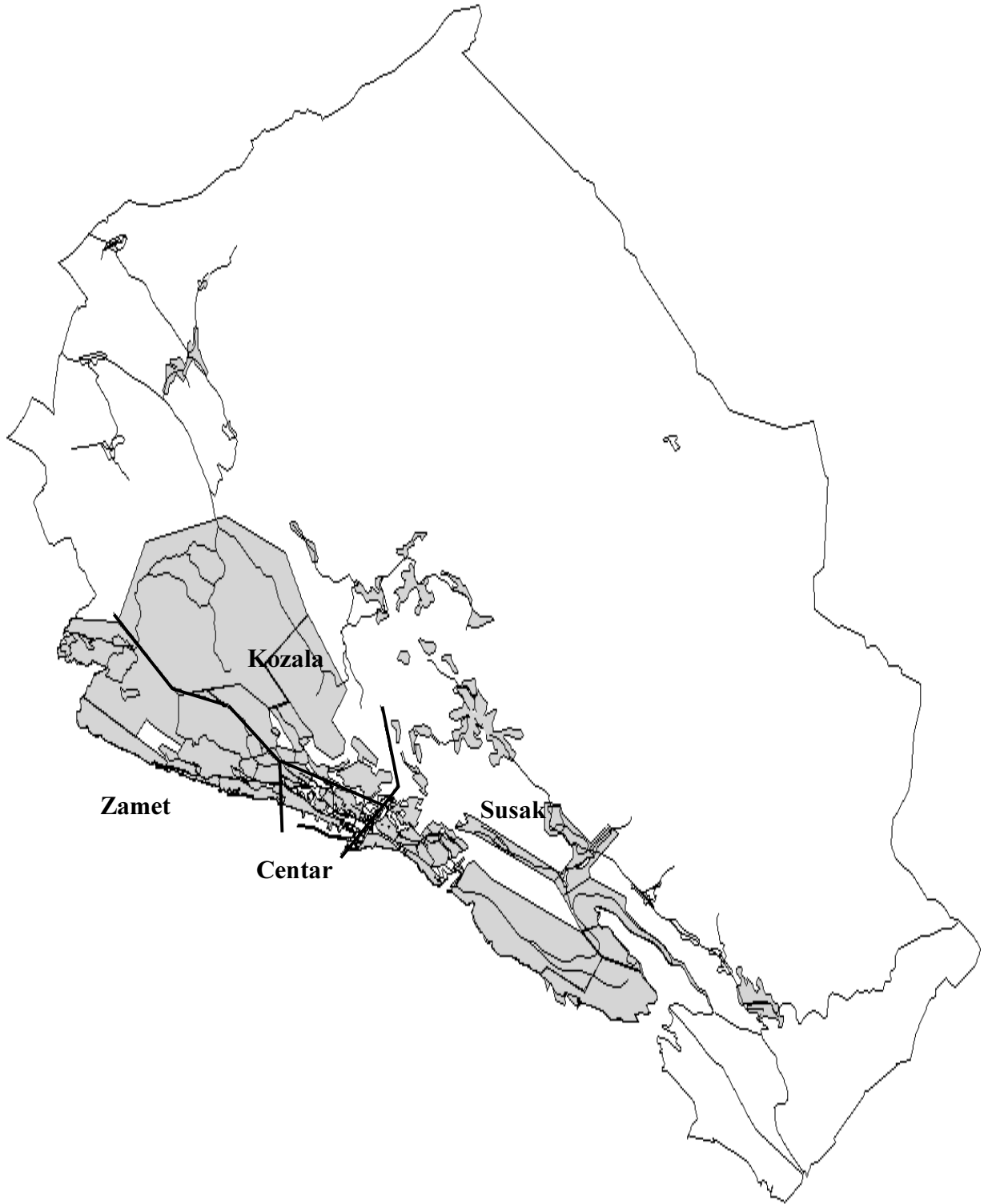
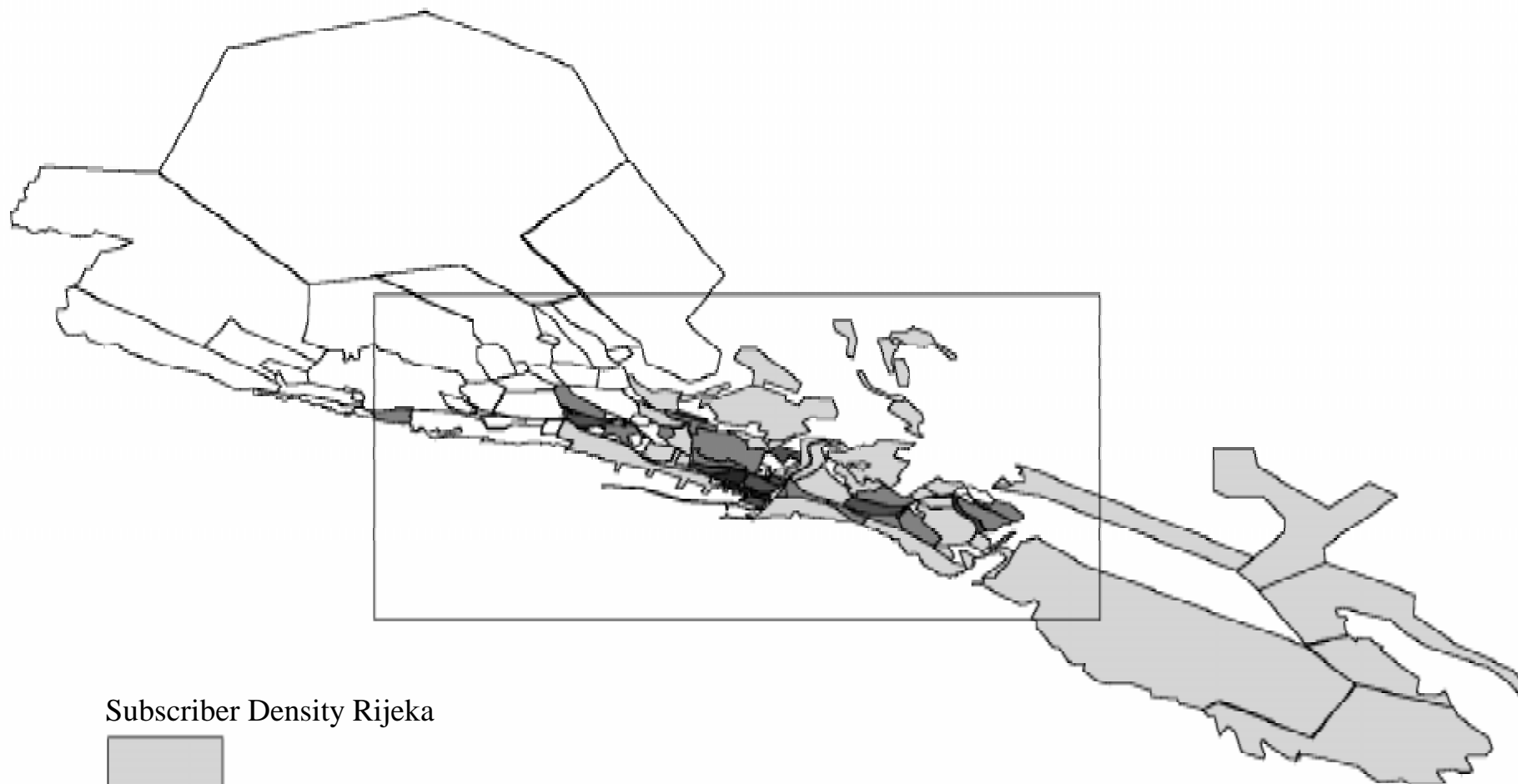


