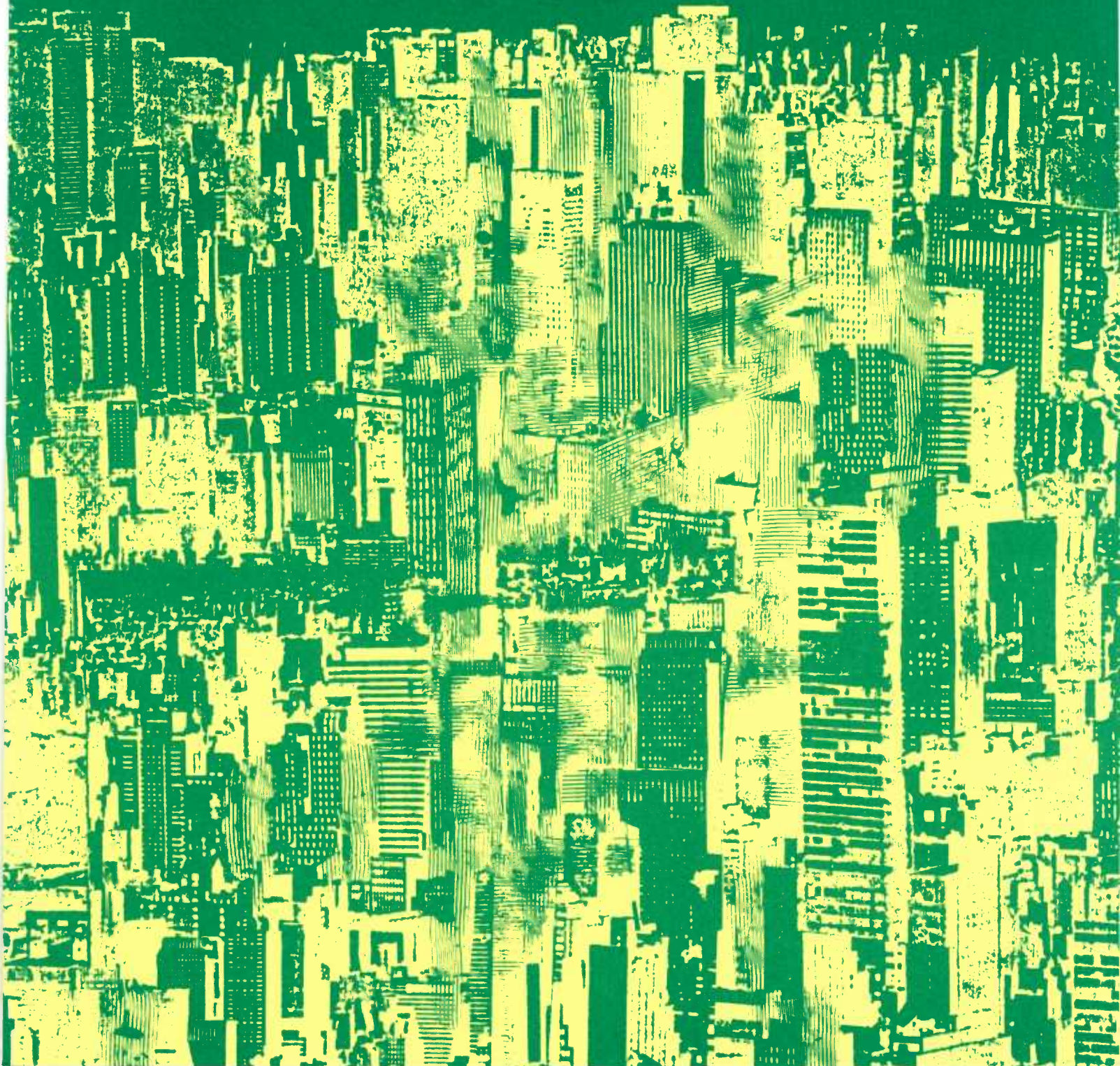




United Nations

Population Growth and Policies in Mega-Cities

SÃO PAULO



Department for Economic and Social Information and Policy Analysis

Population Growth and Policies in Mega-Cities

SÃO PAULO



United Nations
New York, 1993

NOTE

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ST/ESA/SER.R/122

UNITED NATIONS PUBLICATION

Sales No. E.93.XIII.9

ISBN 92-1-151254-9

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PREFACE

The present publication is one in a series of studies being prepared by the Population Division of the Department of Economic and Social Development¹ of the United Nations Secretariat which focus on the population policies and plans of a number of mega-cities in developing countries. In order to yield a set of cities with adequate representation of the major geographical regions, a cut-off figure of 8 million inhabitants by the year 2000 was chosen for the cities to be included in the initial phase of the mega-city series.

The object of the series is to examine the formulation, implementation and evaluation of the population policies of mega-cities from a broad perspective, emphasizing the reciprocal links between population and development in the spirit of the World Population Plan of Action.² The development of population policies to improve the standard of living and the quality of life of the inhabitants of the world's largest cities is a highly complex and multifaceted activity. It involves, for example, not only the analysis of migration trends, the preparation of population projections and the formulation of population distribution strategies but also the provision of cost-effective urban infrastructure (e.g., housing, water, sewerage, transportation and health and educational facilities), the monitoring and creation of employment, the assembly of urban land for development projects, the improvement of municipal revenue-raising mechanisms and the establishment of effective institutional arrangements for planning and managing urban growth.

Each of the technical papers in the series follows a common format consisting of five major sections. Section I provides basic information on demographic trends and reviews the use of demographic data in planning for rapidly growing urban populations. Section II presents background information on the city's economic base, the spatial structure of the metropolitan region and the sectoral and spatial distribution of jobs, all of which are crucial to a proper understanding of how population distribution strategies operate. Section III reviews early decentralization strategies and how they were evaluated and revised by local planners and then examines current population distribution strategies

for the metropolitan region. Section IV deals with a number of key issues and sectors—the labour market, urban land, housing, water-supply and so on—from the perspective of planning for rapidly growing urban populations and managing urban growth. Wherever possible, attention is given in that section to the extent to which various sectoral policies may have served as implicit spatial policies that reinforced, or perhaps counteracted, explicit spatial goals. Finally, section V examines sectoral distribution of public investment and how that investment has influenced the achievement of spatial goals; how individual cities have generated revenue for municipal projects; and what types of institutional arrangements have been established to plan for and manage urban growth.

