

Planning the evolution of a city. A case study of Abidjan

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Abstract This paper examines the planning of urban evolution within the context of Abidjan (Côte d'Ivoire). An integrated approach is adopted in which economic activities, housing and transportation are considered the principal elements. Within this context, particular consideration is given to the following points: the relationships between the city and the country, the functioning of the city overall, and the problems related to the broad spatial structure. Finally, the paper examines the present city plan and discusses the effects that some of the contemporary projects may have on its future evolution.

1. Introduction

This study focuses on the evolution of the city of Abidjan, but it makes use of some general hypotheses. These concern the complexity of the city and thus the need to consider it as an open system where many interrelated elements evolve within a larger, more general context. In this paper, however, the basic elements have been limited to three – economic activities, housing, and transportation – in order to understand the manner in which people work, live, and commute.

In the case study of Abidjan, these three aspects are presented, at both the functional and spatial level, by means of an integrated approach that shows the evolution of the city during the period of its most important urban growth from 1963 to 1988. Within this scenario, the effects of past planning are shown and some plans, already programmed for the future evolution of Abidjan, are tested for the purpose of predicting their possible effects.

Essentially, this study is based on statistical data concerning employment per sector, population per type of dwelling, and commuter flows. The data chosen are based on various reliable sources; however, a word of caution is necessary because generally they have been collected using a sampling method. Although this is a limitation, the information is sufficient for the needs of this paper: to focus on a macroscopic, comparative, and quantitative consideration of the evolution phenomena in the city. To these ends, the data have been organised in a raster GIS data model which allows a space-time comparison of the phenomena.

2. Abidjan and its population

The city occupies a dominant position on the sea in the south-east area of the Côte d'Ivoire (CI). In fact, Abidjan (figure 1) owes its predominance as the economic capital of the CI to these geographical factors. It not only has an important port, it also rules over the railway system that connects the city to the northern region and a part of the Niger valley. For all of these reasons,



Figure 1: Abidjan and its region. Circles are proportional to the urban population in 1988.

Abidjan has assumed the role of the major exchange point between the CI and the rest of the world, thus becoming the primary city in the country.

This fact is disclosed by a ranking of CI cities based on the general survey of 1988, utilising data on urban population from all the counties (*sous-prefectures*) in which the CI is divided for administrative purposes. In all of these cases, the urban population count can be considered to coincide with that of the inhabitants of the chief city of the county. In the survey, the county of Abidjan ranked number one. In 1988, its urban population, ca. 1.9 million, represented about 17 percent of the total CI population of ca. 10 800 000. Overall, the predominance of Abidjan can best be understood by comparing it to other counties. Bouake, located in the central forest area, ranked second. In 1988, it had only 320 000 inhabitants. Yamoussoukro, which has been the political capital since 1983, ranked only fifth with a population of ca. 106 000. In fact, despite projects for a complete transferral of political function to Yamoussoukro, Abidjan continues to be the primary administrative centre.

An examination of the surrounding region reveals an even clearer picture of the way that Abidjan dominates the hinterlands. Of the surrounding cities, Yamoussoukro is the most important and is connected to Abidjan by a highway and a secondary road. In addition, four important, secondary centres have grown up around the outer edges of Abidjan. Of

these, Divo had an urban population of ca. 72 000, Abengourou ca. 59 000, Agboville ca. 46 000, and Dimbrokro ca. 37 000. The latter two are located along the railway. In addition, other minor centres, Anyama (56 000), Grand-Bassam (41 000), and Bingerville (28 000) can also be considered as peripheral parts of the agglomeration of Abidjan which, by 1988, extended over ca. 16 000 hectares of urbanised areas (DCGTX, 1996).

The spectacular growth of the city in recent times contrasts sharply with its beginnings. In fact, until 1903, Abidjan was a city of little significance, and as late as 1928, it still had a limited number of inhabitants, ca. 4500. But, by 1993 the population count had risen to ca. 2.4 million. Most of this growth occurred during the 1960s and 1970s when the rapid economic development stimulated massive migration from the northern region of the Côte d'Ivoire and immigration from Burkina Faso and Mali, and the neighbouring countries. However, in the 1980s, prices fell for the two primary exports, coffee and cocoa; this brought on an economic crisis that was followed by a decline in the city population growth rate¹ (figure 2).

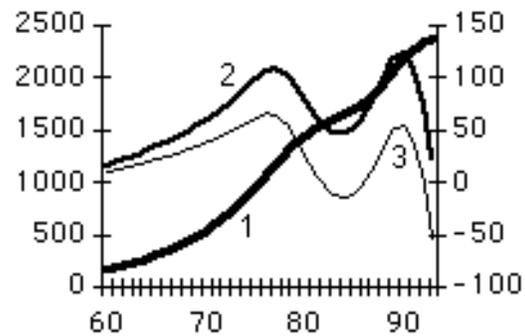


Figure 2: Demographic trend of Abidjan. Population (1), left axis; total yearly increase (2), and net migration (3), right axis. Thousand of inhabitants, 1960 to 1993

An examination of the period 1960-1993 shows that the estimated yearly growth rate varied from a maximum of 12 per cent during the period 1965-1969 to a minimum of 1 per cent in 1993. This decrease is largely attributable to a lower level of migration to the city. And, whereas in 1978 net migration accounted for 6.8 per cent of the growth, in 1988 net migration accounted for only 0.8 per cent even though the natural growth rate remained quite stable (Antoine and Zanou, 1994).

Migrations may be considered as a way to distribute wealth equally among social groups (Naudet, 1993); it is a manner for the population to adapt its location in reference to a spatial distribution of income. To verify this hypothesis, a comparison has been made between the GNP, based on the 1985 constant price (BNETD, 1996), and the percentage of Abidjan's population in relation to all of the CI (figure 3). The trends of these two variables, for the period 1960-1993, show a correlation coefficient equal to 0.98. Furthermore, this result is consistent with a short-run model based on the following assumptions: urban income per capita is higher than the rural income and is more affected by the national economic trend than rural income, and rural-urban migration is proportional to the variations of urban income. This last hypothesis seems to be confirmed by figure 4 which shows how the net migration trend in Abidjan is related to the yearly variation of the GNP. The variations of the GNP have been smoothed using a moving average on three years. The resulting correlation coefficient with net migration is 0.43.

¹Data concerning the city's population are scarce. Information has been taken from various surveys (Cires, 1987; Le Pape, 1993; Dubresson, 1997) which are available for 1955, 1960, 1963, 1970, 1975, 1978, 1980, 1984, 1988, 1991, and 1993 (BNETD, 1996). The corresponding value of the population are: 127 585, 180 000, 246 650, 550 000, 951 216, 1 269 071, 1 422 000, 1 653 000, 1 934 342, 2 280 385, and 2 372 662. In order to estimate the yearly increase, the populations of the intercensary years have been calculated using a cubic splines method. Net migration has been estimated by supposing that natural growth rate was 4.1 till 1978, and that it decreased linearly to 3.2 per cent in 1993. This hypothesis is based on statistics that show the net natural growth rate was 4.1 per cent in 1978 and 3.5 per cent in 1978 (Antoine, Zanou, 1994).

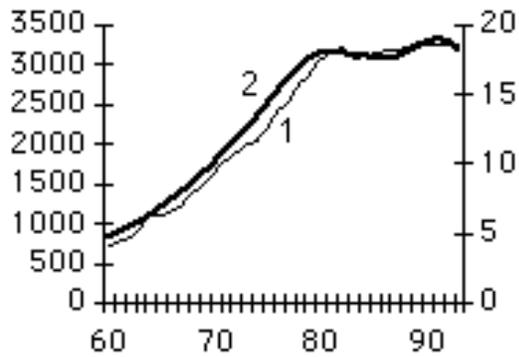


Figure 3: Trend of GNP, billions of CFA, 1985 constant price (1), left axis, compared with the Abidjan's population as a percentage of total CI population (2), right axis. 1960 to 1993

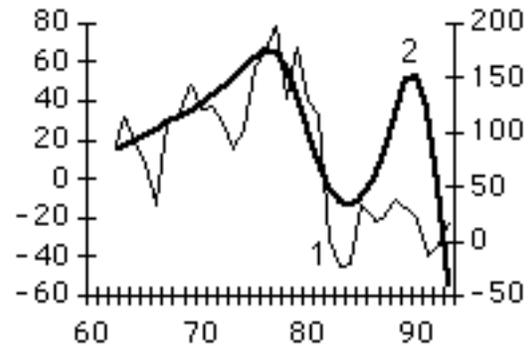


Figure 4: Yearly variation of GNP, billions of CFA, 1985 constant price (1), right axis, compared with net migration in Abidjan, thousand of inhabitants (2), left axis. 1962 to 1993

Although an even more precise analysis would add weight to the study, the simple observations set out above seem sufficient for providing a general outline of demographic growth of Abidjan. Population growth of this city was related to the total CI population as well as to the general trends of the national economy. The influence of the national economic trend can be explained by the central role of the city on the economy of the country. Abidjan was the principal import-export point for the area under discussion, thus the economic base of the city was regulated by the national exports. Hence, it can be seen that during economic growth the city would act as a magnet to attract rural migrants, but that an economic crisis would force large numbers of the workers involved in urban informal activities to migrate back to smaller- or medium-sized peripheral towns and rural areas where living costs were lower. In order to set forth a clear picture of this trend, an in-depth analysis has been made of the economic system of the city and of its economic connections to the national economy².

3. The aggregate functioning of the city

3.1. The economic system

To comprehend the evolution of a city's economic system, it is crucial to describe how work activities are grouped. In the case of Abidjan, a central role can be assigned to three sectors of economic activities: formal, informal, and agriculture, which is limited in size because of the urban context. Usually, inclusion in a formal sector is defined in relation to the number of employees

²Principal data utilised here come from the socio-economic analysis made in 1963 by SEMA (SEMA, 1965, and 1965a), the analysis for the "Perspectives decennales" made in 1975 by SCET International (SCET International, 1978, and 1978a), the 1988 survey for the Transportation plan (DCGTX, 1989, and 1989a). Data collected in these surveys were organised in geographical zones and have been compared to cartography from a similar date: the IGN plans (scale 1:50,000) to 1964 and 1974 and the cartography of the structure plan of 1985 (scale 1:50,000). This data has been organised in a raster GIS data model based on a squared grid containing 122x144 cells. Each cell represents a square with 250 meter long sides. In addition, this data has been also utilised for the analysis of the aggregate functioning of the city. When further sources are utilised they will be declared.

in a firm as well as to annual turnover, as established in the survey made by DCGTX (DCGTX, 1989 and 1989a). In this case, the formal sector³ is characterised by firms with more than 50 workers and the annual turnover of more than 2 million CFA. For the purposes of this study, the informal sector includes small business and traditional informal activities. Small businesses have fewer than 50 employees or an annual turnover of less than 2 million CFA. The traditional informal sector includes retail activities performed in a fixed-area (as a traditional market place), itinerant workers (peddlers and masons), and household service (servants) (DCGTX, 1989 and 1989a). This classification has been used as reference for comparing results of the other two surveys made by SEMA (SEMA, 1965, and 1965a) and SCET International (SCET International 1978, and 1978a) which are utilised in the following analysis.

As this brief description indicates, the formal sector is comprised of modern, capital intensive activities that are generally performed by companies and by the public administration. The employees earn medium-level wages. Informal activities are labour intensive and are performed by small firms. Workers are frequently autonomous and earn low-level wages. The traditional, informal sector is characterised by very little capital input and by its limited size. Small business has particular hybrid characteristics: it tends to increase in size and capital and to compete with the formal sectors in the types of production that are more labour intensive. Nevertheless, the small business sector is closer in character to the traditional, informal sector than the formal sector (Dubresson, 1997). For this reason, this case study has included the small business sector in the informal sector. In reality, it is this ample informal sector, discussed at length below, that currently plays an important role in the economic system of the city. By contrast, during the first growth period of the city, economic development was attributable to a variety of different factors.

During the early development of Abidjan, the success of the firms were intimately associated with accessibility to transportation systems (railways and roads) and the nearby port. This comparative advantage of Abidjan over other cities of the country was further consolidated by the political decision to locate the national public administration in this city. In turn, this situation helped create a larger local market and facilitated contacts between the economic and political powers. In varying measures, then, the economic growth of Abidjan can be attributed to all those factors that combined to strengthen the importance of two sectors: industry and services.

Indeed, an examination of the three traditional economic sectors for 1988 (Secrétariat Général du Recensement, 1991) (figure 5) shows that although the city was almost totally dependent on the country for its food supply, its strength was based on industrial and service activities. For the most part, these service activities were comprised of services related to the port, the formal service sector, the public administration, and the educational and training facilities which also include the university.

Nonetheless, of all the structures present in Abidjan, the port represented the true core of the city and was the location of the most important infrastructure. Furthermore, as major investments were made in this sector, it held a significant role in developing the local economy as a service supply for the national economic system. This is evident when data are studied for the quantity of import-export goods (Port Autonome d'Abidjan, 1995) in relation to the trend of the GNP (figure 6). In addition, the port was also responsible for bolstering the economy by contributing to the local employment (about 3000 workers in 1988 in the "Port Autonome d'Abidjan") and by stimulating the development of the local activities.