Figure 2.1 : District boundary and traffic areas



Subscriber Density Rijeka

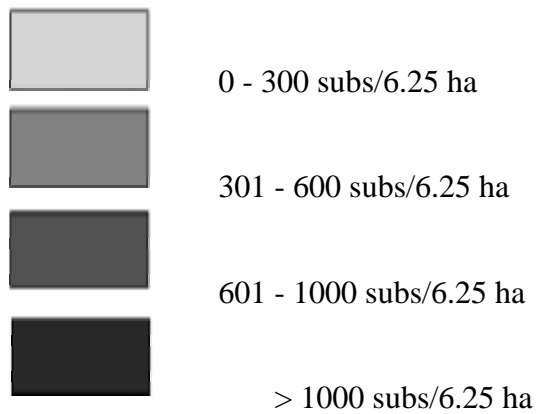


Figure 2.2 : Subscriber density per 6.25 HA (250 x 250 m) & T = 0

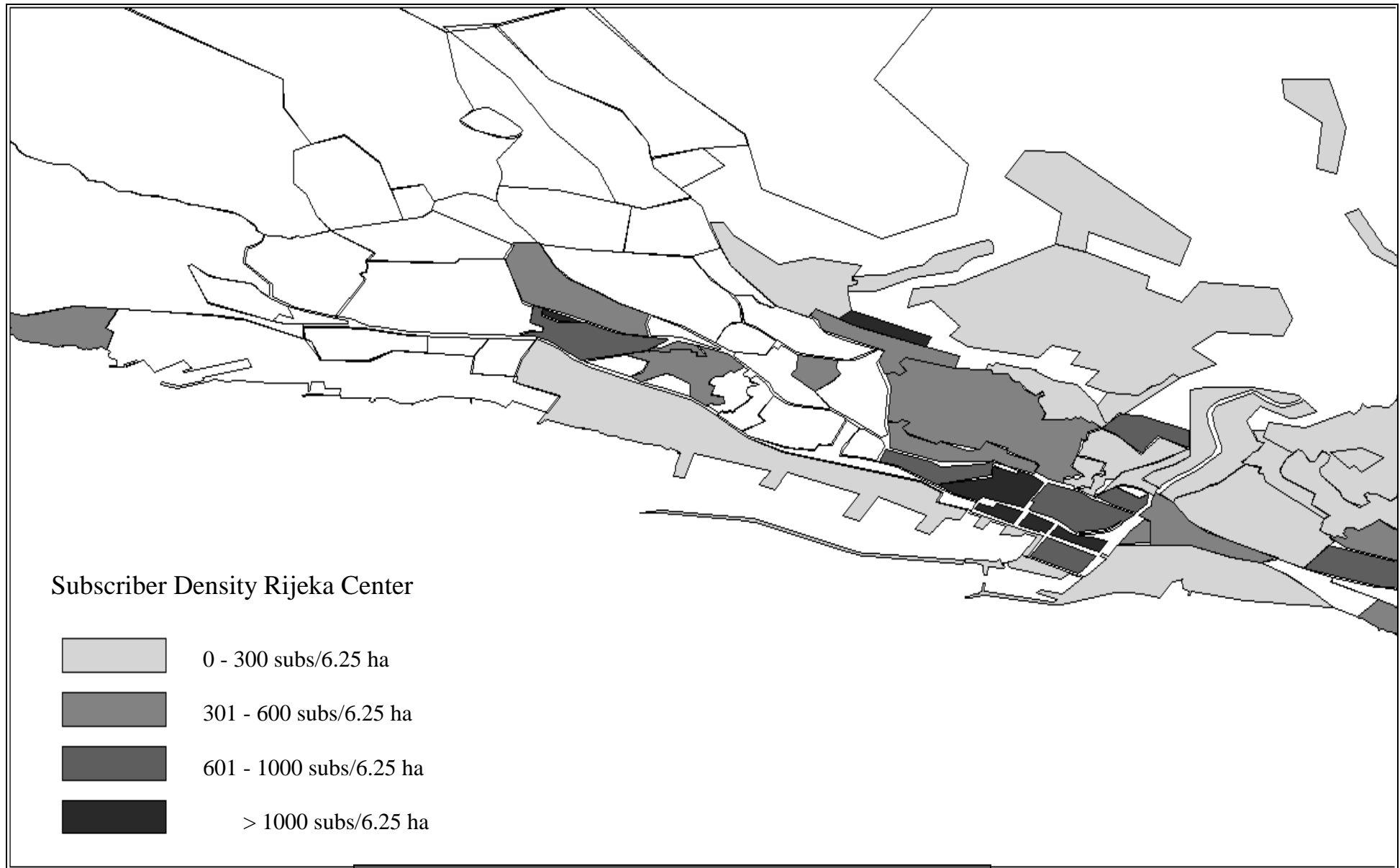


Figure 2.3 : Subscriber density per 6.25 HA (250 x 250 m) & T = 0 (Zoom)

| Year | Exchange Area | | | | | | | | Total |
|------|---------------|------|------|------|------|------|-----|-----|-------|
| | R1 | R2 | K | Z | S1 | S2 | Kos | B | |
| 1972 | 3892 | 3825 | - | 3443 | 5840 | - | 56 | - | 17056 |
| 1973 | 3992 | 3905 | - | 3659 | 5896 | - | 59 | - | 17510 |
| 1974 | 4000 | 3923 | - | 3765 | 5960 | - | 60 | - | 17708 |
| 1975 | 3987 | 4001 | - | 3926 | 5986 | - | 58 | - | 17955 |
| 1976 | 3903 | 5614 | - | 4273 | 5951 | - | 58 | - | 19799 |
| 1977 | 3792 | 7075 | - | 4728 | 5950 | - | 60 | - | 21605 |
| 1978 | 3912 | 8674 | - | 5251 | 5950 | - | 54 | - | 23841 |
| 1979 | 3733 | 8770 | - | 5673 | 4797 | 5362 | 54 | - | 28389 |
| 1980 | 3458 | 9474 | - | 6325 | 3335 | 7832 | 54 | - | 30478 |
| 1981 | 3648 | 9643 | - | 6971 | 3644 | 8409 | 57 | 197 | 32569 |
| 1982 | 3873 | 9749 | - | 7178 | 4344 | 8512 | 56 | 391 | 34103 |
| 1983 | 2961 | 8142 | 4274 | 7948 | 3846 | 8624 | 47 | 411 | 36253 |
| 1984 | 2504 | 8225 | 6811 | 8214 | 3999 | 8744 | 46 | 430 | 39003 |
| 1985 | 2344 | 8859 | 7594 | 8633 | 4418 | 8911 | 46 | 444 | 41249 |
| 1986 | 2281 | 9262 | 8205 | 8931 | 4913 | 9130 | 549 | 476 | 43747 |
| 1987 | 2169 | 8604 | 9766 | 8944 | 5106 | 9325 | 570 | 496 | 44980 |

Table 2.1
Total number of main lines in use for selected years and specified exchange areas

DATA SUMMARY ZONES FOR PLANNING

Density 0-300 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait | Satur- |
|------|-------|---------|-----|-----|----|-------|--------|-----|-----|----|-------|-------|-----|-----|----|-------|------|--------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | List | ation |
| S_R | 0.066 | 230 | 3 | 0 | 0 | 220.6 | 255 | 6 | 0 | 0 | 247.2 | 303 | 6 | 0 | 0 | 292.6 | 178 | 583 |
| K_G | 0.085 | 29 | 5 | 1 | 0 | 25.7 | 237 | 15 | 1 | 0 | 186.0 | 372 | 16 | 1 | 0 | 286.0 | 205 | 683 |
| Z_P | 0.020 | 43 | 2 | 0 | 0 | 140.6 | 65 | 9 | 0 | 0 | 231.3 | 74 | 14 | 0 | 0 | 275.0 | 16 | 183 |
| Z_V | 0.372 | 1045 | 34 | 16 | 0 | 184.0 | 1299 | 44 | 20 | 1 | 229.2 | 1528 | 68 | 32 | 1 | 273.7 | 1212 | 3484 |
| S_Z | 0.348 | 768 | 21 | 0 | 2 | 142.1 | 1032 | 34 | 0 | 2 | 191.8 | 1339 | 43 | 1 | 2 | 248.7 | 300 | 2372 |
| S_AO | 0.059 | 97 | 2 | 0 | 0 | 104.9 | 186 | 2 | 0 | 0 | 199.2 | 221 | 6 | 0 | 0 | 240.5 | 22 | 316 |
| K_S | 0.295 | 2 | 0 | 0 | 0 | 0.4 | 6 | 2 | 0 | 0 | 1.7 | 1099 | 24 | 5 | 5 | 240.0 | 484 | 1874 |
| C_AD | 0.039 | 27 | 33 | 17 | 0 | 123.4 | 43 | 43 | 19 | 0 | 168.3 | 77 | 52 | 19 | 0 | 237.2 | 60 | 380 |
| S_AP | 0.263 | 532 | 40 | 12 | 0 | 138.8 | 784 | 45 | 12 | 0 | 199.9 | 927 | 52 | 14 | 0 | 236.0 | 290 | 1717 |
| C_Z | 0.111 | 142 | 24 | 10 | 0 | 99.1 | 206 | 30 | 12 | 0 | 139.6 | 305 | 43 | 33 | 1 | 215.1 | 219 | 870 |
| S_AF | 0.353 | 655 | 47 | 17 | 1 | 127.5 | 865 | 58 | 17 | 3 | 167.0 | 1014 | 63 | 24 | 3 | 195.5 | 103 | 1630 |
| Z_U | 0.135 | 252 | 1 | 0 | 0 | 117.1 | 318 | 2 | 0 | 0 | 148.1 | 414 | 6 | 0 | 0 | 194.4 | 90 | 1100 |
| C_AC | 0.022 | 42 | 1 | 0 | 0 | 122.2 | 57 | 4 | 0 | 0 | 173.3 | 63 | 5 | 0 | 0 | 193.2 | 14 | 143 |
| C_C | 0.102 | 88 | 61 | 48 | 3 | 122.5 | 106 | 87 | 54 | 3 | 153.2 | 134 | 94 | 72 | 3 | 185.7 | 12 | 883 |
| K_V | 0.458 | 0 | 0 | 0 | 0 | 0.0 | 1044 | 52 | 10 | 0 | 150.9 | 1237 | 64 | 25 | 2 | 181.2 | 636 | 2471 |
| S_AR | 0.135 | 110 | 67 | 39 | 0 | 100.0 | 155 | 87 | 41 | 0 | 131.0 | 214 | 105 | 53 | 0 | 172.2 | 99 | 636 |
| C_W | 0.027 | 17 | 10 | 22 | 0 | 113.4 | 27 | 11 | 22 | 0 | 138.9 | 38 | 13 | 23 | 0 | 171.3 | 28 | 264 |
| S_AM | 0.022 | 2 | 6 | 0 | 0 | 22.7 | 2 | 8 | 0 | 0 | 28.4 | 4 | 51 | 3 | 0 | 164.8 | 8 | 142 |
| S_AG | 0.024 | 32 | 0 | 0 | 0 | 83.3 | 39 | 0 | 0 | 0 | 101.6 | 61 | 1 | 0 | 0 | 161.5 | 19 | 156 |
| Z_R | 1.467 | 2182 | 66 | 2 | 0 | 95.9 | 3000 | 121 | 2 | 2 | 133.1 | 3514 | 138 | 14 | 11 | 156.7 | 872 | 6942 |
| C_K | 0.024 | 12 | 19 | 13 | 0 | 114.6 | 14 | 19 | 13 | 0 | 119.8 | 20 | 20 | 13 | 0 | 138.0 | 20 | 230 |
| Z_H | 0.024 | 22 | 0 | 0 | 0 | 57.3 | 35 | 0 | 0 | 0 | 91.1 | 47 | 0 | 2 | 0 | 127.6 | 0 | 93 |
| K_P | 0.108 | 1 | 1 | 0 | 0 | 1.2 | 55 | 20 | 8 | 0 | 48.0 | 162 | 28 | 30 | 0 | 127.3 | 72 | 506 |
| C_AE | 0.075 | 26 | 9 | 0 | 0 | 29.2 | 54 | 13 | 0 | 0 | 55.8 | 126 | 16 | 0 | 0 | 118.3 | 211 | 464 |
| S_V | 0.009 | 5 | 3 | 1 | 0 | 62.5 | 8 | 6 | 1 | 0 | 104.2 | 8 | 6 | 2 | 0 | 111.1 | 10 | 55 |
| C_M | 0.018 | 15 | 2 | 0 | 0 | 59.0 | 19 | 6 | 0 | 0 | 86.8 | 25 | 6 | 0 | 0 | 107.6 | 12 | 236 |
| S_U | 0.097 | 75 | 0 | 0 | 0 | 48.3 | 152 | 0 | 0 | 0 | 97.9 | 166 | 0 | 0 | 0 | 107.0 | 40 | 250 |
| C_O | 0.030 | 6 | 22 | 6 | 1 | 72.9 | 6 | 24 | 6 | 1 | 77.1 | 12 | 31 | 6 | 1 | 104.2 | 19 | 120 |
| S_C | 0.034 | 35 | 0 | 0 | 0 | 64.3 | 47 | 0 | 0 | 0 | 86.4 | 53 | 0 | 0 | 0 | 97.4 | 0 | 444 |
| Z_E | 0.044 | 43 | 2 | 6 | 1 | 73.9 | 53 | 2 | 6 | 1 | 88.1 | 57 | 3 | 6 | 1 | 95.2 | 2 | 158 |
| Z_I | 0.243 | 251 | 5 | 0 | 0 | 65.8 | 293 | 7 | 0 | 0 | 77.2 | 340 | 7 | 0 | 1 | 89.5 | 162 | 1066 |
| S_AN | 0.470 | 182 | 6 | 0 | 1 | 25.1 | 288 | 12 | 0 | 1 | 40.0 | 589 | 19 | 0 | 1 | 81.0 | 242 | 1298 |
| K_Q | 0.191 | 0 | 0 | 0 | 0 | 0.0 | 146 | 21 | 11 | 0 | 58.2 | 189 | 24 | 11 | 0 | 73.3 | 85 | 422 |
| K_R | 0.198 | 1 | 0 | 0 | 0 | 0.3 | 3 | 0 | 0 | 0 | 0.9 | 221 | 6 | 0 | 0 | 71.7 | 130 | 537 |
| C_F | 0.023 | 10 | 2 | 0 | 0 | 32.6 | 18 | 2 | 0 | 0 | 54.3 | 24 | 2 | 0 | 0 | 70.7 | 0 | 132 |
| K_U | 0.052 | 0 | 0 | 0 | 0 | 0.0 | 4 | 0 | 0 | 0 | 4.8 | 57 | 1 | 0 | 0 | 69.7 | 25 | 171 |
| S_Y | 0.054 | 15 | 0 | 0 | 0 | 17.4 | 44 | 0 | 0 | 0 | 50.9 | 57 | 0 | 0 | 0 | 66.0 | 10 | 94 |
| S_B | 0.110 | 8 | 27 | 10 | 0 | 25.6 | 15 | 32 | 10 | 0 | 32.4 | 28 | 51 | 35 | 0 | 64.8 | 6 | 331 |
| Z_G | 0.012 | 0 | 0 | 0 | 0 | 0.0 | 0 | 8 | 1 | 0 | 46.9 | 0 | 11 | 1 | 0 | 62.5 | 0 | 56 |