To date, reports issued in the *Population Growth and Policies in Mega-Cities* series are:

BANGKOK	(ST/ESA/SER.R/72)
BOMBAY	(ST/ESA/SER.R/67)
CAIRO	(ST/ESA/SER.R/103)
CALCUTTA	(ST/ESA/SER.R/61)
DELHI	(ST/ESA/SER.R/68)
DHAKA	(ST/ESA/SER.R/69)
JAKARTA	(ST/ESA/SER.R/86)
KARACHI	(ST/ESA/SER.R/77)
MADRAS	(ST/ESA/SER.R/75)
METRO MANILA	(ST/ESA/SER.R/65)
MEXICO CITY	(ST/ESA/SER.R/105)
SEOUL	(ST/ESA/SER.R/64)

NOTE

¹ Now the Department for Economic and Social Information and Policy Analysis.

² See *Report of the United Nations World Population Conference, 1974, Bucharest, 19-30 August 1974* (United Nations publication, Sales No. E.75.XIII.3), chap. 1, and *Report of the International Conference on Population, 1984, Mexico City, 6-14 August 1984* (United Nations publication, Sales No. E.84.XIII.8 and Corr. 1 and 3), chap. I, sect. B.

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Explanatory notes

- Symbols of United Nations documents are composed of capital letters combined with figures.
References to "dollars" (\$) indicates United States dollars, unless otherwise stated.
The term "billion" signifies a thousand million.
Annual rates of growth or change refer to annual compound rates, unless otherwise stated.
A hyphen between years (e.g., 1984-1985) indicates the full period involved, including the beginning and end years;
a slash (e.g., 1984/85) indicates a financial year, school year or crop year.
A point (.) is used to indicate decimals.

The following abbreviations are used in this volume:

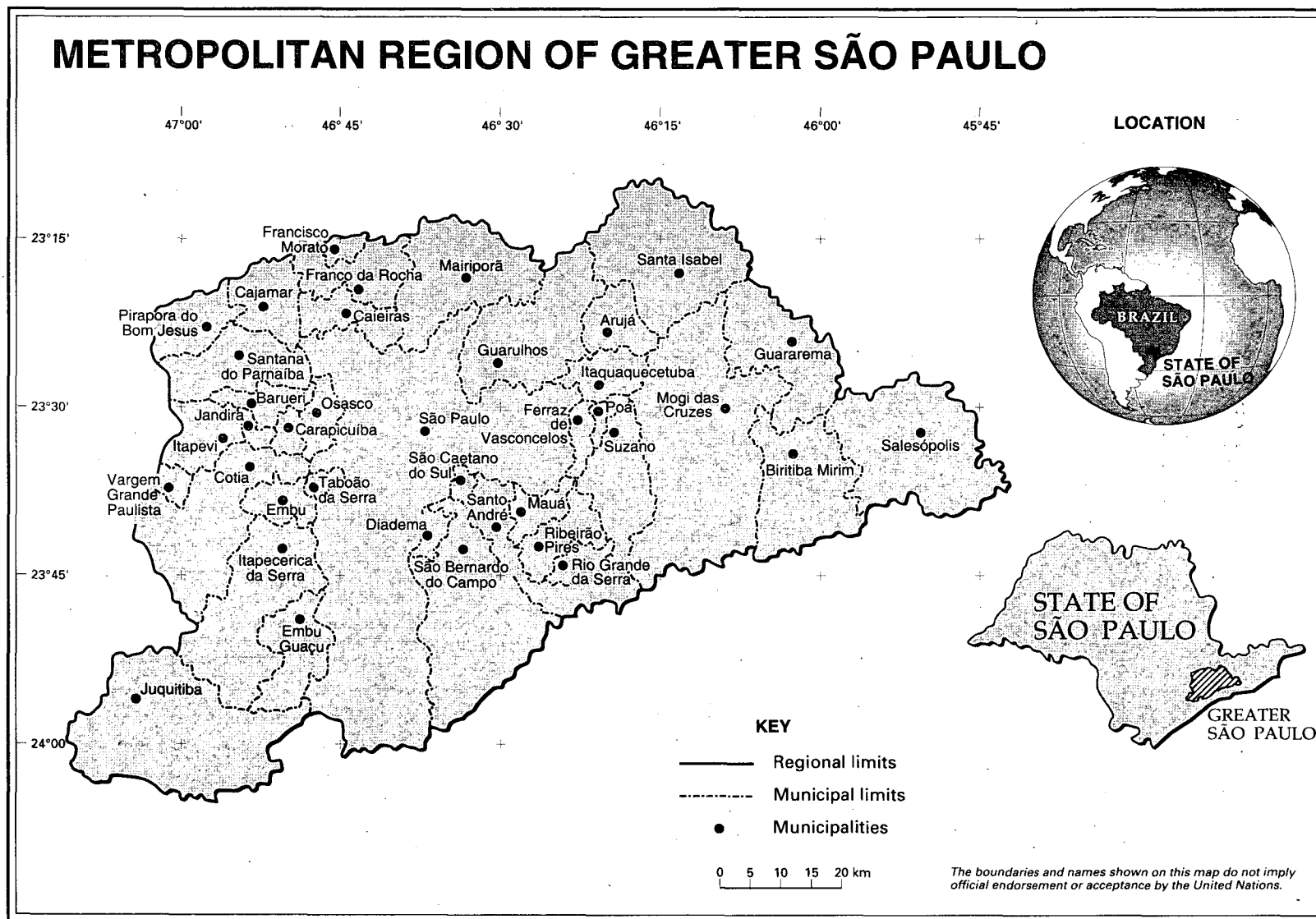
ABC	name of a town
AIDS	acquired immunodeficiency syndrome
BNH	National Housing Bank
BOD	biochemical oxygen demand
CBD	central business district
CBTU	Brazilian company for urban transport
CEF	Caixa Economica Federal
CETESB	São Paulo's Environmental Protection Agency
CMTC	Municipal Transport Company
COGEP	Coordenadoria Geral de Planejamento
COHABS	housing companies
COOPHABS	mutual aid associations
DIESSE	Departamento Intersindical de Estatística e Estudos Socio-econômicos
ECLAC	Economic Commission for Latin America and the Caribbean
EMPLASA	Metropolitan Planning Agency of Greater São Paulo
EMTU	Empresa Metropolitana de Transportes Urbanos
EMURB	Urban Municipal Corporation
FAR	floor area ratios
FGTS	Length of Services Guarantee Fund
GEGRAN	Greater São Paulo Executive Group
ICM	goods circulation tax
IDB	Inter-American Development Bank
INPE	National Institute for Space Research
INSS	National Institute of Social Security
IPTU	property tax on land and buildings
ISS	local tax on services
LIMPURB	Urban Wage Management Department
PUB	Plano Urbanístico Básico
SEADE	Fundação Sistema Estadual de Análise de Dados
SEMPLA	Municipal Planning Secretariat
TFR	total fertility rate
SABESP	State Water and Sanitation Company
SFH	Housing Finance System