³The formal sector includes public administration. It may also include agricultural firms; these generally act as the headquarters of companies involved in agricultural exploitation.

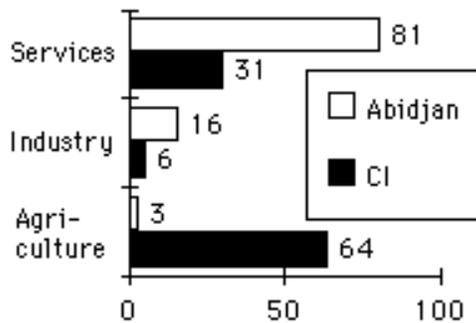


Figure 5: Percentage of employees per sector in the CI compared with that in Abidjan, 1988

On the whole, the growth of the formal industrial activities was determined by their proximity to the port and in response to national and local demand for particular products. The majority of these industries were active in the production of food (cocoa, coffee, beer and palm oil), machinery and mechanical components, metallurgy, and chemicals (petrol and asphalt) (figure 7). And most of them, ca. 70 per cent of the added value in 1980, utilised imported raw materials (Dubresson, 1983) in producing goods that were mainly directed to the national market. Over time, however, the importance of the industrial sector decreased slowly: the sector employed 15 per cent of the total working population in 1963, but dropped to 7 per cent in 1988 during the economic crisis (table 1, figure 8). In particular, after a constant increase till 1980 (Dubresson, 1983), the 1988 data (AUA, DCGTX, 1989) show a decrease in employment for industries that produced textiles, wood, machinery, and building materials (figure 7).

Of all the activities, the formal service sector – transportation, banking, insurance, and import-export – is most closely tied to the trend of national export. This is evident when data concerning GNP are considered (BNETD, 1996). In Abidjan, out of the total number employed in all activities, this sector counted 30 per cent in 1963 but only 16 per cent in 1975 (table 1, figure 8). In 1988, the number rose again to 20 per cent of the total employment, that is ca. 112 000. By comparison, the data for public employment present a quite different picture. Employment in this area – mainly government offices in the city, public education and parastatal companies – decreased steadily from 15 per cent in 1963 to 9 per cent in 1988 (table 1, figure 8).

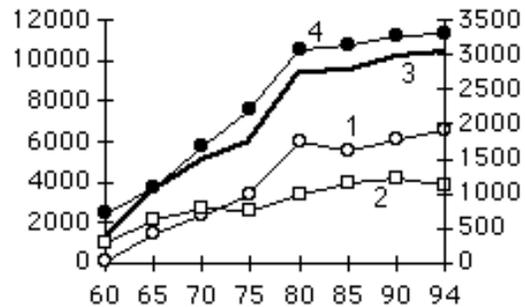


Figure 6: Tons of goods imported (1) and exported (2) through the port of Abidjan, the total (3), left axis, and the GNP (4), billions of CFA 1985 constant price, right axis. 1960 to 1994

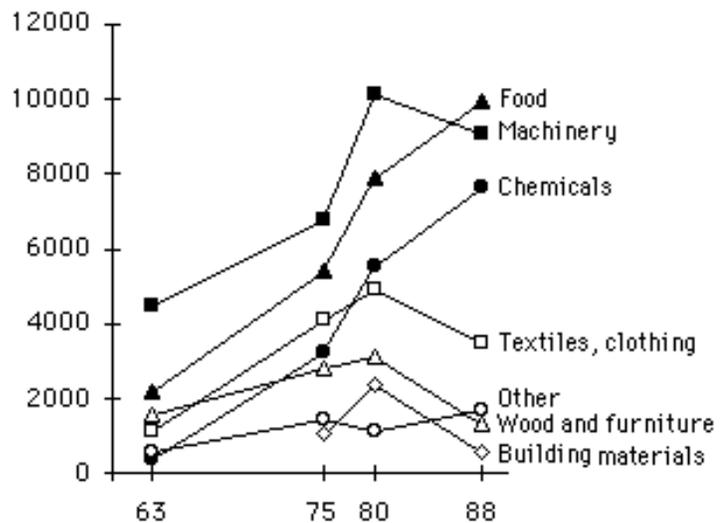


Figure 7: Employees in Abidjan per industrial sector, 1963 to 1988

Table 1: Employees in formal activities in Abidjan, numbers and percentages

Year	Industry and agriculture	Building	Services	Public administration
1963	12 670 (15.3%)	9 550 (11.5%)	25 060 (30.2%)	13 040 (15.7%)
1975	30 730 (10.6%)	18 670 (6.5%)	46 200 (16.0%)	31 840 (11.0%)
1988	37 570 (6.7%)	5 890 (1.1%)	112 390 (20.1%)	52 000 (9.3%)

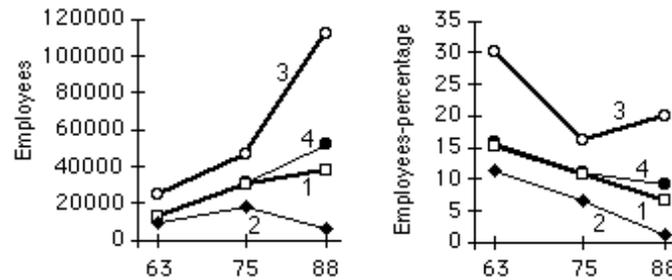


Figure 8: Employees in formal activities in Abidjan, numbers, left, and percentages, right. Industry and agriculture (1), building (2), services (3), and public administration (4). 1963 to 1988. (table 1)

The growth of employment in formal economic activities and the differences that existed between rural and urban wages were active agents in attracting migrants to the city, but this movement also resulted in a scarcity of job openings in relation to job seekers. Thus, this surplus of workers turned to employment opportunities in the informal sector. Indeed, it was this sector that provided ready job opportunities for the new waves of immigrants. Therefore, it is clear that this sector was stimulated by the availability of an unutilised workforce that could count on the presence of a large local market and widespread urban infrastructures, such as water and electricity delivery system.

In turn, the development of the informal sector not only helped to increment employment opportunities, it also contributed to the following effects:

- a widespread distribution of income which allowed workers, excluded by the formal sector, to live in the city at a subsistence salary;
- cheaper food, housing, and transportation;
- an increased propensity to consume goods;
- a decrease in the costs related to the urban lifestyle, especially for the upper-middle income classes (de Mirras, 1982).

The data show that informal activities grew from 27 per cent of the total employment in 1963 to 60 per cent in 1988, that is to ca. 339 000 workers. More specifically, a comparison of employment statistics for formal and informal activities shows that beginning with the 1970s, the estimated number of employees in the informal sector exceeded those in the formal sector (table 2, figure 9). Furthermore, when the informal sector is considered and a comparison of employment is made for small businesses and traditional informal activities, it is clear that while the

Table 2: Employees per activity sector in Abidjan, numbers and percentages. Data on agriculture are not available for 1963

Year	Formal activities	Informal activities	Agriculture	Total
1963	60 320 (72.8%)	22 540 (27.2%)	-	82 860
1975	127 440 (44.1%)	145 070 (50.2%)	16 260 (5.6%)	288 770
1988	207 850 (37.1%)	339 350 (60.6%)	12 800 (2.3%)	560 000

Note:

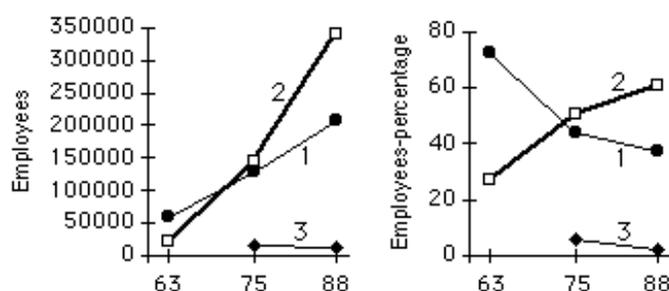


Figure 9: Employees in formal (1), informal activities (2), and in agriculture (3) in Abidjan, numbers, left, and percentages, right. 1963 to 1988. (table 2)

figures for the first group show a continuous growth, both in absolute value and percentage, the figures for the second group show that while the percentage value grew during the first period, it decreased in the second (table 3, figure 10). Thus, it appears that the phase of economic development paralleled the migrant-immigrant growth rate, which, in turn, stimulated traditional, informal activities. In contrast, the economic crisis phase caused growth to slow in large companies to the benefit of small businesses characterised by lower salaries and a more flexible workforce. Thus, even though the economic crisis had a negative effect on the overall demand for goods and services that they produced, small businesses continued to grow.

The activities of these small businesses and traditional informal activities were characterised by their variety, by their large number of employees, usually recently immigrated, and by a work specialisation by nationality: Burkinese (mainly servants), Ghanaians, Togolese and Beninese, as well as Senegalese and Malians (employees in small retail activities), and Nigerians (employees in laundries or small, traditional African restaurants) (Attahi, 1992). In 1975 small businesses employed ca. 49 000 people (table 3, figure 10). More detailed statistics (SCET International, 1978 and 1987a), show that ca. 50 per cent of these small business' employees worked in the retail and services sectors, ca. 21 per cent worked in textiles and clothing, and ca. 4 per cent were employed in the production of wooden furniture. By 1988, this group of small businesses employed ca. 183 000 with 28 per cent in textile production, clothing and furniture, 4 per cent in building activities, and 67 per cent in services and retail (DCGTX, 1989 and 1989a).

In general, traditional informal activities usually revolve around retail jobs which are strictly connected to the demands of a low-income population. Consequently, it not surprising to find that, in 1988, about one-half of the ca. 156 000 employees were involved in fixed-area retail activities and 16 percent were itinerant workers as masons, taxi drivers, or peddlers. Furthermore, it is important to note that this traditional informal activity group also included household servants. In 1988, their number was calculated to be ca. 54 000. This was the lowest level service job

Table 3: Employees in informal activities per activity sector in Abidjan, numbers and percentages. Data on small business are not available for 1963

Year	Small business			Traditional informal activities	
	Industrial	Building	Services	Retail and itinerant workers	Servants
1963	-	-	-	17 980 (21.7%)	4 560 (5.5%)
1975	22 350 (7.7%)	1 110 (0.4%)	25 680 (8.9%)	63 650 (22.0%)	31 700 (11.0%)
1988	50 980 (9.1%)	6 500 (1.2%)	124 890 (22.3%)	102 140 (18.2%)	54 100 (9.7%)

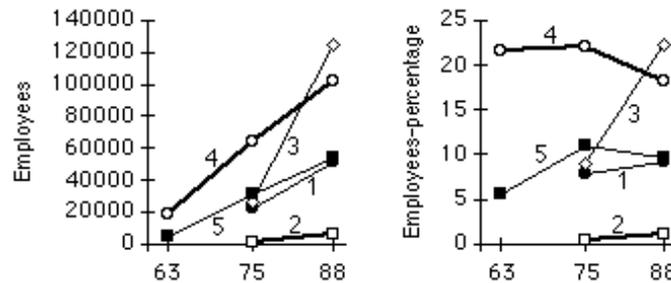
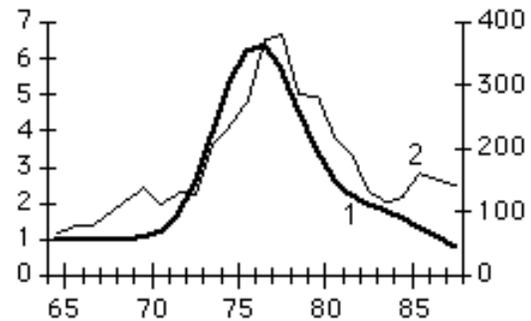


Figure 10: Employees in informal activities in Abidjan. Numbers, left, and percentages, right. Small business: industrial (1), building (2), and services (3); traditional informal activities: retail and itinerant workers (4), and servants (5). 1963 to 1988. (table 3)

available and, as stated above, was typically held by the foreign population, especially Burkinese who lived in the shanty towns.

Clearly, the impact of the activity sectors played an important role on the evolution of the city. Nonetheless, this picture is not a complete one and can not be so without examining two other components: building and transportation. These are of primary importance because it is these two agents that actively shaped the evolving urban pattern.



3.2. Housing and building sector

From 1963 to 1992, stimulated by demands arising from population growth, enormous increases occurred in the number of dwellings, industrial structures, office buildings, and in the quantity of infrastructures in the city. Indeed, an examination of the growth process in Abidjan shows that public investments played a central role in this process. This fact is clearly apparent when the total amount of public investments at a national level is compared to the increase in length of highway within the city (figure 11). Of course employment also grew in conjunction with the investments. In 1963, the building sector

Figure 11: Km of new highways in Abidjan (1), left axis, and public investments in CI, billions of CFA 1985 constant price, (2), right axis. 1964 to 1987

employed ca. 9500 people; in 1975 the number was ca. 19 600 or 7 per cent of the total number of persons employed. Of these ca. 18 600 worked in formal companies (table 1, figure 8) and only ca. 1000 in small businesses. Although the total number of employees in the building sector remained practically unchanged in 1988, the percentage decreased to 3.5. During the same period, construction workers employed in small business increased to ca. 6500 and to ca. 7600 in the traditional informal sector. In contrast, following the economic crisis, employment in building companies suffered a severe shift downwards to ca. 6000. These statistics clearly demonstrate how production carried out in informal activities replaced that of large companies.