DATA SUMMARY ZONES FOR PLANNING

Density 0-300 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait | Satur- |
|------|-------|---------|-----|-----|----|-------|--------|-----|-----|----|-------|-------|-----|-----|----|-------|------|--------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | List | ation |
| S_F | 0.179 | 90 | 6 | 14 | 1 | 38.8 | 116 | 8 | 14 | 1 | 48.5 | 136 | 9 | 24 | 2 | 59.7 | 10 | 304 |
| S_N | 0.092 | 34 | 1 | 0 | 0 | 23.8 | 36 | 1 | 0 | 0 | 25.1 | 85 | 2 | 0 | 0 | 59.1 | 50 | 141 |
| S_AA | 0.020 | 1 | 0 | 0 | 0 | 3.1 | 1 | 0 | 0 | 0 | 3.1 | 16 | 0 | 0 | 0 | 50.0 | 12 | 46 |
| Z_F | 0.088 | 42 | 6 | 0 | 0 | 34.1 | 51 | 6 | 0 | 0 | 40.5 | 62 | 6 | 2 | 0 | 49.7 | 5 | 174 |
| C_AG | 0.065 | 5 | 13 | 0 | 0 | 17.3 | 6 | 23 | 0 | 2 | 29.8 | 6 | 26 | 13 | 4 | 47.1 | 40 | 176 |
| Z_J | 0.228 | 110 | 10 | 2 | 0 | 33.4 | 134 | 12 | 3 | 0 | 40.8 | 144 | 14 | 7 | 0 | 45.2 | 111 | 2293 |
| S_P | 0.133 | 1 | 5 | 4 | 0 | 4.7 | 51 | 11 | 7 | 0 | 32.4 | 76 | 11 | 7 | 0 | 44.2 | 39 | 180 |
| C_AJ | 0.031 | 0 | 1 | 5 | 0 | 12.1 | 0 | 9 | 5 | 0 | 28.2 | 0 | 13 | 6 | 0 | 38.3 | 7 | 65 |
| S_I | 0.165 | 0 | 4 | 3 | 0 | 2.7 | 1 | 9 | 5 | 0 | 5.7 | 75 | 10 | 9 | 0 | 35.6 | 94 | 235 |
| K_K | 0.039 | 0 | 0 | 0 | 0 | 0.0 | 0 | 5 | 0 | 0 | 8.0 | 19 | 1 | 0 | 0 | 32.1 | 17 | 75 |
| C_U | 0.034 | 1 | 2 | 3 | 0 | 11.0 | 6 | 6 | 3 | 0 | 27.6 | 7 | 7 | 3 | 0 | 31.3 | 66 | 145 |
| K_I | 0.034 | 0 | 0 | 0 | 0 | 0.0 | 5 | 0 | 0 | 0 | 9.2 | 15 | 0 | 0 | 0 | 27.6 | 14 | 136 |
| S_O | 0.062 | 1 | 0 | 0 | 0 | 1.0 | 17 | 0 | 0 | 0 | 17.1 | 27 | 0 | 0 | 0 | 27.2 | 14 | 60 |
| K_A | 0.047 | 0 | 0 | 0 | 0 | 0.0 | 15 | 1 | 0 | 0 | 21.3 | 18 | 1 | 0 | 0 | 25.3 | 0 | 31 |
| S_A | 0.309 | 4 | 46 | 22 | 0 | 14.6 | 5 | 61 | 23 | 0 | 18.0 | 14 | 72 | 35 | 2 | 24.9 | 31 | 952 |
| Z_O | 0.220 | 37 | 3 | 0 | 0 | 11.4 | 57 | 4 | 0 | 0 | 17.3 | 73 | 8 | 0 | 0 | 23.0 | 72 | 444 |
| K_J | 0.919 | 1 | 0 | 0 | 0 | 0.1 | 122 | 9 | 1 | 0 | 9.0 | 299 | 21 | 1 | 0 | 21.8 | 261 | 1298 |
| Z_C | 0.035 | 1 | 6 | 0 | 0 | 12.5 | 2 | 7 | 0 | 0 | 16.1 | 2 | 8 | 2 | 0 | 21.4 | 0 | 69 |
| Z_A | 0.610 | 0 | 80 | 51 | 0 | 13.4 | 9 | 95 | 51 | 0 | 15.9 | 31 | 119 | 51 | 0 | 20.6 | 86 | 1446 |
| S_H | 0.010 | 0 | 0 | 0 | 0 | 0.0 | 0 | 1 | 0 | 0 | 6.3 | 0 | 2 | 1 | 0 | 18.8 | 0 | 15 |
| S_AB | 1.168 | 43 | 10 | 0 | 2 | 2.9 | 70 | 10 | 0 | 2 | 4.4 | 312 | 13 | 0 | 2 | 17.5 | 189 | 686 |
| C_A | 0.588 | 10 | 39 | 10 | 0 | 6.3 | 20 | 44 | 11 | 0 | 8.0 | 31 | 91 | 16 | 0 | 14.7 | 6 | 1498 |
| S_AT | 2.033 | 120 | 10 | 0 | 0 | 4.0 | 265 | 103 | 21 | 2 | 12.0 | 357 | 103 | 10 | 2 | 14.5 | 288 | 1068 |
| Z_N | 0.054 | 6 | 0 | 0 | 0 | 6.9 | 8 | 1 | 0 | 0 | 10.4 | 10 | 1 | 0 | 0 | 12.7 | 0 | 122 |
| S_AE | 0.019 | 0 | 1 | 0 | 0 | 3.3 | 0 | 2 | 0 | 0 | 6.6 | 0 | 3 | 0 | 0 | 9.9 | 0 | 7 |
| K_C | 0.070 | 0 | 0 | 0 | 0 | 0.0 | 0 | 4 | 0 | 0 | 3.6 | 3 | 4 | 4 | 0 | 9.8 | 2 | 54 |
| K_Y | 0.293 | 0 | 0 | 0 | 0 | 0.0 | 19 | 1 | 0 | 0 | 4.3 | 42 | 3 | 0 | 0 | 9.6 | 62 | 165 |
| K_X | 5.096 | 1 | 0 | 0 | 0 | 0.0 | 265 | 1 | 0 | 1 | 3.3 | 739 | 8 | 0 | 1 | 9.2 | 1416 | 3413 |
| S_D | 0.075 | 0 | 3 | 4 | 0 | 5.8 | 0 | 6 | 4 | 0 | 8.3 | 0 | 6 | 5 | 0 | 9.2 | 0 | 70 |
| Z_S | 6.941 | 13 | 18 | 4 | 1 | 0.3 | 564 | 28 | 7 | 1 | 5.4 | 951 | 39 | 7 | 1 | 9.0 | 2400 | 6836 |
| C_B | 0.091 | 0 | 4 | 0 | 0 | 2.7 | 1 | 4 | 0 | 0 | 3.4 | 8 | 5 | 0 | 0 | 8.9 | 8 | 291 |
| S_G | 0.071 | 0 | 4 | 0 | 0 | 3.5 | 1 | 4 | 1 | 0 | 5.3 | 3 | 5 | 1 | 0 | 7.9 | 0 | 17 |
| Z_Q | 0.057 | 2 | 2 | 0 | 0 | 4.4 | 3 | 2 | 0 | 0 | 5.5 | 3 | 2 | 2 | 0 | 7.7 | 105 | 324 |
| K_D | 0.034 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 1 | 3 | 0 | 0 | 7.4 | 0 | 32 |
| K_E | 0.034 | 0 | 2 | 0 | 0 | 3.7 | 0 | 3 | 0 | 0 | 5.5 | 0 | 4 | 0 | 0 | 7.4 | 0 | 224 |
| S_Q | 0.017 | 0 | 1 | 0 | 0 | 3.7 | 0 | 1 | 0 | 0 | 3.7 | 0 | 2 | 0 | 0 | 7.4 | 0 | 15 |
| S_J | 0.080 | 0 | 0 | 0 | 0 | 0.0 | 1 | 0 | 0 | 0 | 0.8 | 9 | 0 | 0 | 0 | 7.0 | 26 | 57 |
| Z_K | 2.690 | 28 | 0 | 0 | 0 | 0.7 | 55 | 4 | 0 | 0 | 1.4 | 261 | 9 | 0 | 0 | 6.3 | 644 | 3614 |
| S_AW | 7.100 | 46 | 14 | 0 | 0 | 0.5 | 45 | 11 | 0 | 0 | 0.5 | 573 | 7 | 0 | 0 | 5.1 | 1349 | 11425 |
| K_F | 1.661 | 59 | 12 | 0 | 0 | 2.7 | 66 | 14 | 0 | 0 | 3.0 | 94 | 17 | 0 | 0 | 4.2 | 593 | 2633 |