Map I. Municipality of São Paulo



MAP NO. 3713 UNITED NATIONS
JUNE 1993

Map II. Metropolitan Region of Greater São Paulo



INTRODUCTION

Few mega-cities in the world have experienced the spectacular population growth of São Paulo, which grew by more than 5 per cent per annum from the early 1940s to the early 1970s. From a ranking of tenth largest city in the world in 1970, São Paulo rose to fourth largest in 1980 and third in 1990 and was expected to be the second largest city in the world after Tokyo by the year 2000 (United Nations, 1993). In the aftermath of Brazil's 1991 census, however, it would appear that São Paulo's growth slowed down dramatically during the 1980s, forcing demographers and planners to substantially revise their population forecasts.

Greater São Paulo, which extends over an area of some 8,000 square kilometres, encompasses 39 municipalities—ranging in size from the city of São Paulo, with 9.5 million inhabitants in 1991, to the smallest municipality, with less than 8,000 inhabitants. Population density averages 1,915 inhabitants per square kilometre in the metropolitan area as a whole, rising to an average of 6,380 in the city, and with certain areas reaching as high as 10,000 inhabitants per square kilometre. The heavily concentrated urban core, with its massive high-rise office and residential towers and dense network of roads (which take up nearly 30 per cent of the total land area), has produced conditions for a concentration of heat, creating a temperature gradient of 10°C between the centre and the periphery (Kliass, 1990).

São Paulo is a city of many contrasts. Serving as the vital economic engine of a large and important developing country, São Paulo shows signs of vitality yet of deterioration, of transformation to world city status yet of sharply declining living standards for a large segment of its population. The vivid contrast between its squalid downtown area and elegant neighbourhoods with their state-of-the-art shopping malls is mirrored by steep wage differentials and wide socio-economic disparities, reflected by such basic indicators as levels of infant mortality and access to education and health.

São Paulo has undergone complex demographic changes in recent decades. Whereas it was the most rapidly growing city in the world in the 1950s and continued to grow very rapidly throughout the 1970s,

rapid demographic growth is no longer taking place. Although life expectancy has increased significantly as a result of improvements in health care and sanitation, fertility has simultaneously declined to the point that there has been a decline in the absolute number of births. The city is no longer the magnet that it once was for migrants from the interior of São Paulo State and from other regions of Brazil. Moreover, São Paulo has been undergoing a process of de-industrialization, with industry and population shifting to the outer municipalities in the metropolitan region and, since the 1970s, to interior regions of the state. As other areas within São Paulo's sphere of influence (e.g., Campinas, Santos, the Paraíba valley) have industrialized and begun emerging as metropolitan regions in their own right, São Paulo is becoming what the head of the state planning agency (EMPLASA) terms a "macro-metropolis" (interview with Jorge Wilhelm, November 1991).

São Paulo's current land-use patterns reflect decades of chaotic development. In the process of the city's rapid industrialization, the entire region was developed by opening up illegal allotments without proper infrastructure. Whereas developers were required to donate a portion of the land being developed to the city in order to provide open green spaces, the areas donated were typically located on steep slopes or along watercourses. Many of these open spaces were subsequently invaded by squatters who formed *favelas*.

The housing situation in São Paulo has reached crisis proportions. During the 1980s, large numbers of middle-class households experienced downward mobility and were forced to abandon dwellings near the centre and to buy or rent cheaper accommodations on the periphery. At the same time, many of the city's poorest inhabitants could no longer afford housing on the periphery and crowded into *cortiços* (multi-family tenements, literally, "beehives") in the city's central zones. Currently, an estimated 7.7 million inhabitants—two thirds of São Paulo's total population—are estimated to be living in substandard housing: as many as 1 million in *favelas*, 3 million in *cortiços*, 2.4 million in illegal developments on the periphery, and another 1.3 million in other types of precarious housing.

The transport sector in São Paulo is also in a state of crisis, with declining quality of service, scarce resources, a high level of subsidies, a lack of coordinated planning and the presence of numerous transportation agencies with overlapping functions. There has been rapid growth in the number of private vehicles, causing severe traffic congestion. The public bus system is poorly maintained, slow, crowded and a major source of air pollution. The São Paulo Metro, although well-planned and well-maintained, still accounts for only about 5 per cent of total person trips in the metropolitan region and is unlikely to increase its share of ridership in the near future.