Of all the activities related to the building sector, housing is the most important. In 1963, the number of dwellings were estimated at about 59 800; by 1992 the number had increased to about 374 000 (AUA, DCGTX, 1994). Nonetheless, although there was an increase in the overall number of available dwellings, the average standard of living decreased because the number of inhabitants per dwelling increased from 4.2 to 6.1. Thus, the gain in dwelling units actually led to a lowering of the average living standard.

Furthermore, these dwellings were primarily rental units. Clearly, when the bulk of the wealth of the city is held by a small sector of the population, the number of persons who can afford to purchase a home will be limited. Abidjan reflects this pattern (table 4 and figure 13). It is also the main reason that rentals were prevalent. In 1988, there was a moderate modification from rentals to home ownership; nevertheless, the number of rentals was still higher than 70 per cent. Two factors were instrumental in maintaining this situation: the high mobility of the population (to or out of the city, or internally within the city), and the difficulties associated with the purchase of land.

Generally, however, a quantity of rentals generally means that property is concentrated in a few hands. This is the case of Abidjan where construction in the city was promoted by only a limited number of people, in particular those who were present during the early growth phase of the city. These persons seized the opportunity to invest in land and buildings; they then utilised their profits to invest in further building ventures thus creating work for the small- and medium-sized firms operating in the building sector.

Obviously, the problem of rentals or ownership is important. However to fully understand the housing market in Abidjan, it is essential to examine the four main housing types into which the market is usually subdivided:

- houses with a common, enclosed courtyard: sanitary and cooking equipment (toilets and outdoor kitchens) located in the courtyard are shared;
- social housing built by public or private building companies: isolated houses or apartment buildings;
- shantytowns: built by squatters on hazardous areas using fragile material;
- high standard dwellings for the upper-classes: usually detached houses.

Figure 12 shows the percentages of inhabitants living in different types of housing. The largest percentage occupied common courtyard houses; it remained quite stable. In contrast, the percentage occupying social housing increased due to the thrust of the state policy which aimed, especially during the 1970s, to use public agencies for constructing social housing for the middle-income class. In turn, the percentage of people inhabiting shanty towns decreased especially in the last period (AUA, DCGTX, 1994). This result can be explained by a decreasing rate of immigration and by the expansion of the city which brought about an economic pressure from developers to use land previously occupied by shanty towns and, consequently, an eviction policy.

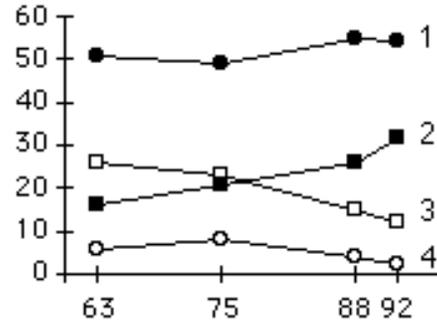


Figure 12: Percentage of people living in common courtyards dwellings (1), in social housing (2), in shanty towns (3), and in high standard dwellings (4). 1963 to 1992

Table 4: Number of families and average income of family (thousand of CFA per month, 1988 current price) per type of dwelling inhabited. Abidjan, 1988

	High standard	Social housing	Common courtyards	Shanty towns
Number of families	17 950	76 180	203 950	65 130
Average income	555	185	90	62

As might be imagined, there is a direct link between the type of dwelling and level of social class (DCGTX, 1989a) (table 4, figure 13), and between the type of dwelling and rent level. In 1992, average rents per dwelling, estimated in CFA per month (AUA, DCGTX, 1994), were: shanty town housing ca. 5000 or ca. 15 per cent of the minimum urban wage, courtyard housing ca. 14 000, social housing ca. 35 000, and high standard housing ca. 120 000. Obviously, the inhabitants were forced to fit income to dwelling costs by migration from one city zone to another and by a change in dwelling type. However, from the results found in the 1992 survey (AUA, DCGTX, 1994), it appears that the most important up and down filtering effects occurred between common courtyard dwellings and social housing. In essence, people filter down to common courtyard dwellings in order to remain in the city during periods of economic crisis.

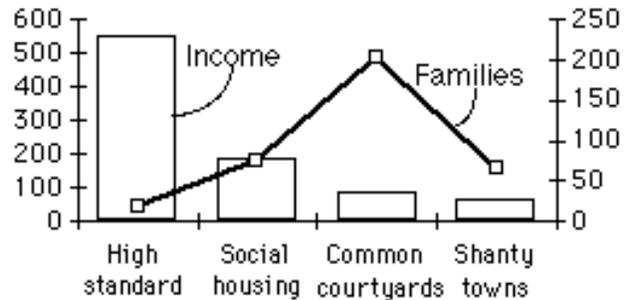


Figure 13: Number of families, in thousands, right axis, and average income of family, left axis, (thousand of CFA per month, 1988 current price) per type of dwelling inhabited by the family. Abidjan, 1988. (table 4)

In conclusion, it is clear that housing played a role in lowering subsistence wage levels and,

at the same time, in boosting employment possibilities especially in the informal sector. The growing housing demand promoted conditions favourable to investment by the medium- and high-income class; therefore their savings were not employed outside the city.

3.3. Transportation and commuting

In 1988, the city had only seven private cars per 100 inhabitants. Given this situation there was a great need for transportation. In addition, as the city expanded and became "scattered" in form, there was an increase in distance travelled. To demonstrate that aspect, calculations have been made for average distance travelled; these are based on the number of commuters in relationship to real distances travelled between geographical zones. The results show that the average distance travelled in 1963 was about 3.8 km, that it grew to 6.5 in 1975, and to 9.7 in 1988. However, the overall travel pattern shows a different trend (figure 14). In 1963 and 1975 the percentage of short trips was high. In 1988 about half of the commuter trip distribution ranged in distances from between 2.5 and 10 km; for the remainder of the commuters, distances travelled ranged to a high of ca. 35 km. This commuting pattern change was partially determined by the spread of informal activities over larger areas, thus workers were allowed to reside in an area not far from their workplace.

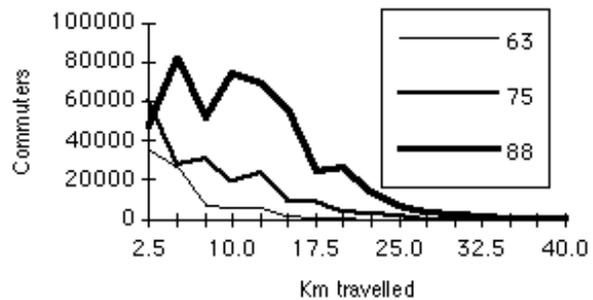


Figure 14: Estimated number of commuters per km travelled. 1963 to 1988

During the 1970s, transportation related investments were concentrated on road construction despite the fact that car ownership was rare. This condition, typical of many developing countries, gave rise to a variety of forms of transportation systems. In Abidjan the major part of the commuter demand, estimated at ca. 50 per cent, was satisfied by a public transport company; the rest of the need was met by the informal sector through minibuses, collective taxis, and regular taxis. In 1988, the public transport company had ca. 6 500 employees; by contrast there were ca. 9 500 taxi drivers.

4. The spatial pattern of the city

Very synthetically, the city developed in two phases: first along the north-south axis and then along the east-west axis. The north-south axis parallels the old railway track system that runs from the southern area on the sea to the inland, northern areas of the country. For this reason, four important zones are situated along this axis (figure 15). These are:

- the port with its industrial zone, the airport, and a mixed residential zone (Petit Bassam isle);
- the central business district (CBD) including the public administration (Plateau);

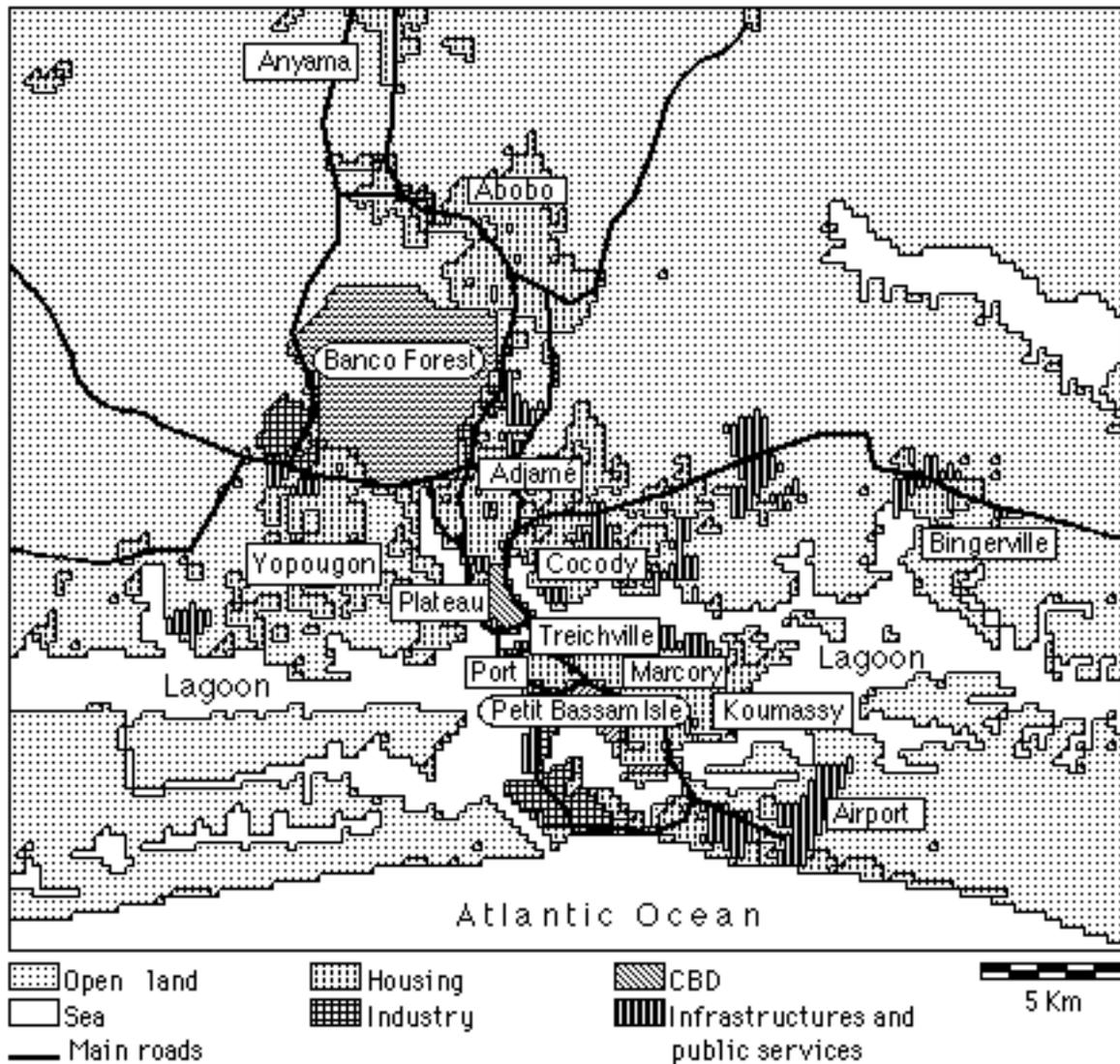


Figure 15: Map of Abidjan, 1985

- the popular commercial centre which includes the bus station, the big traditional city market, and a large popular residential zone (Adjamé);
- a residential low-class zone at the southern part of the city (Abobo).

These zones, however, did not develop at the same time nor with the same growth rate. Initially, the heart of the city, the Plateau – traditionally inhabited by Europeans – did develop simultaneously with two neighbouring areas, Treichville, to the south, and Adjamé, to the north – mainly inhabited by Africans (Attahi, 1992). All of these zones developed quickly, but following the construction of the port and the consequent expansion of the industrial area, the southern sector exploded even more rapidly. Once these zones became saturated, primarily by courtyard dwellings, expansion was then programmed towards the east and west sections of the city.

To the east, an upper-class zone, Cocody, already existed. From the first plans for the city it was designated as a high-standard residential zone and as the area of high-level facilities – embassies and the university. Thus, the area is also characterised by low-density residential construction. The settlement to the west, Yopougon, contrasts sharply with the upper-class zone. This area, which is separated from the city centre by a long narrow waterway, was planned to be the site of a large social housing complex and as the decentralised industrial zone.