DATA SUMMARY ZONES FOR PLANNING

Density 0-300 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait List | Saturation |
|------|--------|---------|-----|-----|----|-------|--------|-----|-----|----|-------|-------|-----|-----|----|-------|-----------|------------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | | |
| Z_T | 1.617 | 40 | 4 | 4 | 1 | 1.9 | 53 | 4 | 4 | 1 | 2.4 | 58 | 4 | 4 | 1 | 2.6 | 63 | 1093 |
| S_AV | 0.887 | 0 | 0 | 0 | 0 | 0.0 | 0 | 3 | 4 | 0 | 0.5 | 0 | 20 | 11 | 1 | 2.3 | 0 | 303 |
| K_T | 0.131 | 0 | 0 | 0 | 0 | 0.0 | 2 | 0 | 0 | 0 | 1.0 | 4 | 0 | 0 | 0 | 1.9 | 0 | 98 |
| K_W | 0.354 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 6 | 0 | 1.1 | 2 | 0 | 8 | 0 | 1.8 | 0 | 472 |
| Z_B | 0.219 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 3 | 0 | 0 | 0.9 | 0 | 64 |
| Z_L | 0.180 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 2 | 0 | 0 | 0.7 | 18 | 48 |
| K_Z | 20.890 | 0 | 0 | 0 | 0 | 0.0 | 24 | 0 | 0 | 0 | 0.1 | 144 | 11 | 0 | 0 | 0.5 | 1427 | 4650 |
| S_AX | 3.342 | 0 | 0 | 4 | 0 | 0.1 | 0 | 3 | 7 | 0 | 0.2 | 0 | 8 | 10 | 0 | 0.3 | 15 | 283 |
| S_AY | 2.174 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 2 | 0 | 0.1 | 0 | 0 | 4 | 0 | 0.1 | 273 | 3339 |
| C_AH | 0.017 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 |
| C_D | 0.039 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 |
| S_E | 0.130 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 10 |
| K_B | 0.087 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 |
| C_AF | 0.005 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 |

DATA SUMMARY ZONES FOR PLANNING

Density 301-600 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait list | Saturation |
|-------|-------|---------|-----|-----|----|-------|--------|-----|-----|----|-------|-------|-----|-----|----|-------|-----------|------------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | | |
| S__AJ | 0.170 | 927 | 51 | 1 | 1 | 360.3 | 1190 | 82 | 1 | 1 | 468.4 | 1478 | 94 | 2 | 1 | 579.0 | 172 | 2166 |
| C__Y | 0.076 | 161 | 21 | 5 | 0 | 153.8 | 420 | 33 | 7 | 0 | 378.3 | 568 | 51 | 23 | 0 | 528.0 | 172 | 1082 |
| S__S | 0.092 | 555 | 1 | 0 | 1 | 378.4 | 630 | 3 | 0 | 1 | 430.7 | 754 | 5 | 0 | 1 | 516.3 | 4 | 859 |
| S__AL | 0.173 | 922 | 17 | 2 | 0 | 340.0 | 1138 | 22 | 2 | 0 | 419.8 | 1335 | 33 | 5 | 1 | 496.4 | 122 | 1682 |
| S__AQ | 0.087 | 247 | 115 | 10 | 4 | 270.1 | 330 | 150 | 14 | 5 | 358.5 | 414 | 179 | 27 | 5 | 449.0 | 112 | 990 |
| S__AH | 0.086 | 425 | 17 | 0 | 2 | 322.7 | 493 | 17 | 0 | 2 | 372.1 | 562 | 21 | 0 | 2 | 425.1 | 215 | 946 |
| K__O | 0.417 | 3 | 3 | 0 | 0 | 0.9 | 1881 | 220 | 29 | 2 | 319.5 | 2343 | 241 | 58 | 41 | 402.1 | 619 | 3857 |
| K__L | 0.082 | 1 | 0 | 0 | 0 | 0.8 | 345 | 36 | 10 | 0 | 298.0 | 467 | 45 | 12 | 0 | 399.4 | 139 | 785 |
| Z__D | 0.112 | 416 | 44 | 53 | 2 | 287.4 | 527 | 46 | 53 | 2 | 350.4 | 597 | 55 | 61 | 2 | 399.0 | 66 | 967 |
| C__I | 0.011 | 51 | 1 | 0 | 0 | 295.5 | 58 | 1 | 0 | 0 | 335.2 | 65 | 1 | 0 | 0 | 375.0 | 0 | 106 |
| S__AS | 0.011 | 4 | 18 | 12 | 0 | 193.2 | 5 | 24 | 20 | 0 | 278.4 | 10 | 29 | 26 | 0 | 369.3 | 20 | 166 |
| C__AB | 0.172 | 641 | 5 | 6 | 0 | 236.9 | 799 | 13 | 6 | 0 | 297.2 | 981 | 20 | 6 | 0 | 365.9 | 362 | 1483 |
| S__AI | 0.056 | 149 | 20 | 14 | 0 | 204.2 | 232 | 26 | 14 | 0 | 303.6 | 278 | 33 | 14 | 0 | 362.7 | 126 | 598 |
| C__X | 0.037 | 4 | 1 | 4 | 1 | 16.9 | 96 | 7 | 4 | 2 | 184.1 | 181 | 10 | 6 | 2 | 336.1 | 36 | 337 |
| S__T | 0.167 | 606 | 23 | 13 | 0 | 240.3 | 711 | 28 | 13 | 0 | 281.4 | 830 | 31 | 13 | 1 | 327.5 | 64 | 1246 |
| C__L | 0.092 | 254 | 39 | 13 | 0 | 207.9 | 334 | 42 | 14 | 0 | 264.9 | 414 | 46 | 14 | 0 | 322.0 | 184 | 758 |

DATA SUMMARY

ZONES FOR PLANNING

Density 601-1000 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait list | Saturation |
|-------|-------|---------|-----|-----|----|-------|--------|-----|-----|----|-------|-------|-----|-----|----|-------|-----------|------------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | | |
| S__X | 0.041 | 437 | 3 | 0 | 0 | 670.7 | 511 | 5 | 0 | 0 | 786.6 | 608 | 5 | 0 | 0 | 934.5 | 209 | 897 |
| C__V | 0.056 | 249 | 104 | 19 | 0 | 415.2 | 432 | 157 | 28 | 1 | 689.7 | 556 | 192 | 55 | 1 | 897.3 | 211 | 1339 |
| C__H | 0.069 | 594 | 8 | 0 | 0 | 545.3 | 728 | 9 | 0 | 0 | 667.6 | 877 | 14 | 0 | 0 | 807.1 | 143 | 1143 |
| C__S | 0.086 | 81 | 332 | 167 | 4 | 424.4 | 126 | 477 | 184 | 7 | 577.0 | 193 | 603 | 217 | 8 | 742.0 | 226 | 1772 |
| S__AK | 0.117 | 934 | 77 | 10 | 2 | 546.5 | 1060 | 91 | 13 | 2 | 622.9 | 1252 | 105 | 15 | 2 | 734.0 | 194 | 1808 |
| C__AK | 0.022 | 84 | 34 | 3 | 0 | 343.8 | 127 | 46 | 5 | 0 | 505.7 | 168 | 54 | 5 | 0 | 644.9 | 86 | 373 |
| C__N | 0.038 | 101 | 122 | 40 | 0 | 432.6 | 144 | 141 | 41 | 0 | 536.2 | 175 | 166 | 46 | 0 | 636.5 | 96 | 672 |
| K__H | 0.058 | 0 | 0 | 0 | 0 | 0.0 | 509 | 3 | 0 | 0 | 551.7 | 574 | 3 | 0 | 0 | 621.8 | 84 | 740 |