Despite the fact that São Paulo has a good water-supply distribution network, many areas of the city receive an intermittent supply. The situation is most serious in the poorer areas to the east and south, where water is received only two thirds of the time. Regarding sanitation, only about 12 per cent of the sewage that is collected in São Paulo receives secondary treatment (i.e., removal of 90 per cent of pollutants). Another 8 per cent receives primary treatment (removal of 30 per cent of pollutants) and is then dis-

charged directly into the watercourses. Whereas collection of solid waste in São Paulo is more or less adequate, disposal remains a serious problem. The entire system is now saturated. Whereas one sanitary landfill has an estimated life-span of less than one year, another has a life-span of less than four.

Drainage is one of São Paulo's most serious problems, with the city recently experiencing the worst flooding in its history. The problem of flooding arises from the fact that, as the surface area of the city has been built up steadily with asphalt roads and other impermeable surfaces, there is less and less ground area to absorb rainwater run-off. The problem is compounded by the fact that about half of the city's 1,600 *favelas* are located along streams and tributaries.

As in other rapidly growing metropolises in the developing world, the quantity of harmful emissions in São Paulo far exceeds the natural self-cleansing capacity of the city's environment. Increases in air pollution levels have been associated with increases in morbidity and mortality and with an increased incidence of respiratory and cardio-vascular diseases.

I. DEMOGRAPHIC CHARACTERISTICS

A. POPULATION GROWTH

Currently tying for first place (with Mexico City) as the largest urban agglomeration in Latin America, São Paulo has grown in the past century from a relatively small population base. From an initial population of some 100 residents in the mid-1500s, the city reached 31,000 in 1872. In 1890, when Rio de Janeiro had a population of more than half a million inhabitants, São Paulo had only about 65,000 (EMPLASA, 1982). By 1900, owing to a massive influx of immigrant workers, the city reached 240,000 inhabitants.

São Paulo has experienced extremely rapid population growth over the past half century. The city of São Paulo grew from 1.3 million inhabitants in 1940 to 2.2 million in 1950, 3.7 million in 1960 and 5.9 million in 1970. Greater São Paulo grew from 1.6 million inhabitants in 1940 to 2.6 million in 1950, 4.8 million in 1960 and 8.1 million in 1970 (EMPLASA, 1982). During the 1940s, Greater São Paulo grew by 5.4 per cent per annum. Between 1950 and 1960, it was the most rapidly growing metropolitan area in the world, with a rate of population growth of 5.9 per cent per annum—twice the national population growth rate. Greater São Paulo grew by 5.6 per cent per annum during the 1960s and then slowed to 4.5 per cent during the 1970s, which was one and a half times the national rate of population growth (SEADE, 1988).

Brazil's 1991 census yielded a number of surprises. According to preliminary results, the city of São Paulo had a population of 9.5 million inhabitants and was growing by 1 per cent per annum (Zmitrowicz, 1993). Greater São Paulo, which is comprised of the city of São Paulo plus 38 additional municipalities, had a population of approximately 15.2 million and was growing by 1.7 per cent per annum. Pending further detailed analysis of the 1991 census data, demographers and planners in São Paulo are still unsure about how to interpret the results. On the basis of the origin-destination survey conducted in 1987—a carefully chosen sample of 26,000 households—analysts in São Paulo estimated a 1990 population of 11.3 million for the city of São Paulo and of 17.5 million for the metropolitan region (Rolnik, Kowarik and Somekh, 1990). Moreover, studies conducted in pre-

paration for the new master plan called attention to the beginning of a major shift in the pattern of population distribution within Greater São Paulo. Data from the origin-destination survey—backed up by satellite photographs—revealed a progressive slow-down in the rate of expansion of the periphery. Whereas the growth of the peripheral ring was nearly 13 per cent per annum during 1960-1970, it declined to 7.4 per cent during 1970-1980 and to 3.8 per cent during 1980-1987. In contrast to the slow-down in growth of the periphery, planners called attention to the resurgence of growth in the city's interior and intermediate rings, both as a result of high-rise construction and the proliferation of multi-family tenements (*cortiços*).

Based on the 1991 census, the extent of this shift has been called into question. Whereas the slow-down in the growth of the periphery was confirmed by the 1991 census, and apparently was even more rapid than assumed by the 1987 origin-destination survey, all other areas of the city of São Paulo experienced negative or, in the case of the exterior ring, very low rates of population growth (see table).

There has been a significant shift in the relative contribution of migration and natural increase to São Paulo's population growth over the past half century. During 1940-1950, the average annual migration rate was more than 4 per cent per annum, and more than three quarters of São Paulo's growth was due to in-migration. In subsequent decades, the migration rate has declined steadily and is expected to be only 0.7 per cent per annum during 1990-2000 (Rolnik, Kowarik and Somekh, 1990).

Regarding the determinants of natural increase, life expectancy at birth in São Paulo has increased considerably—from 47.6 years in 1940 to 68.2 years as of 1985—a gain of more than 20 years (Rolnik, Kowarik and Somekh, 1990). The gains in life expectancy have been uneven over the period, however, with the major advances taking place in the 1940s and 1950s following the introduction of antibiotics and the expansion of the city's water and sanitation networks. During the 1960s and 1970s, as population growth on the periphery strained the city's capacity to provide basic services, there was rapid deterioration in the

TABLE. CITY OF SÃO PAULO: RATES OF POPULATION GROWTH BY RING, 1960-1991

Ring	Average annual rates of population growth			
	1960-1970	1970-1980	1980-1987*	1980-1991**
Centre	0.72	2.23	0.94	-1.30
Interior	0.08	1.26	3.63	-0.93
Intermediate	2.79	1.28	3.65	-0.43
Exterior	5.52	3.13	2.96	0.41
Periphery	12.90	7.42	3.78	2.97
<i>Total</i>	4.49	3.67	3.32	1.00

Sources: Raquel Rolnik, Lucio Kowarik and Nadia Somekh, *São Paulo: Crise e Mudança* (São Paulo, Brasiliense, 1990); and Suzana Pasternak Taschner, "Mudanças no padrão de urbanização: novas abordagens para a década de 90" (1993).