Abobo, at the northern side of the north-south axis, was not an official part of the early urbanisation scheme. This suburb sprang up, spontaneously, around a secondary railway station in an area distant from the city centre. For this reason, the cost of land was low; consequently, the area was quickly saturated with common courtyard houses and shanty towns. Despite urban programming, many of these shanty towns mushroomed, during the 1970s, on the edges of the expanding city spreading out over vacant property of uncertain ownership or of hazardous character due to run off from the sewage system, high power lines, or the hilly configuration of the land. Therefore, as the city expanded, the shanty towns dwellers were evicted and forced out to new locations in even more peripheral areas. Consequently, small shanty towns are now widely scattered all around the edges of the city, but some of considerable size do still exist in the suburbs.

Clearly, the expansion of these housing settlements helped shape the structure of the city, but the construction of the road network also contributed to the shaping of its form. In Abidjan, the road system is particularly important because of the presence of the lagoon. In fact, this peculiarity created problems that are still present, for as the city grew around this body of water, communication from one zone to the other became even more difficult, particularly from north to south. Further, as a result of the unusual geographic aspect, it was impossible for the city to assume a classic radial form; consequently, the situation promoted the growth of a number of peripheral centres. This was one of the reasons for the creation in 1980 (Attahi, 1989) of ten autonomous districts in which the city is currently divided.

4.1. Location and spatial dynamics of jobs

Opportunity for job growth was focused primarily in the area of the port of the Petit Bassam isle and in the city centre on the Plateau: the industrial area developed around the port and the CBD around the administrative centre. To help clarify the picture, information from the raster GIS data model has been utilised in order to pinpoint the location of the activities. Originally, formal industrial activities (figure 16) were confined to the Petit Bassam isle near the port area, but expansion during the 1970s forced these activities to seek space in the areas planned for industry. In addition, other companies, especially building which is also included in the industrial activities, located their headquarters in the Plateau. In the latter part of the 1970s, other changes took place: industrial employment decreased and the industrial areas, in accordance with the planning policy, began to decentralise along the borders of the expanding city. Similarly, although the public administration, service and commercial activities were originally concentrated on the Plateau (figure 17), in the 1980s they also began to decentralise throughout the Petit Bassam isle. All of these changes encouraged decentralisation, but the major impetus for a thorough decentralisation of the structures of the city came from the small businesses and traditional informal activities.

Informal activities that first began in the two neighbourhoods of Adjamé and Treichville later spread all over the city. However, in 1988, they were still more highly concentrated in the first two zones (figure 18). The traditional, commercial activities of the informal sector grew along

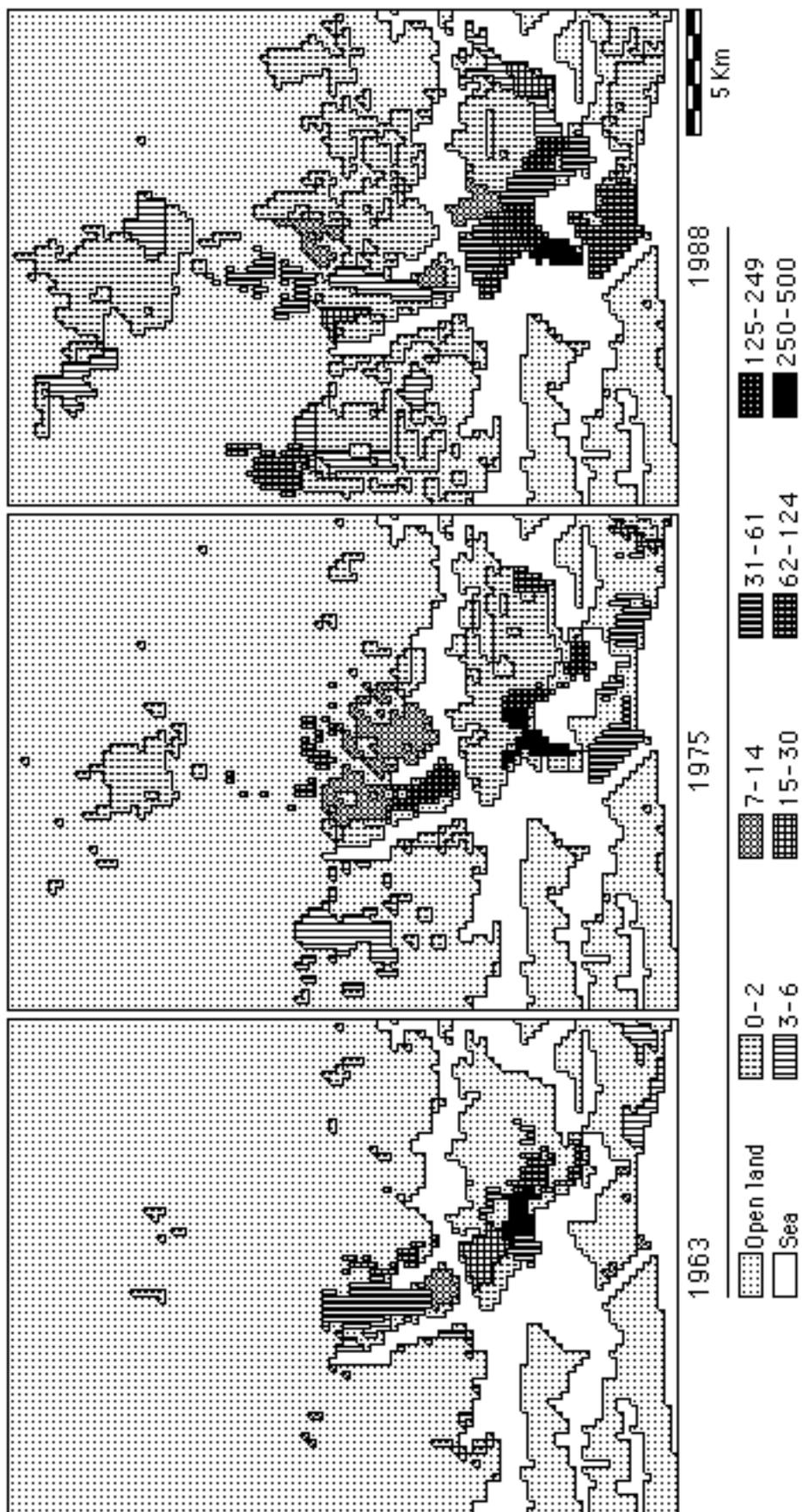


Figure 16: Employees in formal activities in Abidjan: industry, building, and agriculture. The legend refers to the number of employees that are located in each squared cell

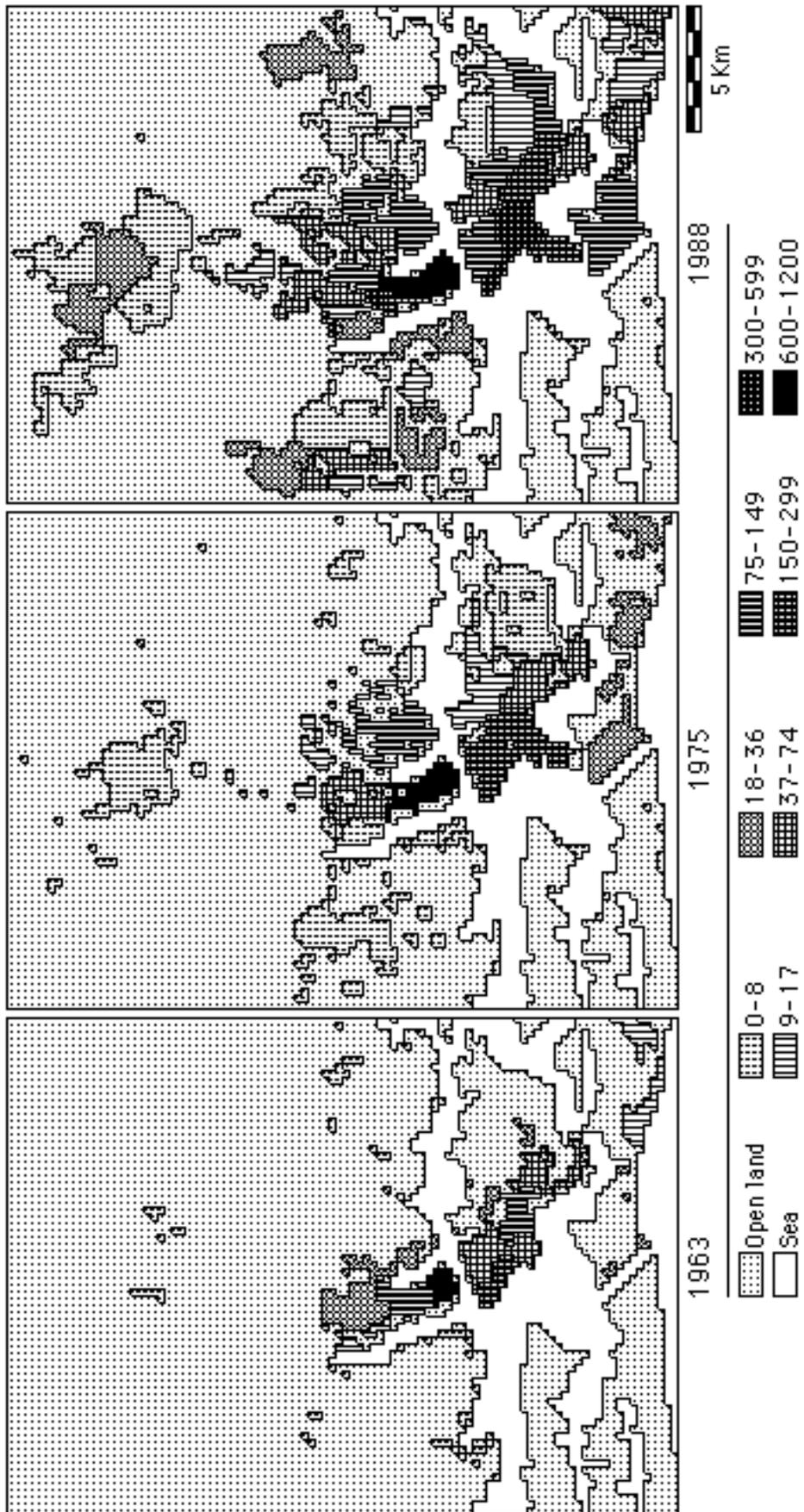


Figure 17: Employees in formal activities in Abidjan: services and public administration

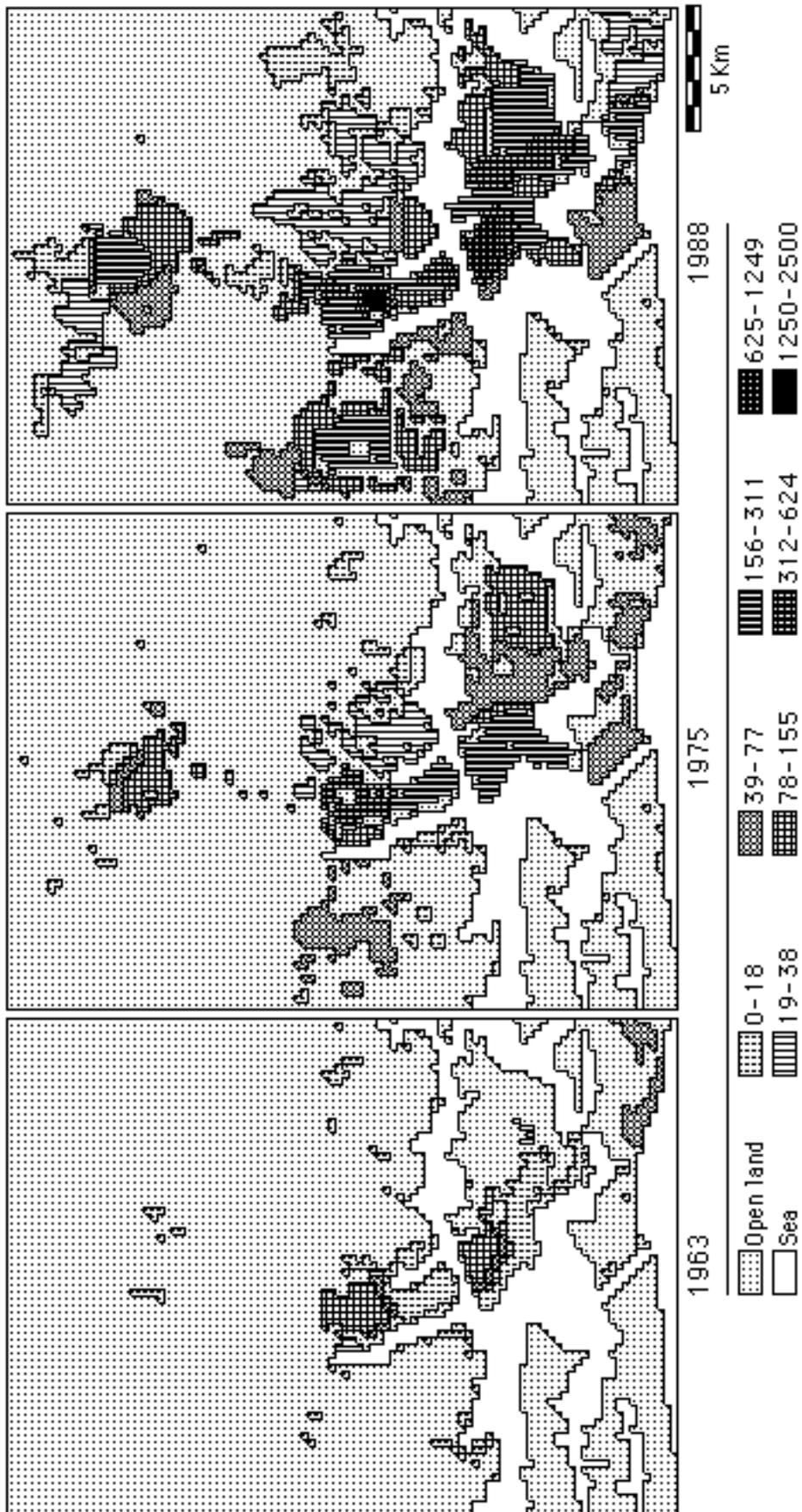


Figure 18: Employees in small businesses and traditional informal activities in Abidjan

with the expansion of the city and the increased presence of the low-income population. In fact, it was the expansion of these traditional, informal activities and small businesses that most contributed to the economic growth of new zones such as Abobo and Yopougon. To underline this fact, calculations were made on a dispersion index⁴

These show that industrial services and public administration were the least dispersed of all the activities and that small businesses and retail activities were the most decentralised (figure 19). In particular, small business tended to take root in semi-central areas near traditional market informal activities where they could avoid high rent costs on land and yet remain not far from formal activities. This makes sense because formal activities (or their employees) are connected to small business activities both as consumers and providers, whereas traditional market activities are a favourable urban environment for the development of small businesses. This decentralisation process helped to open up jobs accessibility and to improve housing quality as is explained below .