DATA SUMMARY ZONES FOR PLANNING

Density > 1000 /6.25 ha

| Zone | | T = -10 | | | | | T = -5 | | | | | T = 0 | | | | | Wait | Satur- |
|------|-------|---------|-----|-----|----|--------|--------|-----|-----|----|--------|-------|-----|-----|----|--------|------|--------|
| Name | Area | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | RES | BUS | PBX | CB | Dens. | list | ation |
| C_AI | 0.003 | 29 | 58 | 17 | 2 | 2208.3 | 38 | 84 | 25 | 2 | 3104.2 | 47 | 104 | 27 | 2 | 3750.0 | 31 | 300 |
| C_Q | 0.015 | 62 | 278 | 54 | 3 | 1654.2 | 102 | 315 | 60 | 3 | 2000.0 | 140 | 385 | 115 | 20 | 2750.0 | 54 | 1121 |
| S_W | 0.010 | 263 | 2 | 0 | 0 | 1656.3 | 293 | 2 | 0 | 0 | 1843.8 | 355 | 2 | 0 | 0 | 2231.3 | 0 | 393 |
| C_P | 0.012 | 51 | 157 | 24 | 6 | 1239.6 | 83 | 188 | 25 | 9 | 1588.5 | 106 | 227 | 47 | 26 | 2114.6 | 89 | 740 |
| K_M | 0.033 | 0 | 0 | 0 | 0 | 0.0 | 601 | 2 | 0 | 1 | 1143.9 | 733 | 2 | 0 | 1 | 1393.9 | 195 | 1019 |
| C_R | 0.017 | 81 | 105 | 15 | 5 | 757.4 | 109 | 139 | 22 | 5 | 1011.0 | 152 | 164 | 26 | 5 | 1275.7 | 52 | 499 |
| C_T | 0.067 | 295 | 253 | 46 | 6 | 559.7 | 478 | 342 | 54 | 8 | 822.8 | 639 | 451 | 150 | 9 | 1165.1 | 169 | 2080 |
| C_G | 0.007 | 64 | 6 | 4 | 0 | 660.7 | 82 | 7 | 4 | 0 | 830.4 | 112 | 11 | 7 | 0 | 1160.7 | 71 | 313 |

DATA SUMMARY for the Traffic Areas

| Name | T = -10 | | | | T = -5 | | | | T = 0 | | | | Waiting List | Saturation |
|--------|---------|------|-----|----|--------|------|------|----|-------|------|------|-----|--------------|------------|
| | RES | BUS | PBX | CB | RES | BUS | PBX | CB | RES | BUS | PBX | CB | | |
| Centar | 3203 | 1766 | 551 | 31 | 4739 | 2326 | 624 | 43 | 6250 | 2923 | 948 | 82 | 2704 | 20015 |
| Kozala | 98 | 23 | 1 | 0 | 5349 | 409 | 76 | 4 | 8834 | 527 | 155 | 50 | 6466 | 26346 |
| Susak | 8555 | 671 | 192 | 17 | 11074 | 974 | 246 | 22 | 14543 | 1213 | 351 | 28 | 4955 | 40988 |
| Zamet | 4533 | 283 | 138 | 5 | 6526 | 402 | 147 | 8 | 8166 | 517 | 191 | 18 | 5924 | 30576 |
| Total | 16389 | 2743 | 882 | 53 | 27688 | 4111 | 1093 | 77 | 37793 | 5180 | 1645 | 178 | 20049 | 117925 |

| Year | Traffic Area | | | | | Total |
|------|--------------|-------|------|------|-------|-------|
| | C | (C+K) | K | Z | S | |
| 1972 | | 7717 | | 3443 | 5896 | 17056 |
| 1973 | | 7897 | | 3659 | 5954 | 17510 |
| 1974 | | 7923 | | 3765 | 6020 | 17700 |
| 1975 | | 7988 | | 3926 | 6044 | 17955 |
| 1976 | | 9517 | | 4273 | 6009 | 19799 |
| 1977 | | 10867 | | 4728 | 6010 | 21605 |
| 1978 | | 12586 | | 5251 | 6004 | 23841 |
| 1979 | | 12503 | | 5673 | 10213 | 28389 |
| 1980 | | 12932 | | 6325 | 11221 | 30478 |
| 1981 | | 13291 | | 6971 | 12307 | 32569 |
| 1982 | | 13622 | | 7178 | 13303 | 34103 |
| 1983 | 11103 | | 4274 | 7948 | 12928 | 36253 |
| 1984 | 10759 | | 6811 | 8214 | 13219 | 39003 |
| 1985 | 11203 | | 7594 | 8633 | 13819 | 41249 |
| 1986 | 11543 | | 8205 | 8931 | 15068 | 43747 |
| 1987 | 10773 | | 9766 | 8944 | 15497 | 44980 |

Table 2.3. Number of Main Lines in Use for each Traffic Area

| Year | Subscr. Category | Exchange Area | | | | | | | | Total |
|------|------------------|---------------|------|------|------|------|------|-----|-----|-------|
| | | R1 | R2 | R3 | R4 | S1 | S2 | Kos | B | |
| 1977 | RES | 1876 | 5227 | - | 4254 | 5024 | - | 49 | - | 16430 |
| | BUS | 1599 | 1106 | - | 367 | 676 | - | 11 | - | 3759 |
| | PBX | 293 | 726 | - | 96 | 227 | - | 0 | - | 1342 |
| | CB | 24 | 16 | - | 11 | 23 | - | 0 | - | 74 |
| | Total | 3792 | 7075 | - | 4728 | 5950 | - | 60 | - | 21605 |
| 1982 | RES | 2402 | 6735 | - | 6498 | 4021 | 7646 | 45 | 265 | 27612 |
| | BUS | 1407 | 1912 | - | 529 | 244 | 694 | 11 | 103 | 4900 |
| | PBX | 54 | 1034 | - | 136 | 61 | 158 | - | 21 | 1464 |
| | CB | 10 | 68 | - | 15 | 18 | 14 | - | 2 | 127 |
| | Total | 3873 | 9749 | - | 7178 | 4344 | 8512 | 56 | 391 | 34103 |
| 1987 | RES | 1094 | 5128 | 8883 | 8178 | 4604 | 8347 | 563 | 349 | 37146 |
| | BUS | 1045 | 2410 | 610 | 626 | 365 | 800 | 7 | 123 | 5986 |
| | PBX | 28 | 1014 | 259 | 120 | 123 | 162 | - | 21 | 1727 |
| | CB | 2 | 52 | 14 | 20 | 14 | 16 | - | 3 | 121 |
| | Total | 2169 | 8604 | 9766 | 8944 | 5106 | 9325 | 570 | 496 | 44980 |

Table 2.4. Number of Main Lines per Subscriber Category and Exchange Area

| Year | Subscr Categ | Traffic Area | | | | Total |
|------|-----------------|--------------|------|------|-------|-------|
| | | C | K | Z | S | |
| 1977 | RES | 7103 | | 4254 | 5073 | 16430 |
| | BUS | 2705 | | 367 | 687 | 3759 |
| | PBX | 1019 | | 96 | 227 | 1342 |
| | CB | 40 | | 11 | 23 | 74 |
| | Total | 10867 | | 4728 | 6010 | 21605 |
| 1982 | RES | 9137 | | 6498 | 11977 | 27612 |
| | BUS | 3319 | | 529 | 1052 | 4900 |
| | PBX | 1088 | | 136 | 240 | 1464 |
| | CB | 78 | | 15 | 34 | 127 |
| | Total | 13622 | | 7178 | 13303 | 34103 |
| 1987 | RES | 6222 | 8883 | 8178 | 13863 | 37146 |
| | BUS | 3455 | 610 | 626 | 1295 | 5986 |
| | PBX | 1042 | 259 | 120 | 306 | 1727 |
| | CB | 54 | 14 | 20 | 33 | 121 |
| | Total | 10773 | 9766 | 8944 | 15497 | 44980 |

Table 2.5. Number of Main Lines per Subscriber Category and Traffic Area

2.3 *Detailed subscribers' data for the zones*

Very detailed subscribers' data for each zone is given in Appendix 1. For each zone, the number of subscribers' for point of time $T = -10$, $T = -5$ and $T = 0$ (31.12.1987) is given for four categories. Categories are:

1. Residential
2. Business
3. PBX
4. Coinboxes and Public Services

The percentage of each subscriber category is also given. The waiting list and saturation are specified for two categories only, the residential and business.

Data for existing subscribers', as well as the waiting list data, were extracted from the data base. Saturation figures were derived from the data given by the town planning authority for each primary rectangle of 250 x 250 meters. Data for the zone is obtained by numerical integration of those rectangles whose coordinates fall within the digitized area of the zone. Forecasted data are also held in the data base.

Boundaries for each zone were digitized at the ITU Headquarters from two different maps, 1:5000 scale map for the city center and 1:50000 scale map, covering the complete district area (see Figure 2.1, - Figure 2.3). As usual, the exact location of existing and potential subscribers is identified by the street name and building number (address), so an additional list of all the streets, squares, etc., for the area under investigation was compiled and stored in the data base.

Above specified streets, squares, ... inventory combined with detailed maps with all the buildings and their addresses inscribed, helped us to define which streets, squares, etc., and from which to which building number falls within the zone areas.

After this manual preparation, data processing functions (MATCH, SEARCH, TOTALIZE, CALCULATE) put the final touch on the data listed in the Appendix 1.

Six charts were prepared to simplify the task of subscriber forecasting. On Figure 2.4, summaries for the four traffic areas are given for three points of time waiting list and saturation.

The average subscribers' density per 6.25 HA (250 x 250m) is presented on Figure 2.5.

Pie charts showing percentages of different categories and totals for each traffic area are presented on Figure 2.6 - Figure 2.9.

2.4 *Visualization of the data base entities*

Telecommunication network entities are characterized by their precise environmental position. For the present case, absolute coordinate system notation was adopted. The notation is based on Gauss-Kruger projection and implemented both in the data base and for the digitalization of the zones and telecommunication network entities (exchanges, cables, manholes, etc.)