NOTE: * Data for 1980-1987 are from origin-destination survey.

** Preliminary results of 1991 census.

quality of life, which was reflected in the fact that life expectancy in 1970 remained about the same as in 1960. After 1970, however, large-scale involvement by the Government in expanding water and sanitation networks, medical services and vaccination programmes once again brought about significant gains in life expectancy.

The rise in life expectancy in São Paulo in recent years is mainly due to a decline in the risk of mortality in the earliest years of life. Indeed, infant mortality in São Paulo declined by more than 70 per cent over the past four decades—from 115 per 1,000 live births in 1950 to 90 per 1,000 in 1970, 50 per 1,000 in 1980 and to 35 per 1,000 in 1988 (Rolnik, Kowarik and Somekh, 1990). About 85 per cent of infant deaths continue to be caused by preventable diseases, however, and 30 per cent of those deaths are attributable to poor sanitation.

Studies have shown that, within São Paulo, there is a strong correlation between the concentration of poverty in a particular subdistrict and levels of infant mortality. Indeed, in areas where up to 30 per cent of the population is below the poverty line, infant mortality is about 20 per 1,000 live births; the proportion rises to more than 50 per cent in areas where 50 to 60 per cent of the population is below the poverty line. The most precarious situation is found in Perus (49 per 1,000 live births), Guaianazes (58), Jaraguá (59), Vila Matilde (62), Ermelino Matarazzo (65), Brasilândia (63) and Itaim Paulista (76), all of which have more than 50 per cent of the population living below the poverty line (Rolnik, Kowarik and Somekh,

1990). It is interesting to note that, because of crowded, unsanitary living conditions in *cortiços* in a number of central areas (e.g., Bom Retiro, Liberdade, Santa Cecília, Barra Funda, Santa Ifigênia, Sé), levels of infant mortality are comparable to some of the poorest areas on the periphery.

There are also significant differentials in infant mortality within the metropolitan region, with rates in the range of 60 to 90 per 1,000 live births in a number of peripheral municipalities (EMPLASA, 1988). Indeed, the infant mortality rate is currently estimated to be of the order of 97 per 1,000 on the periphery, declining to 63 per 1,000 in the first ring, and to 52 per 1,000 in the central city (Jacobi, 1991).

Research has found that São Paulo's epidemiological profile is very sensitive to social inequality (Carvalho, 1989). The level of child morbidity and mortality, for example, has been found to be closely correlated with levels of maternal education. Indeed, the incidence of infectious and parasitic diseases varies from 2.7 per cent for children of women with a higher education to 31 per cent for children whose mothers have had no formal education (Carvalho, 1989).

In the adult ages, there are major mortality differentials according to sex. Life expectancy at birth (1985-1990) is estimated to be about 64 years for males and 73 years for females (*Informe demográfico*, No. 18). Among males, there has been a significant rise in mortality owing to violent causes such as homicides and automobile accidents. Indeed, in 1984, more than half of deaths in ages 15-44 were catego-

rized as preventable, and nearly 40 per cent of those deaths were due to violent causes (Ortiz, 1988). Among females, there has been an accelerating decline in mortality from all groups of causes. This has resulted in a steady increase in excess male mortality. In 1984, for example, the mortality rate for males aged 15-44 was 2.6 times greater than the rate for females (Ortiz, 1988). In the advanced ages, there have been slower declines in mortality, with non-preventable diseases assuming ever greater importance.

São Paulo has also experienced a rapid decline in fertility, with the total fertility rate (TFR) declining from 5 births per woman in the early 1960s to 3.5 births per woman in the mid-1970s and to 2.5 births as of 1987 (Rodríguez, 1987). Indeed, fertility in São Paulo has declined to the extent that there has been a decline in the absolute number of births. In 1982, for example, the year in which the absolute number of births began to decline, there were 775,000 births; in 1987, there were only 698,000 births (Rodríguez, 1987).

A number of factors have contributed to São Paulo's fertility decline. Women's participation in the workforce rose from 23 per cent in 1970 to 33 per cent in 1980. The proportion of persons with a middle- or higher level education also rose from 11 to 22 per cent. On the negative side, with Brazil's continuing economic crisis and reduced purchasing power, couples have found themselves unable to support large families. Whereas there has been some opposition to family planning from the hierarchy of the Catholic church, clergy at the parish level have generally supported the efforts of couples to limit their family size.

São Paulo has experienced significant changes in its age structure over the past half century. Between 1940 and 1990, the proportion of persons over age 60 in the total population increased from 4 to 7 per cent (Rolnik, Kowarik and Somekh, 1990). The population under 14 years of age remained relatively stable at about 30 per cent of the total population; in terms of absolute numbers, however, there was an increase of 1 million young people between 1980 and 1990. The proportion of population in the economically active ages increased from 3.6 per cent in 1970 to 5.4 per cent in 1980 and to 7 per cent in 1990. This represented an increase of 1.6 million persons in the economically active ages between 1980 and 1990.

Although international migration made a major contribution to São Paulo's initial demographic dynamism, particularly during the last quarter of the nineteenth century, the contribution of immigration has been negligible in recent decades. With Brazil's deepening economic crisis, however, a new phenomenon has been observed in recent years, involving the temporary emigration of Paulistas of Japanese descent (who constitute the world's largest community of ethnic Japanese living outside Japan). Following the passage in 1990 of a law in Japan that almost automatically grants children and grandchildren of emigrants three-year work visas, the number of such visas issued in São Paulo rose to 61,500 in 1991. Although not yet demographically significant, the movement represents a significant drain in human capital, since many of the emigrants are university graduates.