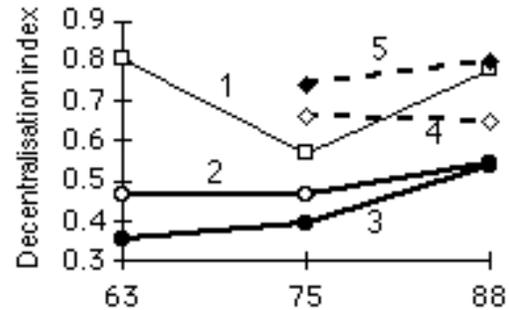


Figure 19: Index of decentralisation. Formal activities: industry, building, and agriculture (1), services (2), and public administration (3); informal activities: small businesses (4), and traditional informal activities (5). 1963 to 1988

4.2. Location and spatial dynamic of housing

As explained previously, dwellings are categorised in types corresponding to income levels. In Abidjan, the spatial distribution of these categories varied enormously from one period to the other, and the quality of housing was determined by the accessibility to jobs as well as by the type of dwelling available.

When dwellings per type are considered, it appears that those with common courtyards (figure 20) were the most widespread. This type originated in the two older neighbourhoods of Adjamé and Treichville but later spread, during the 1970s and 1980s, throughout the zone of Abobo and the northern part of the Petit Bassam isle. On the other hand, social housing (figure 21) came into existence through public investment projects; thus this type of housing was more evident on the west side of the zone of Yopougon and in the Petit Bassam isle. Shanty towns (figure 22) seem to have been more mobile, but, in fact, they were squeezed out of the central Plateau area by rising rents on land. However, high standard dwellings (figure 23) were also affected by land costs as villas required large areas of terrain. As high-income people decreased and housing of the Plateau was empty, it took on its current use as the seat of service activities. A test on the stability of dwellings based on comparison of data related to 1975 and 1988 confirm that dwellings with common courtyards have the most stable location, in contrast high standard

⁴Using the real distance from the city centre c that was established on the southern side of the Plateau, the dispersion index, D_k , for the activity sector k has been calculated with the following equation: $D_k = (1/D_a) \frac{\sum_{ij} W_{k,ij} d_{ij,c}}{\sum_{ij} W_{k,ij}}$ where D_a is the average dispersion index from the city centre c , obtained utilising data concerning total population and total employment; $W_{k,ij}$ is the employees in sector k and in cell ij , and $d_{ij,c}$ is the distance from the cell ij to the city centre c . Because the total employment and total population are usually more dispersed than each activity sector, index range normally between 0, minimum to 1, maximum decentralisation.

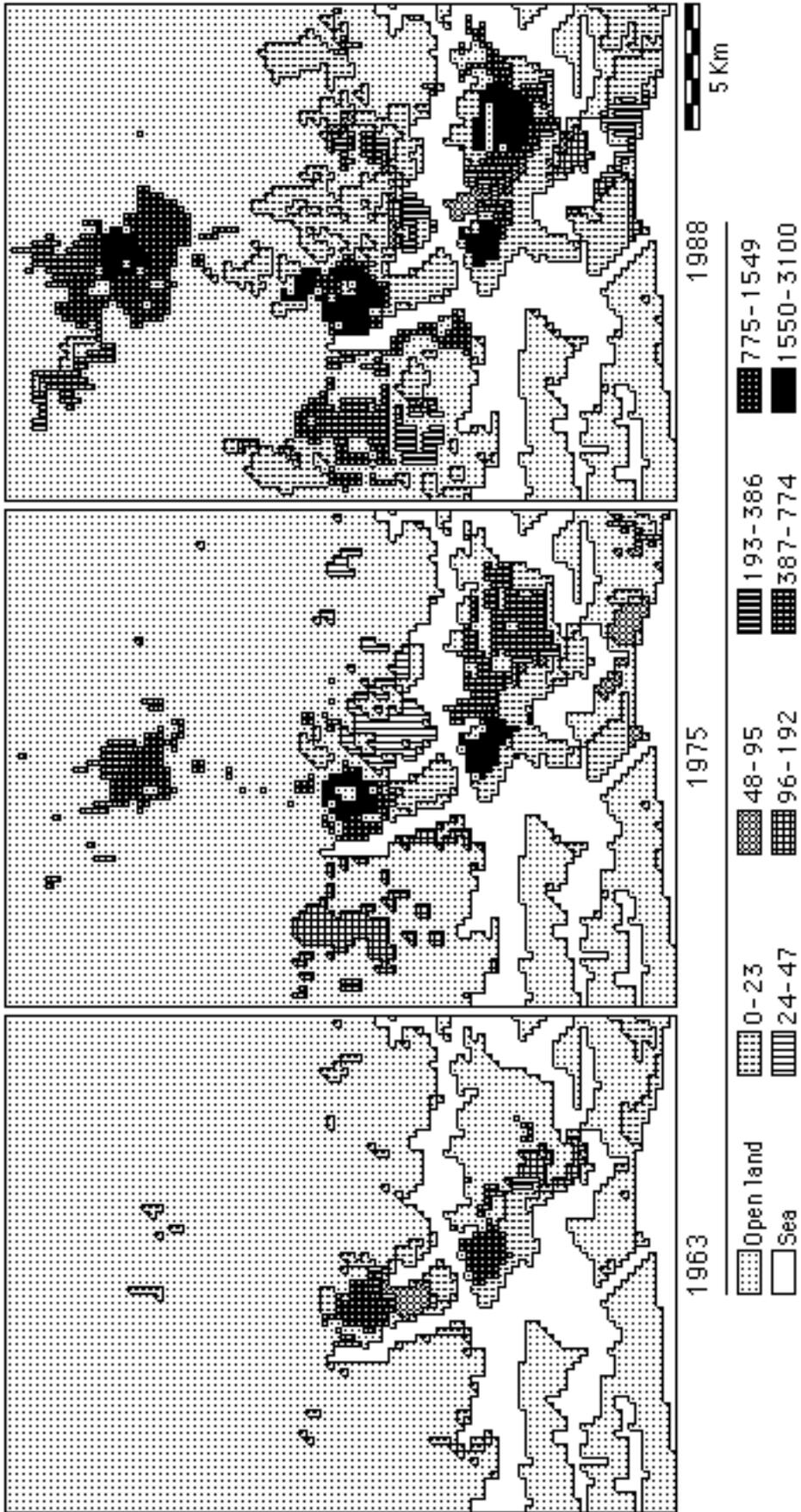


Figure 20: Population living in common courtyard dwellings in Abidjan. Legend refers to the number of inhabitants located in each squared cell