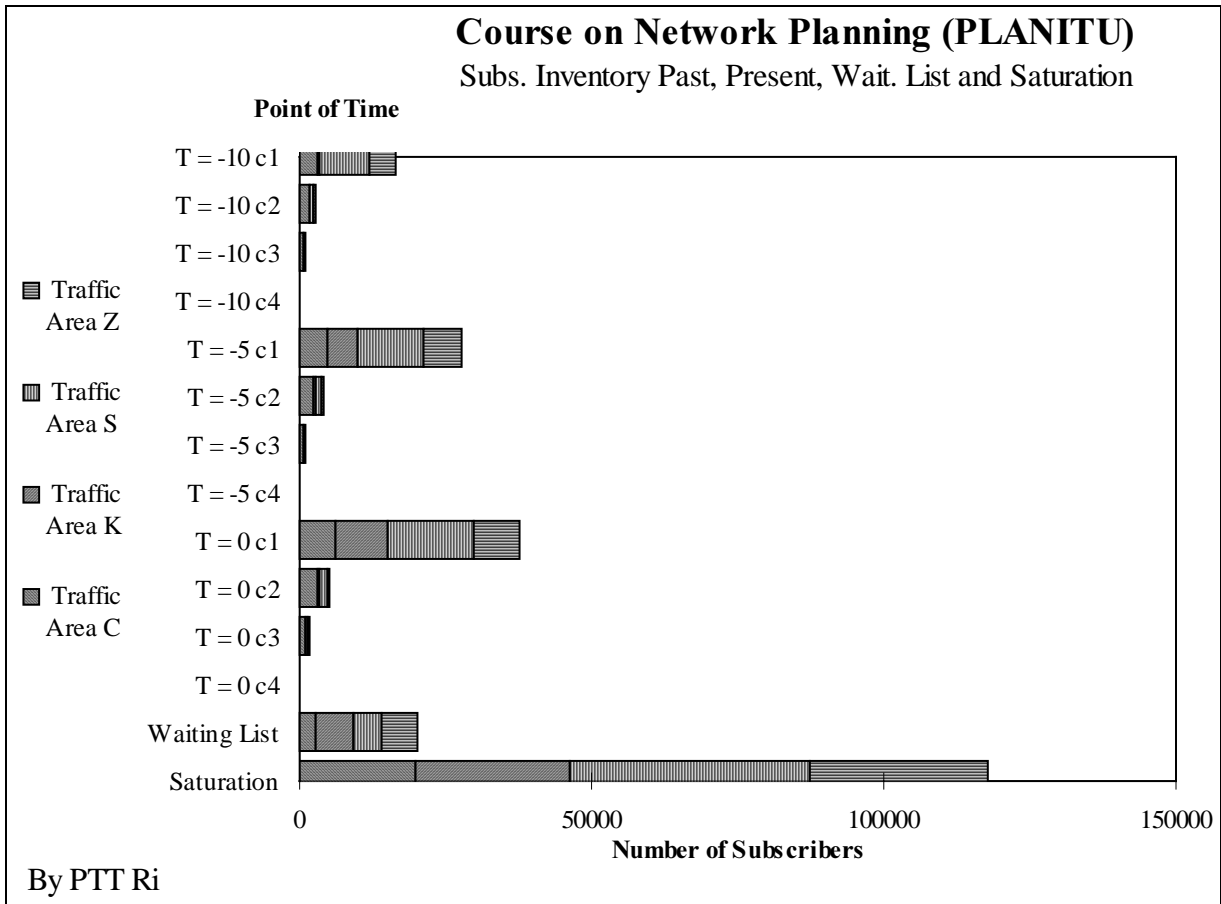


Figure 2.4
Subscriber inventory for four traffic areas

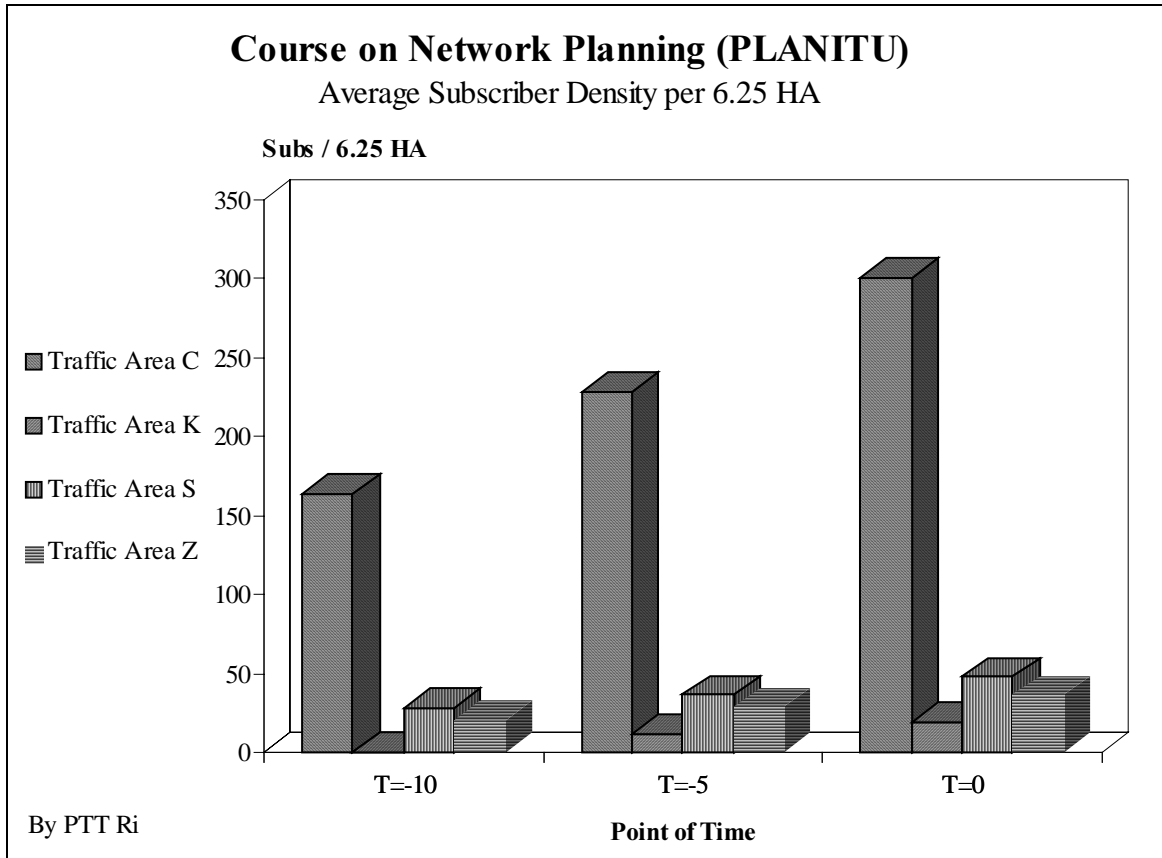


Figure 2.5
Average subscriber density per 6.25 HA

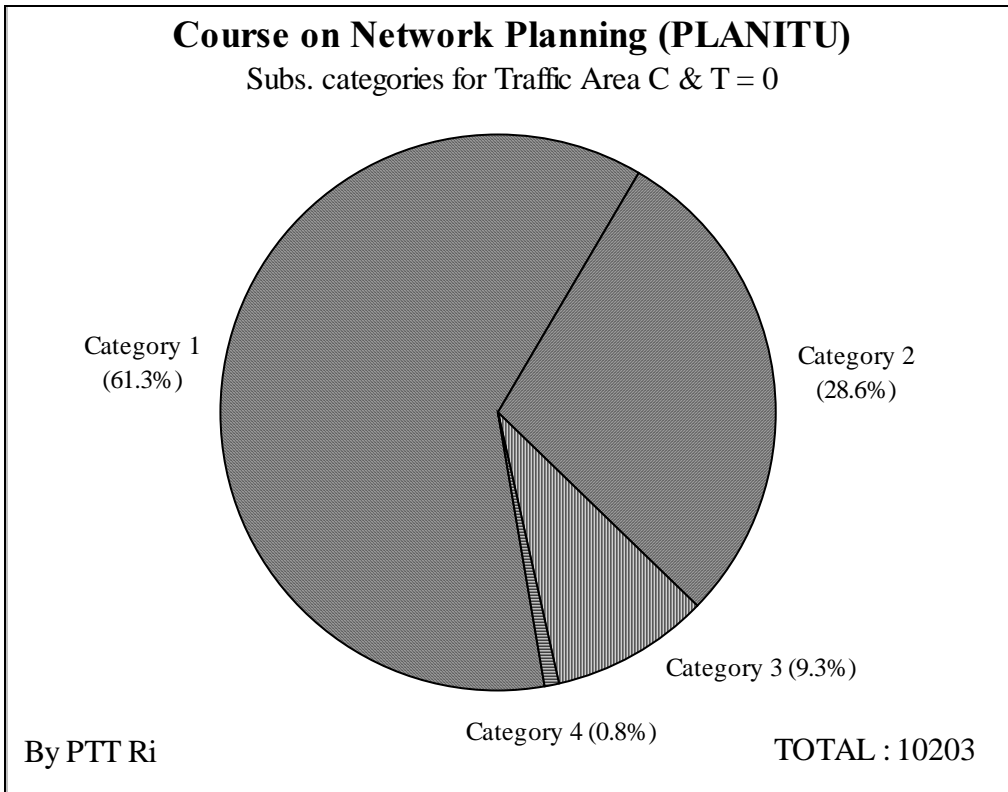


Figure 2.6
Percentage of subscriber categories for Traffic Area C.