B. MIGRATION

Historically, migration has been a major determinant of São Paulo's population growth. The influx of migrants at the end of the nineteenth century, for example, was responsible for more than 80 per cent of population growth in São Paulo State. During the 1940s, migration accounted for 73 per cent of Greater São Paulo's population growth; however, the contribution of migration declined to about 60 per cent during the 1950s and 1960s and to 51 per cent between 1971 and 1980 (Rolnik, Kowarik and Somekh, 1990).

Whereas the traditional image of São Paulo has been that of a dynamic industrial centre attracting large numbers of migrants from other regions of Brazil, the reality of current patterns of migration is far more complex. Regions within the state with a large positive net migration balance coexist with regions that have experienced significant out-migration. Greater São Paulo had 2.5 million migrants as of 1980 (defined as persons who had resided in São Paulo for less than 10 years), but also had more than 800,000 out-migrants (814,000), resulting in a net migration balance of 1.6 million persons (Pinto and Rodrigues, 1989).

The State of São Paulo has been a major area of attraction for migrants from other regions of Brazil, particularly from the north-east (23.7 per cent), Paraná (13.6 per cent) and Minas Gerais (11.3 per cent) (Pinto and Rodrigues, 1989). Greater São Paulo has been the major recipient of this interstate migration, with 68 per cent of the total, followed by Campinas (6 per cent) and Santos (4 per cent). However, of the nearly

5 million migrants residing in São Paulo State as of 1980, 42.2 per cent had resided previously within the state. Indeed, intra-state migration—whether between distant or adjacent regions—is the prevalent pattern of migration in the majority of regions in São Paulo State. As of 1980, Greater São Paulo had a positive net migration balance of 1,560,000 with other regions of the country and of 89,000 with other regions of São Paulo State. However, it had a negative net migration balance of 46,000 with the Campinas region and of 97,000 with adjacent regions within the state (Pinto and Rodrigues, 1989).

According to preliminary results of the 1991 census, out-migration from Greater São Paulo accelerated over the past decade, resulting in the negative net migration of 433,000 persons. The bulk of this out-migration is believed to have been from the city of São Paulo. On the basis of vital registration data alone, assuming that no migration took place, the city of São Paulo should have had a population of 10.5 million inhabitants—in contrast to the 9.5 million enumerated in the 1991 census. Since the capital may have lost as many as 1 million residents during 1980-1991, whereas the entire metropolitan region lost only 433,000 inhabitants, analysts have concluded that the outlying municipalities in the metropolitan region may have had a positive migration balance of more than 500,000 (Taschner, 1993).

C. POPULATION PROJECTIONS

According to the first comprehensive development plan prepared for Greater São Paulo in 1971 (*Plano Metropolitano de Desenvolvimento Integrado* (PMDI I)), the population of Greater São Paulo was projected to reach 17.5 million by 1990 and 22.2 million by the year 2000. PMDI II, which was prepared in 1981/82, projected a population in the range of 10-14 million for the city of São Paulo and of 18-20 million for Greater São Paulo by 1990. For planning purposes, the low variant was chosen.

SEADE's projections of the population of Greater São Paulo are based on four migration hypotheses (that of a minimum volume; a slow decline; constant migration; and a slow increase); three fertility hypotheses (a TFR of less than 2.0 in 1990 in the low variant; a TFR of 3.0 in 1985 in the medium variant; and a TFR of 3.4 held constant to the year 2000 in the high variant); and two mortality hypotheses (1980

levels held constant; and a slow decline, with a progressively smaller reduction) (SEADE, 1988). For 1990, SEADE projected a minimum population of 16.7 million for Greater São Paulo, a maximum population of 19.2 million, and a probable population of 17.4 million. By the year 2000, SEADE projected a minimum population of 19.3 million, a maximum population of 27.5 million, and a probable population of 21.4 million (SEADE, 1988).

In 1986, EEMPLASA prepared a series of population projections for the state water-supply company, SABESP, utilizing rather interesting methodology. The objective of the exercise was to translate the dynamics of urbanization to the subregional level and then to the local level—as a means of accurately determining local demand for public services.

Total population in the year 2005—which was projected to reach 21 million—was distributed throughout the region, first among the so-called vectors (historically, growth vectors were road and rail networks that influenced urban expansion), then at the subvector level, and finally among the census sectors. In distributing population among the broad growth vectors, EEMPLASA used aerial photography (on a scale of 1:35,000), cartographic analysis (on a scale of 1:25,000 and 1:50,000) and site visits (EEMPLASA, 1986b). In the next phase, in distributing population among the smaller subvectors, a number of additional factors were considered, including land supply and prices, availability of infrastructure, access to tertiary employment, proximity of industrial parks, investment in mass transit, investment in low-cost housing, and the trend in population absorption during 1970-1980 (EEMPLASA, 1986b). Among the advantages of the methodology, by preparing projections at the subvector level, local demand for schools, health posts, water and sewerage and so forth could be fairly accurately determined. Also, a major advantage of the methodology was its flexibility.

According to the background study prepared by the municipal government for the Plano Diretor, the State of São Paulo was projected to have a population of more than 40 million by the year 2000; Greater São Paulo was projected to reach 21.4 million by the year 2000 and the city of São Paulo to reach 13.1 million (Rolnik, Kowarik and Somekh, 1990). In the light of the unexpected results of the 1991 census, these projections undoubtedly will be revised downward.

II. THE ECONOMY

A. HISTORICAL BACKGROUND AND DEVELOPMENT OF THE CITY'S ECONOMIC BASE

Founded by Jesuit priests in the second half of the sixteenth century, São Paulo had its beginnings on a wide plateau, 80 kilometres inland and almost 800 metres above sea level. Because of its relative inaccessibility, the city grew slowly for its first three centuries. Beginning in the early nineteenth century, the cultivation of coffee as an export crop began to develop beyond the coastal mountains in what is now São Paulo State. The market centre for the coffee growers was the city of São Paulo, which by 1920 was producing 80 per cent of Brazil's coffee and 60 per cent of the world supply.