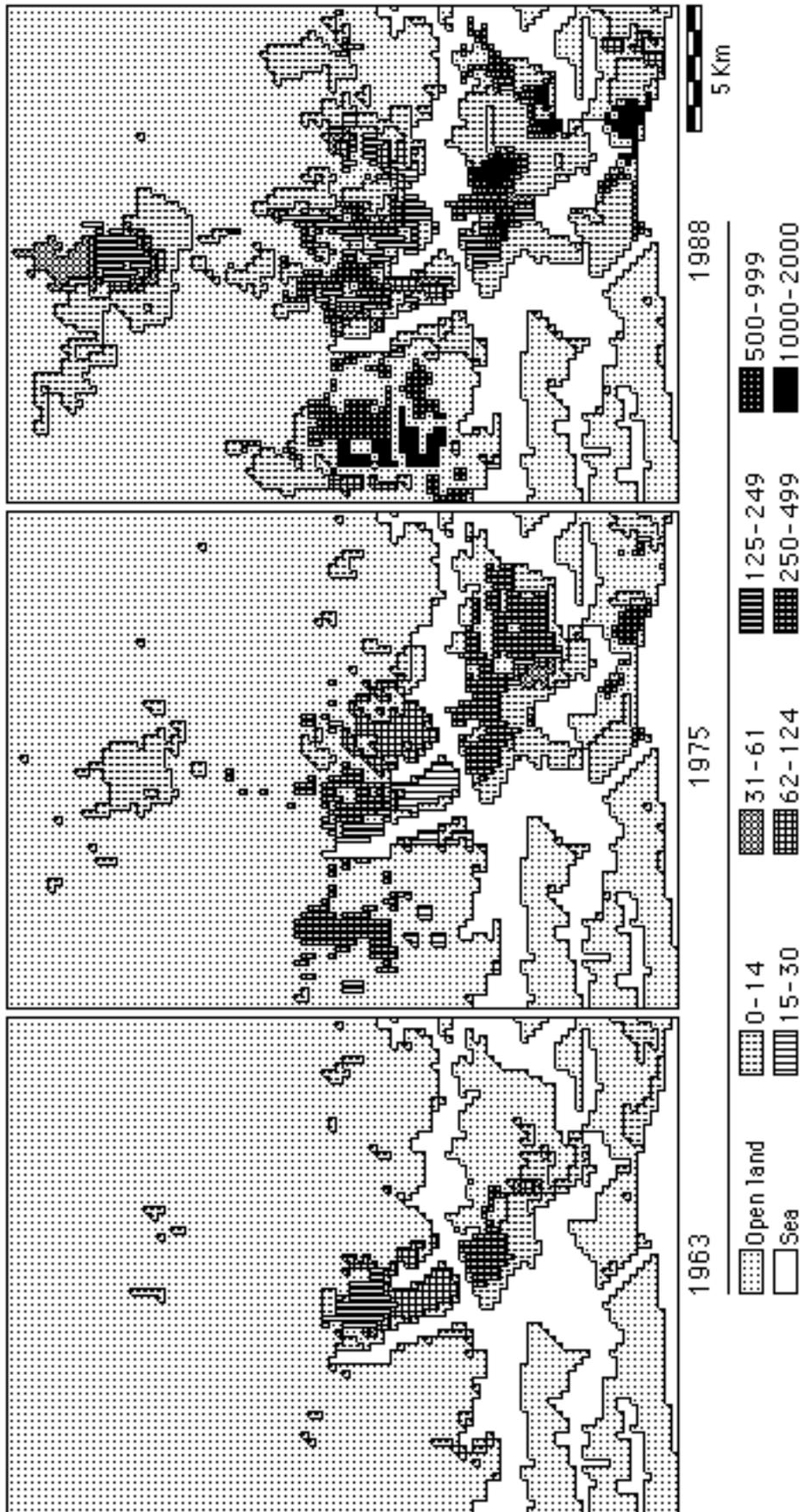


Figure 21: Population living in social housing in Abidjan

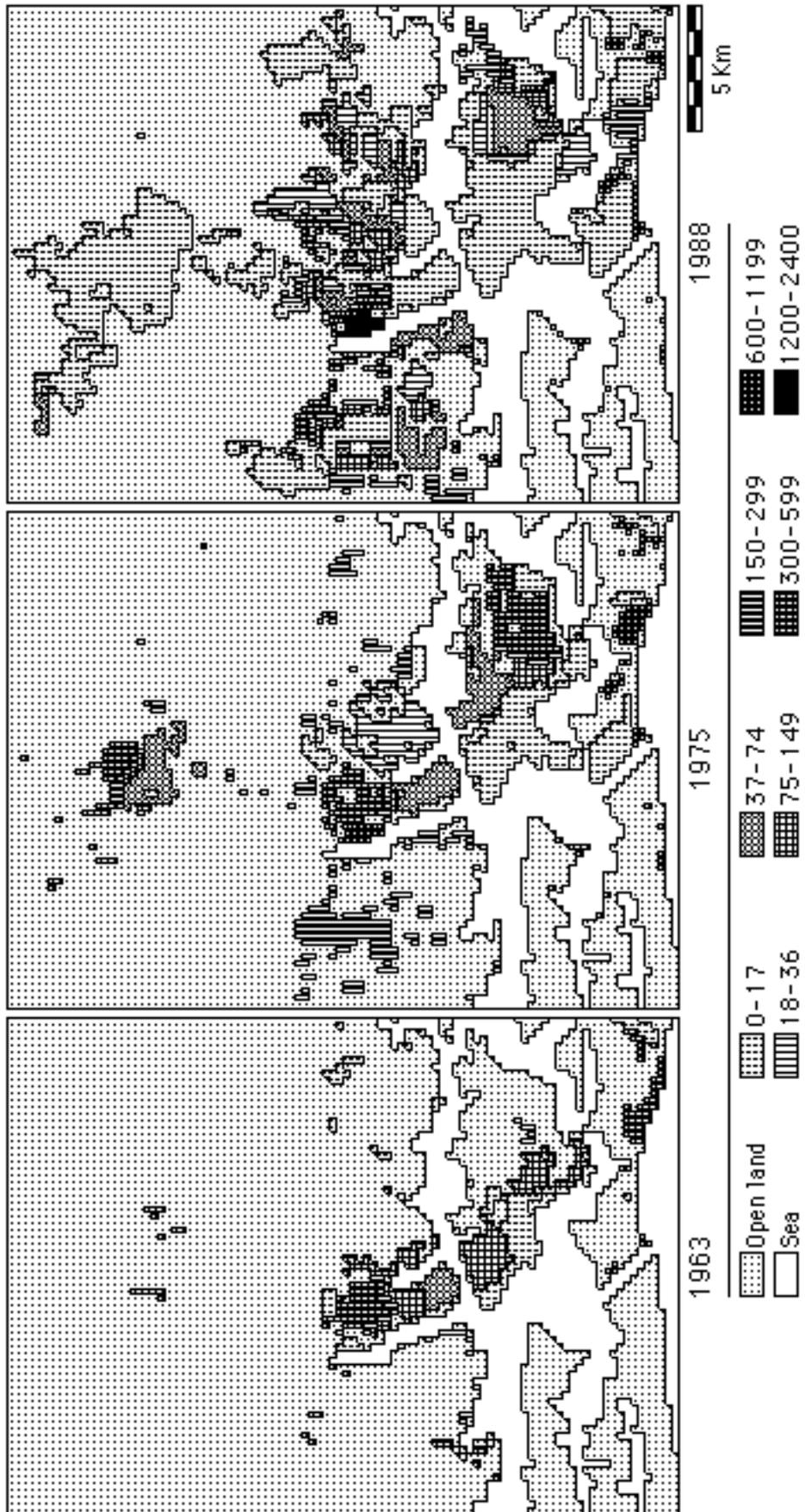


Figure 22: Population living in shanty towns in Abidjan

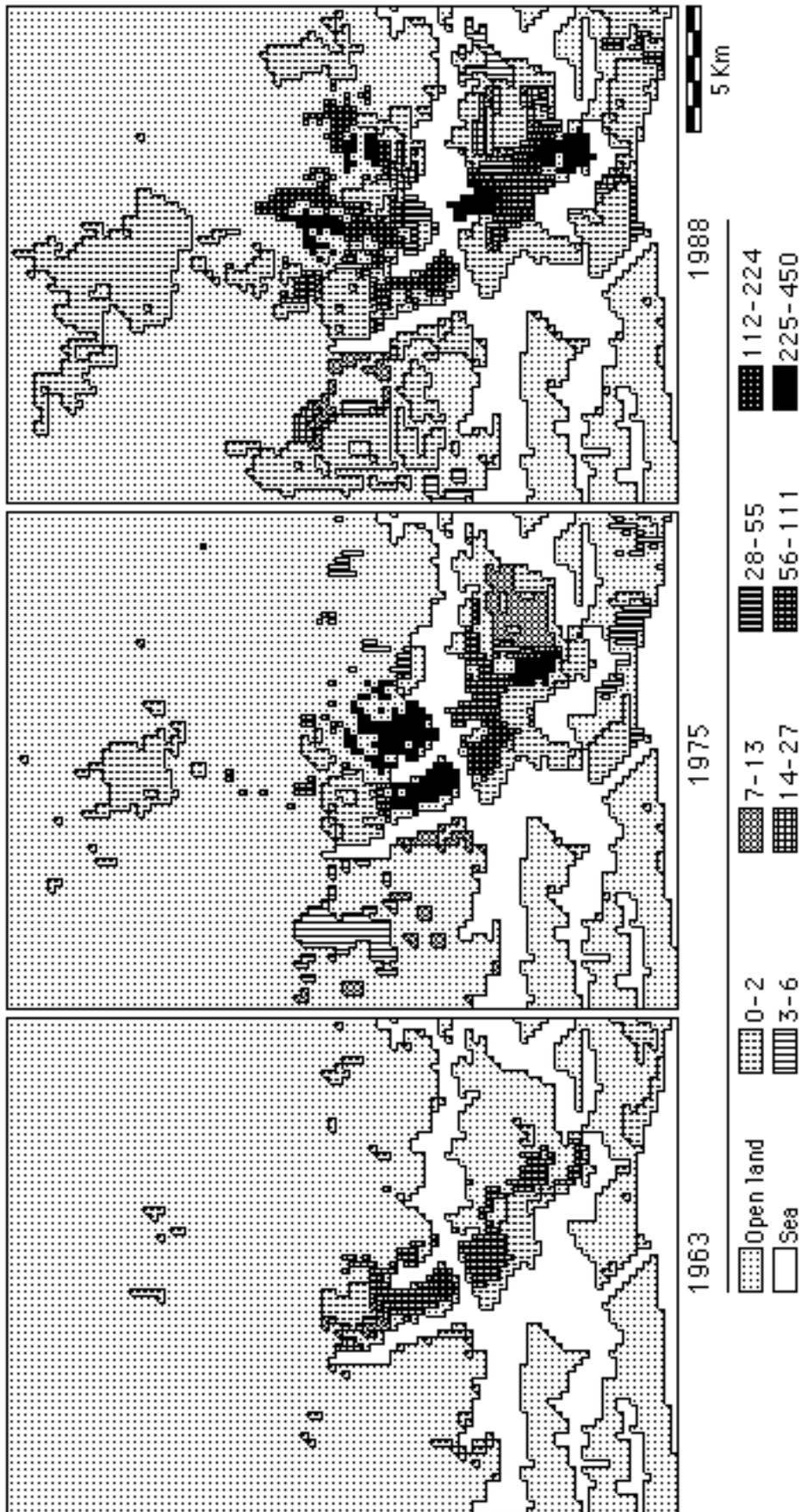


Figure 23: Population living in high standard dwellings in Abidjan

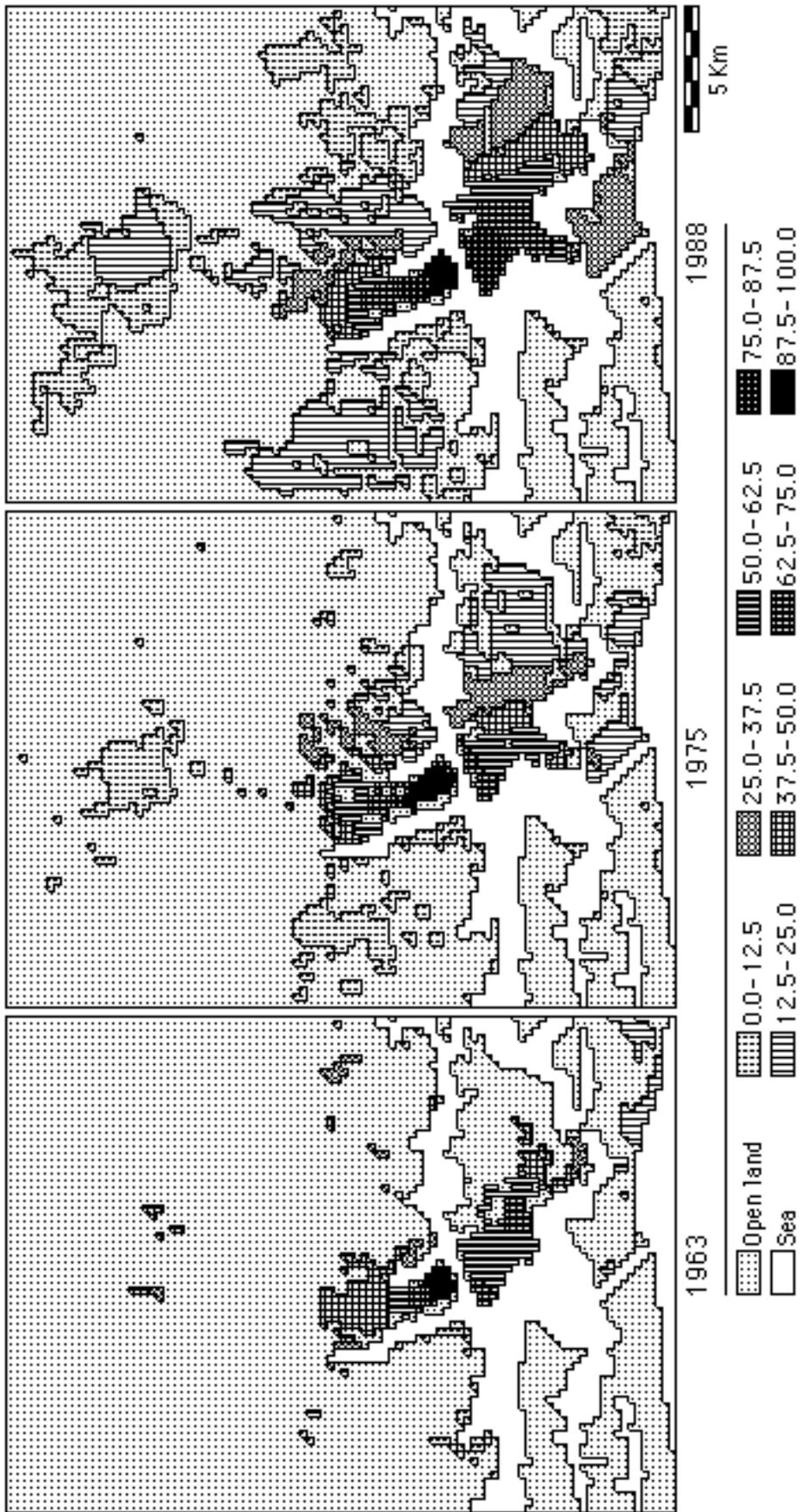


Figure 24: Accessibility to jobs in Abicjan. Legend refers to the degree of jobs accessibility

dwellings and shanty towns have the least stable location.

Housing quality is an essential element in this study, but a simple study of the physical aspect of the dwelling is not sufficient. Jobs accessibility⁵ (figure 24) must be taken into consideration because transportation plays a role in establishing the living conditions of people. Furthermore, jobs accessibility is pertinent because it is determined by the evolution of the formal and informal activity pattern. In the first growth period of Abidjan, jobs accessibility was more or less spread equally throughout the area, although it was somewhat concentrated in the southern side of the Plateau. However, in 1975, during the rapid growth period, the differences in accessibility became more evident as the jobs became more concentrated in the city centre. By contrast, a study of the last period clearly shows that jobs accessibility had expanded in the old neighbourhood of Treichville due to the effect of the growth of informal activities and the decentralisation of formal services activities. Furthermore, it is obvious that as the city expanded, new activity poles developed in the suburbs, thus jobs accessibility increased for the more decentralised dwellings in areas such as Abobo.

To assess the relationships between jobs accessibility and housing, an analysis has been made on the distribution of inhabitants by type of dwelling and by degree of accessibility to jobs (figure 25): jobs accessibility values are plotted on the abscissa of the graph; the value of density of population per cell divided by average density is plotted on the ordinate. Data have been fitted with a cubic polynomial. The results demonstrate that relative density of residential housing increases, at the beginning, but then decreases when jobs accessibility is high. This can be attributed to the effects of competition for the utilisation of space between jobs and housing. Other results of the graph show: a steady increase for high standard dwellings, a steady decrease for social housing, little response to the variation of accessibility for common courtyard dwellings, which are spread throughout the city, and a strong response for shanty towns because they are very sensitive to jobs accessibility. In this latter case, when jobs accessibility increase beyond a half of its maximum, density quickly decreases. Thus it is clear that inequalities related to dwelling types are also connected to the jobs accessibility scale and to travel costs.