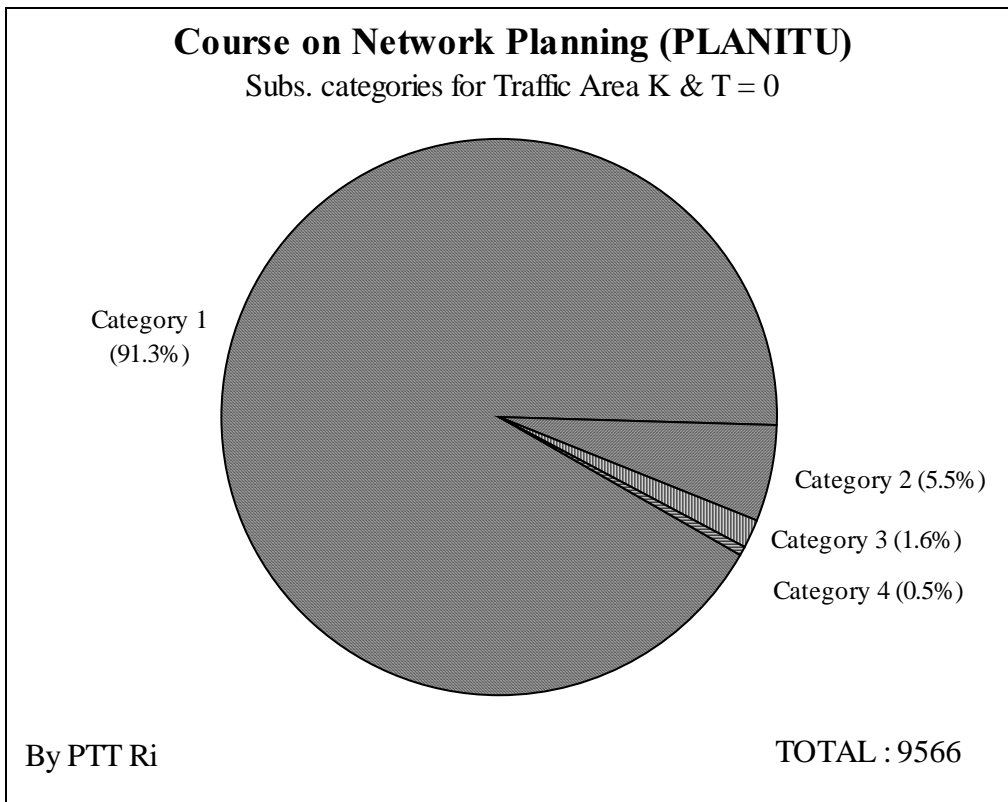


Figure 2.7
Percentage of subscriber categories for Traffic Area K.

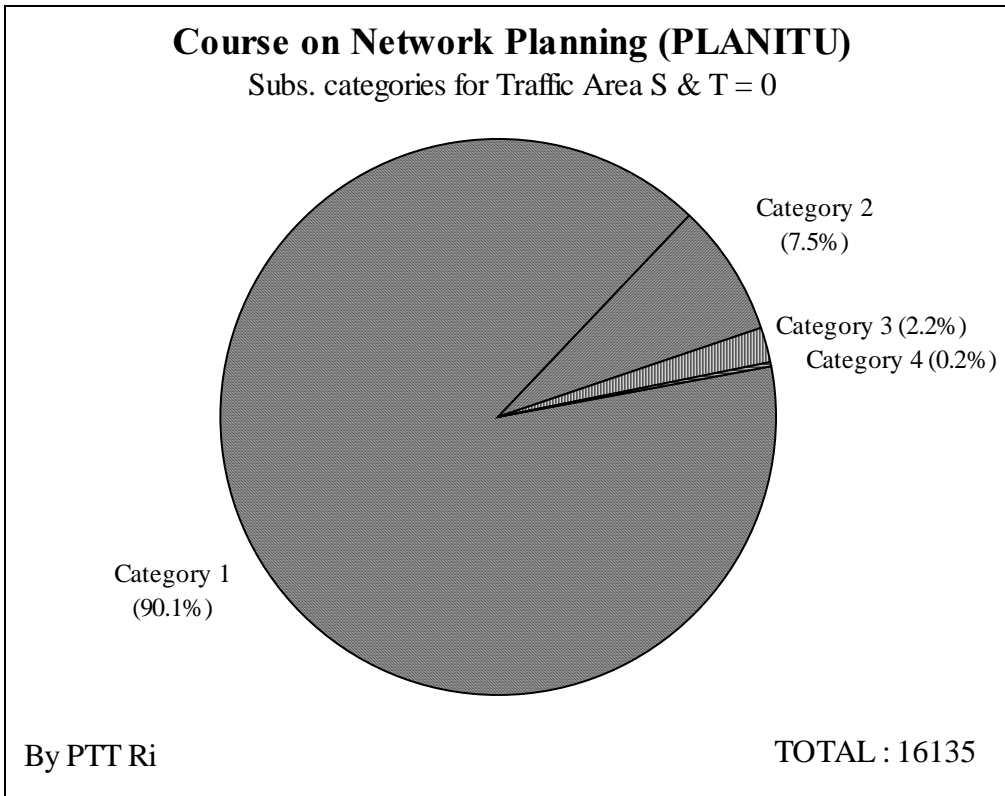


Figure 2.8
Percentage of subscriber categories for Taffic Area S.

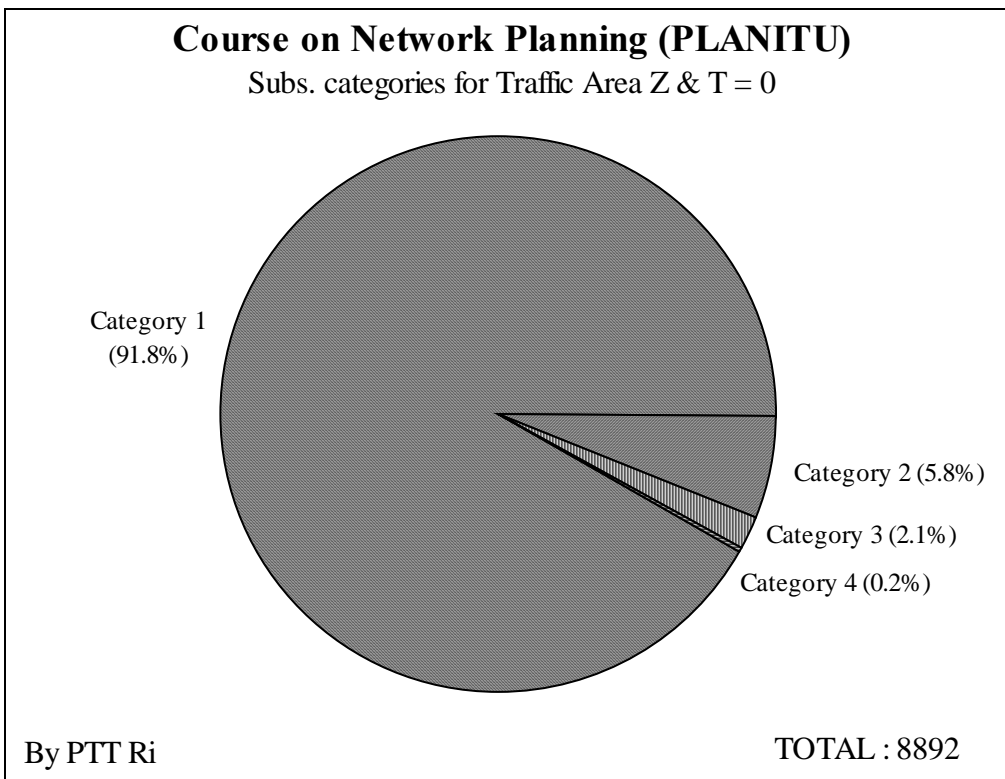


Figure 2.9
Percentage of subscriber categories for Traffic Area Z.

3. Traffic Data

Traffic matrices for exchanges and traffic areas for three points of time are given in Table 3.1 - Table 3.6. Calling rates for four categories of subscribers in each traffic area and T = 0 are tabulated in Table 3.7.

| Traffic Area | From To → Exchange | C + K | | Z | S | 7 | A | Special | Long | A |
|--------------|--------------------|--------|--------|--------|--------|-------|----------|----------|------------------|----------|
| | | 1 (R1) | 2 (R2) | 4 (Z) | 5 (S1) | (KOS) | Loc. Out | Services | Distance Traffic | Tot. Out |
| (C+K) | 1 - RIJEKA 1 | 69.20 | 50.60 | 28.60 | 33.70 | 0.35 | 182.45 | 4.30 | 64.30 | 251.05 |
| | 2 - RIJEKA 2 | 49.00 | 71.30 | 28.00 | 37.20 | 0.60 | 186.10 | 10.50 | 73.00 | 269.60 |
| Z | 4 - ZAMET | 24.20 | 23.10 | 22.10 | 13.90 | 0.05 | 83.35 | 3.00 | 21.70 | 108.05 |
| S | 5 - SUSAK 1 | 34.00 | 37.80 | 14.90 | 31.30 | 0.25 | 118.25 | 6.65 | 31.05 | 155.95 |
| | 7 - KOSTRENA | 0.40 | 0.75 | 0.05 | 0.30 | 0.30 | 1.80 | 0.15 | 0.65 | 2.60 |
| A | Loc. In | 176.80 | 183.55 | 93.65 | 116.40 | 1.55 | 571.95 | (26.60) | (190.70) | (787.25) |
| | Special Services | - | - | - | - | - | - | - | - | - |
| | Long Dist. Traffic | 45.00 | 49.90 | 17.20 | 24.30 | 0.35 | 136.75 | - | - | - |
| A | Tot. In | 221.80 | 223.45 | 110.85 | 140.70 | 1.90 | 708.70 | - | - | - |

Table 3.1
Traffic matrix for exchange areas in year 1977 (T = -10)

| From Traffic Area | To → | C + K | Z | S | A | Special | Long | A |
|-------------------|--------------------|--------|--------|--------|--------|---------|------------------|--------|
| | | | | | | | Distance Traffic | |
| C - (CENTAR) | | 240.10 | 56.50 | 71.85 | 368.55 | 14.80 | 137.30 | 520.65 |
| K - (KOZALA) | | | | | | | | |
| Z - (ZAMET) | | 47.30 | 22.10 | 13.95 | 83.35 | 3.00 | 21.70 | 108.05 |
| S - (SUSAK) | | 72.95 | 14.95 | 32.15 | 120.05 | 6.80 | 31.70 | 158.55 |
| A | Loc. In | 360.35 | 93.65 | 117.95 | 571.95 | (24.60) | (190.70) | 787.25 |
| | Special Services | - | - | - | - | - | - | - |
| | Long Dist. Traffic | 94.90 | 17.20 | 24.65 | 136.75 | - | - | - |
| A | Tot. In | 455.25 | 110.85 | 142.60 | 708.70 | - | - | - |