São Paulo's main initial advantages were a concentration of population and capital, a well-developed transportation network, the availability of cheap energy (hydroelectric power) and superior schools. Subsequently, the opening of a rail link to the coastal port of Santos greatly improved access of coffee-producing areas to world markets and was favourable for industrial location in São Paulo. After slavery was abolished in 1888, coffee growers turned to the Mediterranean countries of Europe and to Japan to solve the labour force shortage on São Paulo's coffee plantations. Immigration subsequently took place on such a massive scale that it was responsible for more than 80 per cent of São Paulo's population growth between 1887 and 1900 (Castello Branco, 1988).

Infrastructure in São Paulo was provided by a number of foreign private companies, such as the São Paulo Railway Company (1860), the São Paulo Gas Company Limited (1869), the São Paulo Light and Power Company Ltd. (1900), a Canadian company that reproduced Toronto's power generation system, and the City of São Paulo Improvements and Free Land Company Ltd. (1912), a British company responsible for land development in an area of São Paulo today known as the "Jardins". With the wealth generated from coffee production, the Government began to remodel the urban core along the lines of a European city. Sections of São Paulo's downtown area were rebuilt, for example, and a number of large parks were constructed during 1910-1915 under the guidance of the French architect, Bouvard.

By the early 1900s, manufacturing—initially to service agriculture—began to develop in São Paulo. Profits from the coffee growers, the effects of isolation in two world wars, the availability of cheap energy, and a large pool of educated immigrants further stimulated manufacturing activity. From the inter-war period, but especially after the Second World War, the Brazilian Government directly encouraged industrial development and, by 1950, São Paulo was Brazil's chief manufacturing centre. During the 1950s, industrialization accelerated as a result of import substitution and the construction of a highway system (e.g., the President Dutra highway) which reinforced the city's nodal character.

The economic base of Greater São Paulo, compared with that of Brazil as a whole, is highly specialized in performing industrial and modern central-place service functions. The percentage of persons employed in the secondary sector is almost twice as high as in Brazil as a whole. Indeed, nearly one third of Brazil's industrial labour force is located in Greater São Paulo. Greater São Paulo is therefore Brazil's most industrialized area and rough estimates indicate that its contribution to total value added by the manufacturing industry in Brazil in 1980 was about 40 per cent. Greater São Paulo's main manufacturing sectors are the metallurgical, automotive, electrical and mechanical industries, which together account for nearly half of manufacturing employment in the metropolitan area.

B. RECENT PERFORMANCE OF THE ECONOMY

There has been a considerable decline in São Paulo's standard of living over the past two decades. Median family income increased from 21.8 cruzeiros (\$Cr) in 1967 to \$Cr 35.1 10 years later. By 1987 it had fallen to \$Cr 21.6—less than its level 20 years before.

In recent years, Brazil has experienced a sharp increase in inflation (to an annual level of 930 per cent in 1988) and stagnation in economic growth. Inflation speeded up continuously over the course of 1988, increasing from 16 per cent in January to 24 per cent in June and to 29 per cent in December (United Nations, 1989). This acceleration was the result of various factors which mutually reinforced one another.

During 1988 and 1989, the Government maintained the wage readjustment mechanism inaugurated in 1987, which provided for monthly increases according to the average inflation of the preceding quarter. The evolution of real wages was uneven. In the industrial sector of São Paulo State, average annual wages increased by 8 per cent. In the main state enterprises and agencies of the federal Government— where there is more trade-union pressure—wages rose in line with prices. In contrast, wages deteriorated in state and municipal governments, because of the less frequent readjustments (United Nations, 1989).

Regarding Brazil's external debt, the country's economic policy sought to normalize the servicing of the external debt through a multi-year renegotiation with creditors and the implementation of new programmes with the multilateral financing agencies. The agreement signed with the banks in June 1988 covered a term of more than one year for the first time since the beginning of the debt renegotiation process. The debt already due or scheduled to mature between 1987 and 1993 (US\$ 63 billion) was renegotiated with a 20-year term, with eight years' grace, while it was also stipulated that US\$ 5.2 billion in new loans would be provided to pay arrears of interest (United Nations, 1989). The following month, Brazil obtained credits from the Paris Club of about US\$ 5 billion for the reprogramming of its debt between 1987 and the first quarter of 1990.

As a means of avoiding hyper-inflation, in March 1990 the Collor Government decided to freeze roughly 80 per cent of the money in virtually all bank accounts for 18 months. The Government also abolished the system that tied monthly wage increases to the inflation rate, imposed a capital gains tax on stock trades and curbed the use of personal cheques. It announced its intention to cut the number of government ministries in half, to start a programme to sell state companies, to abolish subsidies and to decrease import tariffs. The Government further announced that private investment would be welcome in several areas that had long been state monopolies (e.g., highways, railroads, electric power generation, telecommunications and steel).

As a result of this anti-inflation programme, the monthly inflation rate was brought down from 85 per

cent in March 1990 to 10 per cent in June and to 11 per cent in July 1990. However, widespread strikes and protests occurred in response to the severe recession that followed the Government's decision to freeze most bank accounts.

Industrial production in 1990 was expected to be about 10 per cent below the previous year's. In a forecast released by the Institute of Social and Economic Planning, a government agency, Brazil's gross domestic product was projected to drop by 4.7 per cent in 1990, its largest fall in history (*New York Times*, 6 August 1990).

While public opinion polls in Brazil reveal uneasiness about the Government's economic changes, the shifts to a balanced budget and to free markets have continued. The Government has continued to whittle down the number of goods sold under price controls. In addition, Brazil may be heading towards a free-floating exchange rate for the first time in decades. Whereas the gap between the exchange rate on the parallel market and the official rate grew to almost 50 per cent in 1988, the gap between the official currency exchange rate and the black-market rate has steadily narrowed. Brazil is currently believed to be \$8 billion behind in payments on its \$115 billion foreign debt, the largest in the third world.