Figure 25: Relative density of population per degree of accessibility to job locations (accessibility ranges from 1, minimum, to 100, maximum) and per type of dwelling: common courtyard (1), social housing (2), shanty towns (3), and high standard (4). Abidjan, 1988

⁵Accessibility has been calculated by using the following equation: $A_{ij} = \frac{\sum_{kl} W_{kl} \exp(-\beta d_{ij,kl})}{\sum_{kl} \exp(-\beta d_{ij,kl})}$ where A_{ij} is the accessibility index of the cell ij , W_{kl} is the number of employees in cell kl and $d_{ij,kl}$ is the distance between cell ij and cell kl ; β has been fixed to a value that $\exp(-\beta d^*) = 0.001$, where $d^* = 10km$. After completing the calculation the index was normalised to 100.

4.3. Spatial pattern of transportation and commuting

As stated previously, travel distances increased as the city expanded thereby distancing the population from workplace. These changes are shown by mapping the average distance travelled by the inhabitants: distance travelled increased as distance from the city centre increased (figure 26). This is a normal occurrence which was also determined, in part, by the concentrated structure of activities, especially the formal ones, in the city. Indeed, in relation to the survey of the geographical zones considered, when the main outward fluxes of each zone are represented, the form resembles a star with its centre in the Plateau, the CBD (figure 27) although some autonomous areas do appear at the border of the most important centralised areas. These border zones can be highlighted by weighting the number of commuters with the inverse of the distance travelled. In this manner the emphasis is placed on local relationships. When the main outward fluxes are recalculated and plotted, it can be seen (figure 28) that some local, autonomous zones are quite evident in the peripheral areas.

5. The new structure plan

Although the informal activities gradually helped to push the city into a decentralisation pattern, the basic structure of the city remained unchanged until the 1970s. After this date, there was a period of growth slow-down, but this trend has reversed. Present day Abidjan seems already to be in the process of new changes. In fact, the 1994 devaluation of the CFA and the rise of coffee and cacao prices continue to boost the trend of an economic upswing. And, as this study has demonstrated, if this trend continues, new population growth will reoccur; new migration will be attracted to the city and, consequently, there will be a higher demand for housing and infrastructure. This situation will require new investments for additional infrastructures: roads and transportation that also include the port facilities, a more decentralised pattern of formal activities, and the availability of new building areas.

With this expansion in mind, the city planners of Abidjan (DCGTX, 1996) have already projected a new plan for restructuring the city. Basically, investments in new city infrastructures, and in new areas located on the east side of the city would help to decentralise city employees. Although this plan would appear to be a continuation of the past policy of investing in public facilities, there is a difference. Public funds are more limited than in the past, therefore financial help has been requested from private companies that will also condition the use of the infrastructures that will be carried out in that their utilisation will no longer be free.

The cornerstone of this plan is based on the "Twelve projects of the African Elephant" (BNETD, 1998), which are considered to be central to the entire CI economic policy. The projects include: improvement of existing infrastructures (extension and upgrading of the international airport and the new bus station at Adjamé); building of a new road infrastructure (as new bridges between Riviera on the north side and Marcory on Petit Bassam isle, and between Yopougon on the west side and the Plateau, CBD) and a new expressway along the sea so that construction can continue on the south-east side of the city that faces the sea. In addition, the project calls for a reorganisation of the existing railway for commuters in order to improve accessibility to the northern part of the city and removal of the slaughterhouse from the port area.

Other projects included in the plan for restructuring are: 12 000 units of social housing located at the borders of the urban zone, extension of the port into the area of Yopougon where a third power plant is also to be located, and the location of new activity zones at the edge of the

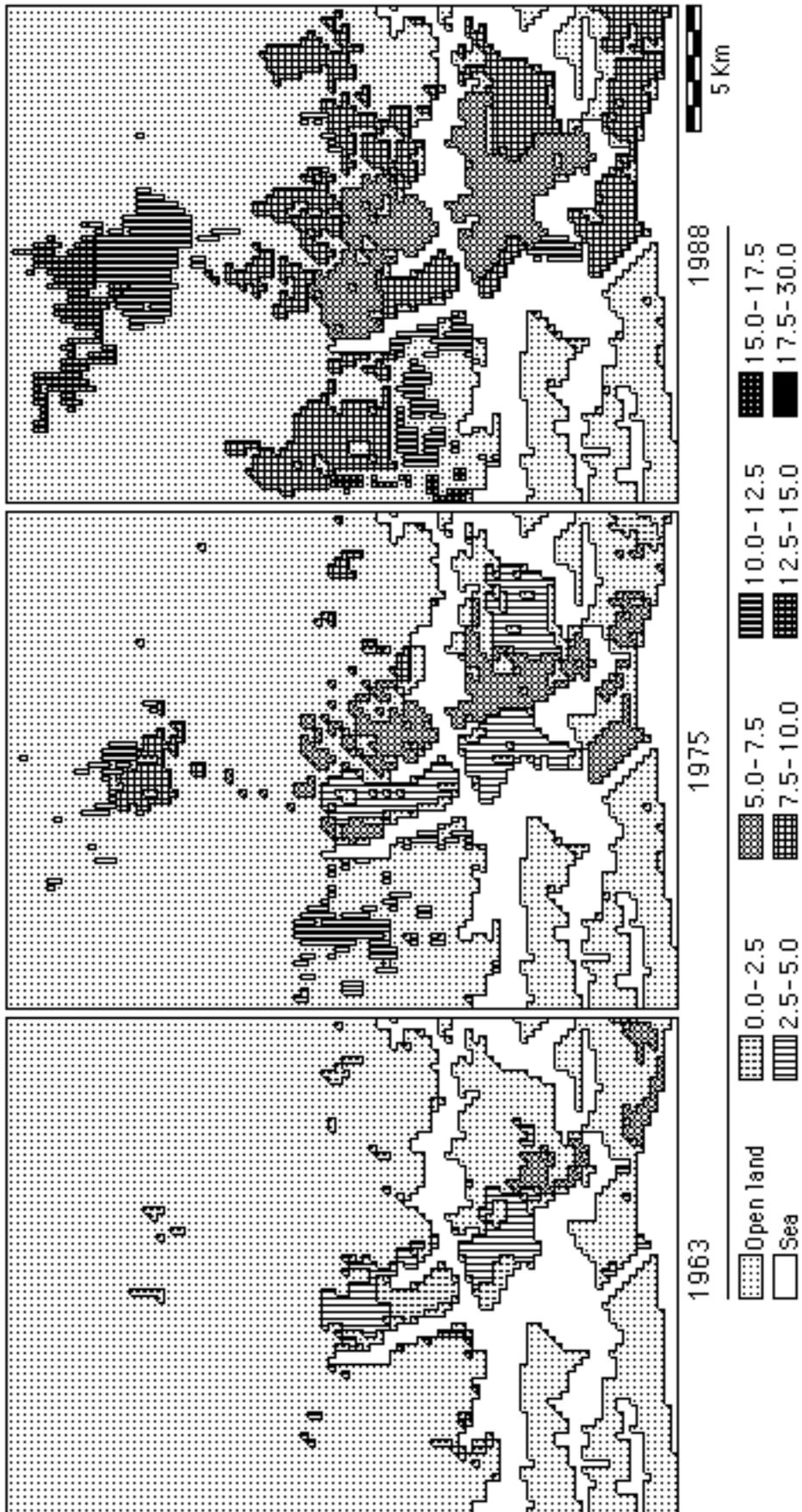


Figure 26: Average distance travelled by commuters located in each cell (kilometres) in Abidjan

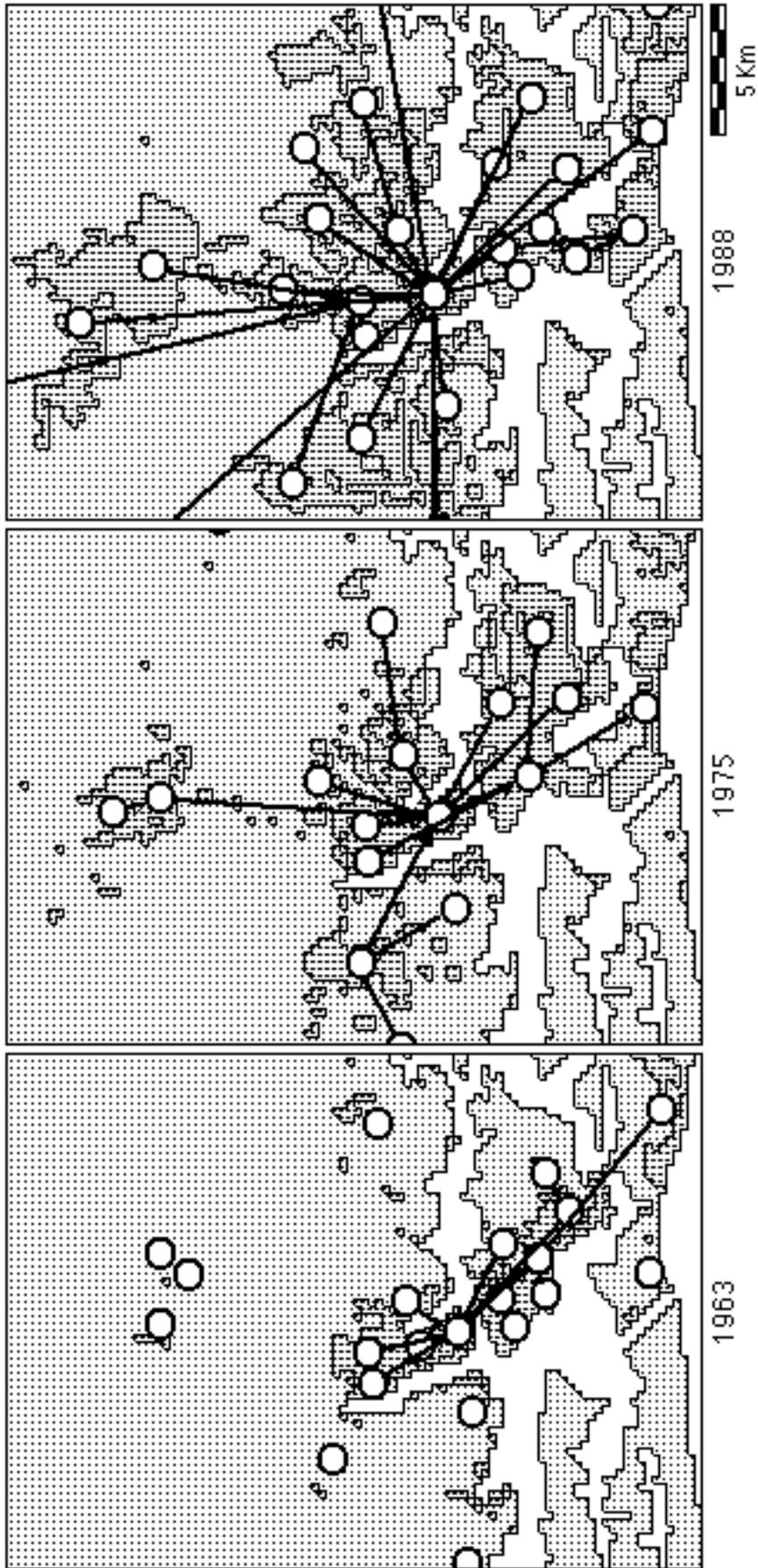


Figure 27: Principal outward commuters fluxes from each zone in Abidjan

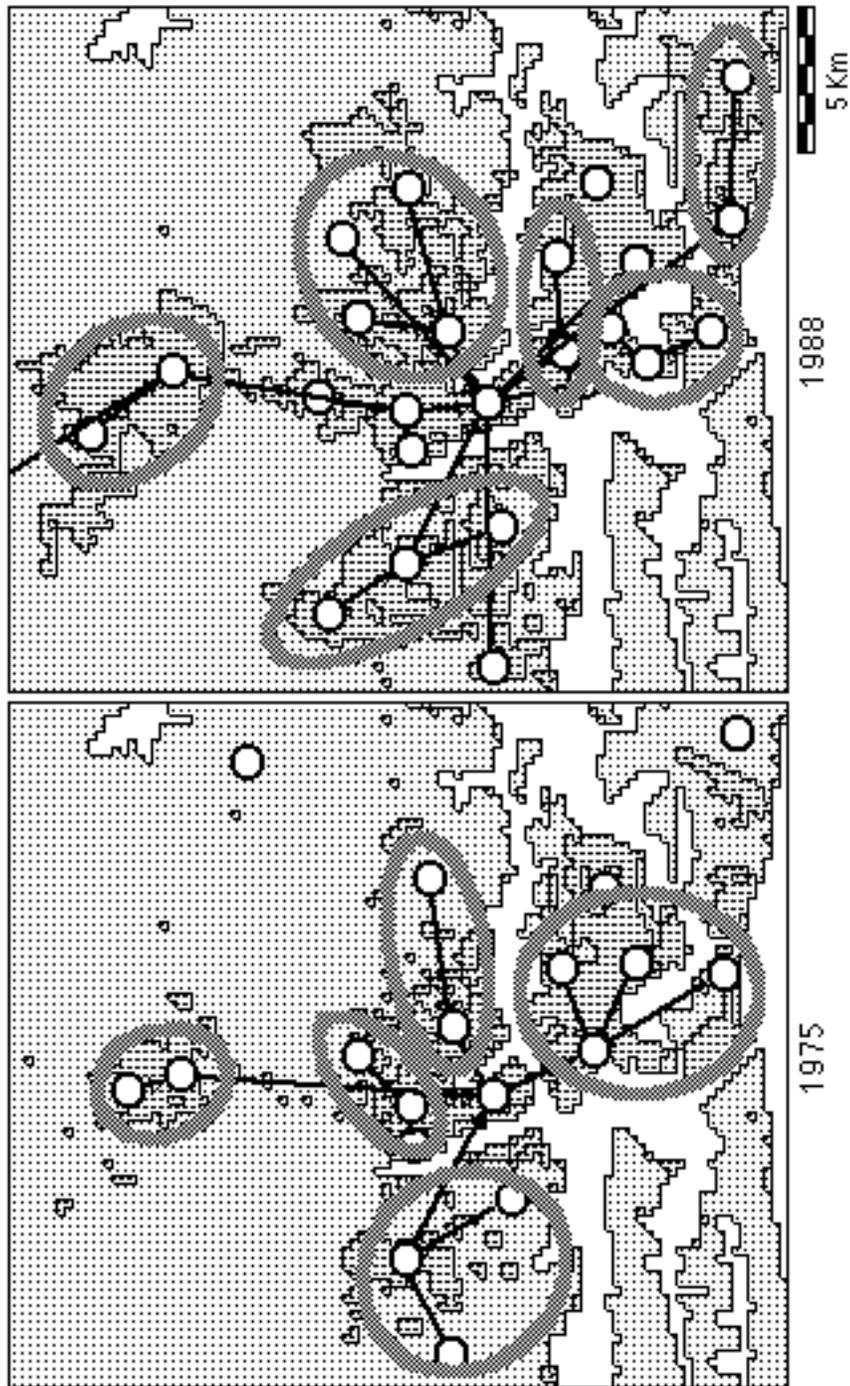


Figure 28: Peripheral zones with important commuter flux exchange in Abidjan

expanded city.