Table 3.2
Traffic matrix for traffic areas in year 1977 (T = -10)

| Traffic Area | From To → Exchange | C + K | | Z | S | | | | Long Distance Traffic | | | |
|--------------|--------------------|--------|--------|--------|--------|--------|---------|-------|-----------------------|------------------|------------------|------------|
| | | 1 (R1) | 2 (R2) | 4 (Z) | 5 (S1) | 6 (S2) | 7 (KOS) | 8 (B) | A Loc. Out | Special Services | Distance Traffic | A Tot. Out |
| (C+K) | 1 - RIJEKA 1 | 34.80 | 49.00 | 13.30 | 9.10 | 18.20 | 0.40 | 1.30 | 126.10 | 1.50 | 53.30 | 180.90 |
| | 2 - RIJEKA 2 | 56.30 | 163.20 | 49.90 | 30.20 | 60.90 | 0.70 | 3.40 | 359.60 | 4.50 | 158.60 | 522.70 |
| Z | 4 - ZAMET | 15.90 | 46.20 | 32.90 | 9.70 | 16.60 | 0.05 | 0.15 | 121.50 | 3.70 | 39.80 | 165.00 |
| | 5 - SUSAK 1 | 9.20 | 25.80 | 8.90 | 15.30 | 16.40 | 0.10 | 0.15 | 75.85 | 1.10 | 19.50 | 96.45 |
| S | 6 - SUSAK 2 | 15.60 | 49.80 | 21.80 | 14.70 | 39.50 | 0.20 | 0.20 | 141.80 | 2.30 | 43.25 | 187.35 |
| | 7 - KOSTRENA | 0.40 | 0.80 | 0.50 | 0.15 | 0.25 | 0.30 | 0.30 | 2.00 | 0.10 | 0.90 | 3.00 |
| | 8 - BAKAR | 2.60 | 5.40 | 0.25 | 0.25 | 0.25 | 0.10 | 0.10 | 9.30 | 0.45 | 7.20 | 16.90 |
| | A Loc. In | 134.80 | 340.20 | 122.10 | 79.40 | 152.10 | 1.85 | 5.70 | 836.15 | (13.6) | (322.55) | (1172.30) |
| | Special Services | - | - | - | - | - | - | - | - | - | - | - |
| | Long Dist. Traffic | 40.30 | 123.20 | 31.80 | 18.20 | 36.85 | 0.45 | 3.45 | 254.25 | - | - | - |
| | A Tot. In | 175.10 | 463.40 | 153.90 | 97.60 | 188.95 | 2.30 | 9.15 | 1090.40 | - | - | - |

Table 3.3
Traffic matrix for exchange areas in year 1982 (T = -5)

| From Traffic Area | To → | C + K | Z | S | A Loc. Out | Special Services | Long Distance Traffic | A Tot. Out |
|--------------------|------|--------|--------|--------|------------|------------------|-----------------------|------------|
| C + K | | 303.30 | 58.20 | 124.20 | 485.70 | 6.00 | 211.90 | 703.60 |
| Z | | 62.10 | 32.90 | 26.50 | 121.50 | 3.70 | 39.80 | 165.00 |
| S | | 109.60 | 31.00 | 88.35 | 228.95 | 3.90 | 70.85 | 303.70 |
| A Loc. In | | 475.00 | 122.10 | 239.05 | 836.15 | (13.60) | (322.55) | (1172.30) |
| Special Services | | - | - | - | - | - | - | - |
| Long Dist. Traffic | | 163.50 | 31.80 | 58.95 | 254.25 | - | - | - |
| A Tot. In | | 638.50 | 153.90 | 298.00 | 1090.40 | - | - | - |

Table 3.4
Traffic matrix for traffic areas in year 1982 (T = -5)

| Traffic Area | From To→ | C + K | | | Z | S | | | | Long Distance A | | | |
|--------------------|------------|--------|--------|--------|--------|--------|--------|---------|-------|-----------------|------------------|------------------|------------|
| | | 1 (R1) | 2 (R2) | 3 (K) | 4 (Z) | 5 (S1) | 6 (S2) | 7 (KOS) | 8 (B) | A Loc. Out | Special Services | Distance Traffic | A Tot. Out |
| C | 1-RIJEKA 1 | 22.20 | 34.20 | 12.30 | 11.60 | 5.70 | 11.60 | 0.70 | 1.10 | 99.40 | 4.10 | 36.80 | 140.30 |
| | 2-RIJEKA 2 | 38.90 | 140.00 | 72.80 | 50.80 | 33.10 | 55.90 | 2.00 | 4.10 | 397.60 | 19.00 | 197.80 | 614.40 |
| K | 3-KOZALA | 15.60 | 66.80 | 48.80 | 26.50 | 15.20 | 29.60 | 0.70 | 0.50 | 203.70 | 6.00 | 71.000 | 280.70 |
| Z | 4-ZAMET | 9.40 | 42.90 | 25.60 | 47.60 | 10.90 | 21.30 | 0.30 | 0.30 | 158.30 | 7.00 | 54.10 | 219.40 |
| | 5-SUSAK 1 | 5.50 | 26.40 | 11.70 | 10.00 | 24.30 | 20.50 | 0.80 | 0.70 | 99.90 | 3.00 | 26.80 | 129.70 |
| S | 6-SUSAK 2 | 11.00 | 50.70 | 29.60 | 21.70 | 20.30 | 53.40 | 1.00 | 1.20 | 188.90 | 8.00 | 60.10 | 257.00 |
| | 7-KOSTRENA | 0.70 | 2.00 | 0.70 | 0.40 | 0.60 | 1.00 | 2.20 | 0.20 | 7.80 | 0.40 | 3.80 | 12.00 |
| | 8-BAKAR | 2.00 | 6.30 | 1.00 | 0.80 | 0.90 | 2.20 | 0.20 | 1.60 | 15.00 | 1.00 | 9.00 | 25.00 |
| A Loc. In | | 105.30 | 369.30 | 202.50 | 169.40 | 111.00 | 195.50 | 7.90 | 9.70 | 1170.60 | (48.55) | (495.40) | (1678.50) |
| Special Services | | - | - | - | - | - | - | - | - | - | - | - | - |
| Long Dist. Traffic | | 31.80 | 144.90 | 62.00 | 53.20 | 26.10 | 50.90 | 2.60 | 8.90 | (380.40) | - | - | - |
| A Tot. In | | 137.10 | 514.20 | 264.50 | 222.60 | 137.10 | 246.40 | 10.50 | 18.60 | 1551.00 | - | - | - |

Table 3.5
Traffic matrix for exchange areas in year 1987 (T = 0)

| From Traffic Area | To → | C | K | Z | S | A Loc. Out | Special Services | Long Distance Traffic | A Tot. Out |
|--------------------|------|--------------|--------|--------|--------|------------|------------------|-----------------------|------------|
| | | C - (CENTAR) | | 235.30 | 85.10 | 62.40 | 114.20 | 497.00 | 23.10 |
| K - (KOZALA) | | 82.40 | 48.80 | 26.50 | 46.00 | 203.70 | 6.00 | 71.00 | 208.70 |
| Z - (ZAMET) | | 52.30 | 25.60 | 47.60 | 32.80 | 158.30 | 7.00 | 54.10 | 219.40 |
| S - (SUSAK) | | 104.60 | 43.00 | 32.90 | 131.10 | 311.60 | 12.40 | 99.70 | 423.70 |
| A Loc. In | | 474.60 | 202.50 | 169.40 | 324.10 | 1170.60 | (48.50) | (459.40) | 1678.50 |
| Special Services | | - | - | - | - | - | - | - | - |
| Long Dist. Traffic | | 176.70 | 62.00 | 53.20 | 88.50 | 380.40 | - | - | - |
| A Tot. In | | 651.30 | 264.50 | 222.60 | 412.60 | 1551.00 | - | - | - |

Table 3.6
Traffic matrix for traffic areas in year 1987 (T = 0)

| Traffic Area | Calling Rate (in Erlang x 10 ³) | | | | |
|--------------|--|-------------|-------------|---------------|-------------|
| | Subs. Cat. | Local | | Long Distance | |
| | | Originating | Terminating | Originating | Terminating |
| Centar | RES | 13.78 | 12.50 | 6.22 | 4.70 |
| | BUS | 68.90 | 62.80 | 31.10 | 23.30 |
| | PBX | 186.00 | 167.70 | 84.00 | 62.30 |
| | CB | 52.00 | - | 23.00 | - |
| Kozala | RES | 13.50 | 13.00 | 4.50 | 4.00 |
| | BUS | 67.30 | 65.10 | 22.70 | 19.90 |
| | PBX | 179.00 | 172.90 | 61.00 | 52.80 |
| | CB | 30.00 | - | 10.00 | - |
| Zamet | RES | 12.80 | 13.10 | 4.20 | 4.10 |
| | BUS | 60.30 | 61.60 | 19.70 | 19.40 |
| | PBX | 181.00 | 185.00 | 59.00 | 58.10 |
| | CB | 30.00 | - | 10.00 | - |
| Susak | RES | 13.00 | 13.00 | 4.00 | 3.50 |
| | BUS | 61.20 | 61.10 | 18.80 | 16.60 |
| | PBX | 206.50 | 206.00 | 63.50 | 56.10 |
| | CB | 30.00 | - | 10.00 | - |
| Total | RES | 12.90 | 12.87 | 4.85 | 4.00 |
| | BUS | 61.20 | 64.60 | 23.35 | 21.00 |
| | PBX | 191.30 | 183.70 | 72.10 | 59.70 |
| | CB | 40.40 | - | 15.20 | - |

Table 3.7
Calling rates (traffic per main line) for T = 0

Note: Local traffic includes internal traffic and traffic to special services

References

Although not explicitly specified in the text body, the following references influenced the document:

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(*) = (Titles from summaries in English).