Basically, all these projects would extend the city to the east in order to provide a more decentralised urban structure, increase the availability of urban land, and equip the city for future developments. In fact, a decentralisation of job zones, especially through the expansion of the port on the west side of the city and the building of new bridges, will allow the city to improve its overall structure. In addition, the plan aims to relaunch the building sector thereby reinforcing a general economic expansion. Thus, it appears that the plan, by design, hopes to be able to reduce housing and transportation inequalities by opening up expansion to a filter-down effect of positive economic improvements. Such improvements, especially for the majority of population, will not be direct but it is supposed that these improvements will occur via causal chains. The problem with this scenario is that a temporal lag is needed before all of the population will receive positive effects from the plan. Therefore, the recent evolution of Abidjan has demonstrated, when direct government control and assistance is absent, people react spontaneously to form their own city, and, in this case, inequalities can increase.

5.1. Forecasting the effects of the new structure plan

Obviously, each of the planned projects has been designed to help improve the overall structure of the city. But as each of these projects is connected to specific interest groups of the various social classes, each project will have a different effect in each zone and, in addition, there will be indirect effects due to the complexity of the urban system. In order to verify these hypotheses, my study has examined the importance of the following projects:

- the new bridge between the zone on the north side (Riviera) and Petit Bassam isle (Mar-cory), and the new bridge between Yopougon and the Plateau;
- the port expansion which has been supposed to result in an increase of 20 000 new jobs considering the port, the new power plant located near the port and the activity zone;
- reutilisation of the existing railway for commuting which has been supposed to reduce half of actual travel cost. This effect has been traduced in the reduction of 50 per cent of the distance.

These hypotheses, such as the new employment in the port area or the reduction of the travel cost along the railway, have not been subjected to a precise analysis. Nonetheless, they are useful for testing the macroscopic change of the urban structure that will result once these projects are completed. To determine their effectiveness, these projected interventions have been studied in relation to jobs accessibility, average distance travelled, and assignment of commuters to the network of roads. In essence, jobs accessibility in each built or unbuilt cell has been calculated first, in relation to the 1988 framework and second, in relation to the proposed results of the projects. Than these results have been compared (figure 29).

As figure 29A shows, the building of the new bridges will probably improve accessibility to jobs, especially in the southern area of Yopougon on the west side. In contrast, increase in accessibility in the east side of Cocody will be of less importance because this location, which houses the medium-high income population, already enjoys good jobs accessibility. The southern zone of Treichville is, apparently, undergoing an increase of accessibility. Consequently, as land rent and service activities will probably increase, low income housing will begin to disappear.

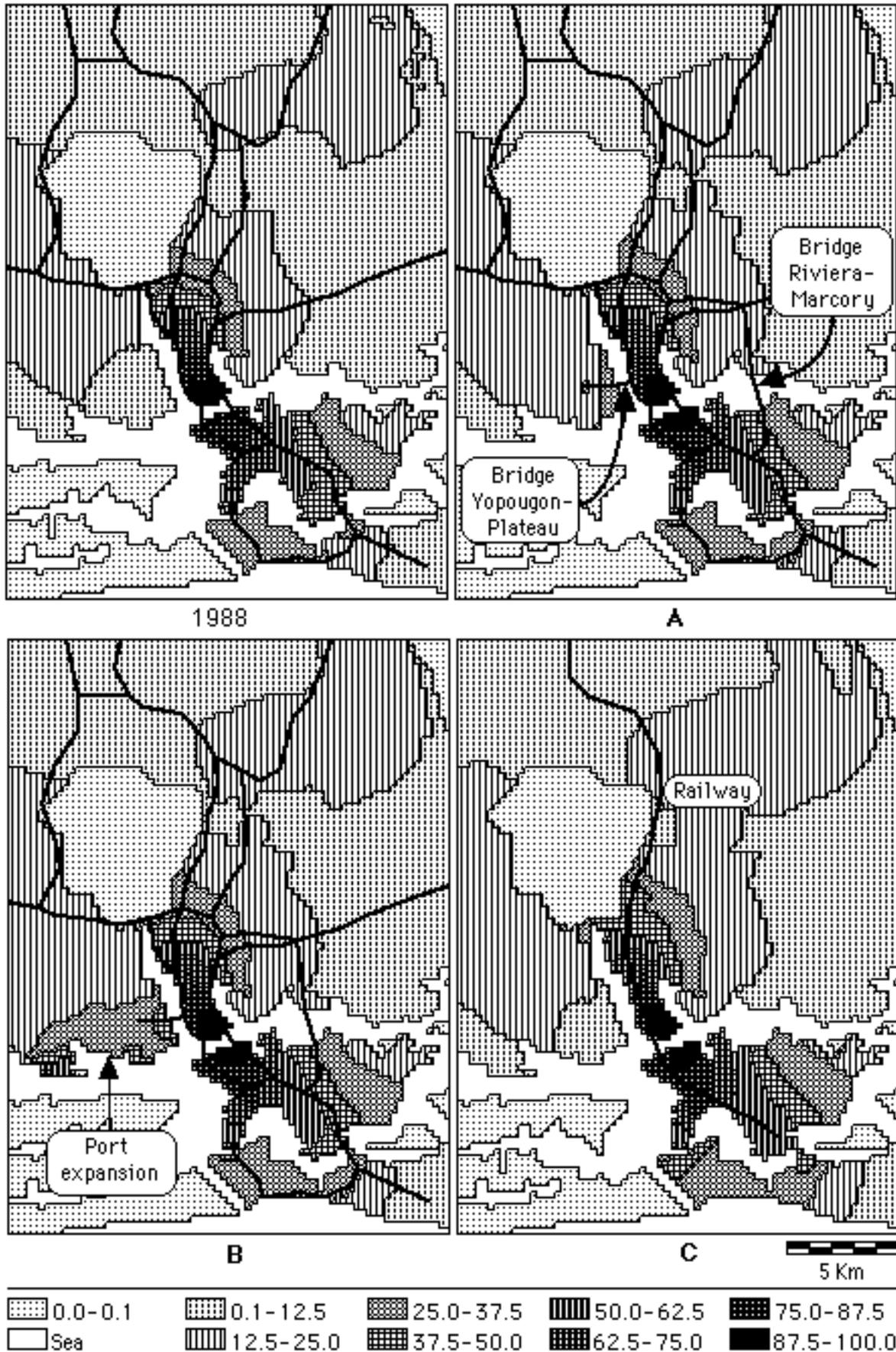


Figure 29: The jobs accessibility in 1988 in Abidjan compared with the effects on jobs accessibility of some new projects. A: the bridges; B: the bridges and the port; C: the reutilisation of the railway for commuters. Legend refers to the degree of jobs accessibility

In addition, the new bridges should also greatly reduce congestion on the two existing bridges. This means that the average distance travelled will be cut from 9.7 to 9.48 km, which means the total km travelled per day by the overall population will decrease to ca. 300 000. However, this projection does not consider the fact that these will be toll bridges and that the majority of commuters currently utilise public transportation. In reality, the project to reutilise the existing railway for commuters (figure 29C) is the one that should have the greatest impact on mobility, especially in the southern zone between Adjamé and Abobo where a low-income population is located. Nevertheless, success of this project may depend on frequency of service and ticket price. In contrast, the project to expand the port will probably lead to an important increase in jobs accessibility in the southern zone of Yopougon⁶ (figure 29B); this increase will stimulate the local economy. In fact, as all of these projects are related to the activities of the city, these projects will effect the location or relocation of economic activities and dwellings. For this reason, a dynamic model would be much more suitable for forecasting effects.

6. Conclusion

From this study, it appears that the growth of the city is intimately connected with that of the entire country and that the government policy played a role in enhancing urban development through public investments in infrastructures such as the port that stimulated the growing of the industrial areas and the urban highway network. Although these were the key elements that gave form to the city, it has also been further structured by a massive increase of housing and work places. This increase was determined by the growth of population associated with the natural trend as well as with the ebb and flow of the inhabitants. Their changing migration patterns were stimulated by their search for job opportunities, but the migration resulted in a scarcity of urban jobs in relationship to potential workers. On the other hand, migration had a stimulating effect, in particular, on the growth on that part of the informal sector which produces services and goods in response to a local demand. Therefore, particular activities in this sector – retail businesses, services, transportation, and building – developed greatly. Because these are also the key activities for the functioning of the city, their development caused living costs to drop thereby permitting more very low-income people to remain in the city. This situation also strengthened inequalities among the social groups. In addition, all these informal activities, especially building, became an area of investment for savings held by individuals and families; consequently, the investments helped to development of the local economy and resulted also in a concentration of housing property in few hands.

In essence all of these factors played a role in changing the spatial pattern of the city. In large part, the city that had been decreed by governmental planning gave way to a sort of process of self-organisation that was brought about by the inhabitants and businesses which partly adapted the city to fit their own peculiar needs under limits established by free market rules. As a consequence, in this general reorganisation, rent for land and transportation means played a central role in determining the location of housing and of the activities, especially the informal ones. In fact, as the richest of the formal activities dominated the market for land in the more central zones, their presence pushed low-level housing growth towards the peripheral zones. Consequently, these inhabitants were forced to accept a longer commute in exchange for cheaper housing. However, in response to this development, the appearance of retail activities in these new zones

⁶For the purposes of this paper, the bridges are considered to be completed. Thus, the resulting effects must be considered in relation to the results given in figure 29A.

initiated a growth in the local economies, such as that in Abobo. In addition, small businesses that catered to the demands of formal workers became prevalent in the areas as those of Adjamé and Treichville, which are located near formal activities. They found a favourable environment in the traditional market areas as well as in common courtyard houses that are located in these two neighbourhoods. Social housing, due to the fact that state was compelled to find land in peripheral zone in order to attenuate conflict with private developers, acted as a driven forces of the new urbanisation such as in Yopougon. As a result of the peripheral location of new residential zones and of the continuing concentration of formal activities, there was an increase in the average distance travelled by inhabitants to their work places and, consequently, a development within the transportation sector that included the utilisation of a variety of transport solutions.

As this paper has shown, economic activities, housing, and transportation are the keys to comprehending both the functioning of the urban system and the living conditions of the inhabitants, for it is in response to these elements that the public administration has had to come to grips in attempting to control and orient the urban development. Hence, it is important to understand the probable consequences of public action. regarding the improvement of living conditions for the majority of the population. With this particular goal in mind, a simple analysis was made of some of the proposed projects. The analysis revealed that, due to the complexity of the urban systems, the projects direct and indirect effects will be concentrated in some zones of the city and that resulting advantages for each social group will be different.

In conclusion, urban planning for large, fast growing cities, as that of Abidjan, should consider the fact that all interventions take place within the confines of a complex dynamic system characterised by a variety of interests. Thus, planning boards should consider two primary points: ways to interrelate the significant elements in order to obtain the best living conditions for the majority and ways to mobilise human resources in order to promote economic development. To achieve these goals, detailed knowledge of the urban situation seems necessary. In the case of Abidjan, the temporal dimension of data is crucial. For this case, as others, it is essential to have homogeneous data that can be compared in time and space and to be able to situate this data in a theoretic framework that is capable of incorporating a quantity of interrelated elements in a complex system.

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