At the end of January 1991, the Government froze all wages and prices for an indefinite period in an effort to stop inflation, which was running at 20 per cent a month. (This was Brazil's fifth experience in five years with wage and price controls.) The Government also announced sharp increases in public utility charges and the abolition of a series of instruments that Brazilians have long used to keep pace with inflation, including daily interest-bearing savings accounts known as "overnight" accounts. These were steps towards the total de-indexation of an economy in which, for years, wages have been automatically indexed upward to keep pace with inflation.

With high monthly inflation and a sharp recession, Brazil has slipped into what economists in Brazil term stagflation—inflation and economic stagnation. In 1990, industrial activity in São Paulo State, for example, fell 11.2 per cent, the worst performance in the 15 years during which the São Paulo Federation of Industries had charted industrial performance.

C. SPATIAL STRUCTURE OF THE METROPOLITAN REGION

The settlement of São Paulo had its beginnings on a hill surrounded by the flood plains of the Tiête river and its tributaries. By the beginning of the nineteenth century, the city had sprawled outwards in all directions and new neighbourhoods were established in the green belt of small farms and country houses on the outskirts of the city (Kliass, 1990).

During the 1920s and 1930s, industry spread out along the principal railroad lines towards MÓoca, Barra Funda and even towards distant suburbs such as Osasco. Later, industry spread along the rail lines towards the south-west and, in a more dispersed form, towards the east. Beginning in the 1950s, modern industries began to locate along the principal highway axes. This resulted in the rapid development of the industrial areas of ABC in the south along the Anchieta highway, Osasco in the north along the Castelo Branco highway and Guarulhos in the north-east along the Dutra highway.

Today, São Paulo is a high-rise city. Intensive real estate speculation and the indiscriminate demolition of buildings long before the end of their useful life has erased almost all visible remnants of the past. The CBD continues to have the major concentration of tertiary activity, although a number of secondary commercial poles have emerged in recent years. The CBD also incorporates high density, high-income residential areas and a number of lower density high-income areas that were developed some 40-60 years ago (e.g., the Jardins).

The eastern urbanized area, which is bounded by the centres of Tatuape and Cangaíba within the city and by the outlying municipality of Mogi das Cruzes, was built up by the consolidation of dormitory towns along the suburban rail lines and the old highway to Rio de Janeiro (EMPLASA, 1986a). In recent years, high-density expansion in this area has been reinforced by improvements to the suburban rail lines and by completion of the eastern line of the Metro which runs to Itaquera. In the south, there has been an accelerating process of high-density urban expansion. The growth of Jabaquara, Diadema and Taboão de Serra, and development of the industrial sub-centre of Santo Amaro has created strong demand in this area for housing. Development of the south-east has been characterized by the disorderly growth of a number of

dormitory nuclei (e.g., Mauá, Ribeirão Pires and Rio Grande da Serra) along an urban corridor in proximity to the industrial area of ABC.

The west, which also functions mainly as a dormitory area, is made up of the municipalities of Osasco, Carapicuíba, Barueri, Jandira and Itapevi, which are located along the suburban transport corridor. The west also contains a number of industrial areas on its northern edge, as well as the high-income residential area of Alphaville. In the north, an area characterized by parks and woodlands, the urban nuclei perform mainly dormitory functions. The north-east, which has expanded greatly following completion of the new international airport, contains large areas of mixed lower and medium-income residential development. It is polarized by the industrial centre of Guarulhos and the industrial corridor along the Presidente Dutra highway. Further out, expansion to the east and south-east is dispersed and discontinuous and is generally marked by the absence of urban infrastructure and collective transport. To the west, the areas of Itapecerica, Embu and Cotia are higher income areas that are the site of many weekend residences.

From the point of view of income levels, the traditional pattern found in many Latin American cities of a central city of middle- and higher income households surrounded by a poor periphery is being transformed in São Paulo, mainly by the impoverishment of the higher income areas. There has been a significant increase in poverty in most central areas of São Paulo, as shown by the growth of *cortiços* and the expulsion of many middle-income households to the periphery. As São Paulo's new master plan has described it, there recently has been a "perverse" decline in residential segregation by income levels—"perverse" in the sense that it has originated from the spread of poverty rather than as a result of economic development (Rolnik, Kowarik and Somekh, 1990).

D. SECTORAL AND SPATIAL DISTRIBUTION OF JOBS

The process of concentration and dispersal of urban economic activity in São Paulo has been accompanied by a noticeable shift in the sectoral distribution of employment. In the city, the proportion of the population engaged in industry declined from 78 to 54 per cent between 1950 and 1980, whereas the population employed in commerce remained relatively stable (Rolnik, Kowarik and Somekh, 1990). In contrast, the

proportion of the population employed in services nearly tripled over the same period.

A similar process has been occurring within the metropolitan region. Whereas the city was the preferred site for the location of industry up to the 1940s, it steadily lost ground in the following decades to other municipalities in Greater São Paulo. Beginning in the 1970s, the metropolitan region in turn lost ground to the interior of the state. Currently, industry has its greatest dynamism in poles located some 100 kilometres from the city of São Paulo—e.g., Campinas and São José dos Campos, making up an enormous economic pole that is internally deconcentrated. This is of great importance for, in the State of São Paulo, the spatial distribution of industrial employment has decisively determined the growth and distribution of population as a whole. Indeed, it is estimated that during 1970-1980 each new industrial job created in São Paulo resulted in the growth of two new jobs in the tertiary sector and a total of six new urban residents (Macedo, 1990).

In the city of São Paulo, there was an absolute loss of about 40,000 industrial jobs between 1981 and 1987. There were two exceptions, however, to the overall picture of stagnation or decline: the growth of modern, medium-sized industries in Lapa (in the southern zone of the capital) and Santo Amaro (in the western zone), and the continuing dynamism of many small, traditional industries (e.g., clothing, shoes, leather goods) in central areas and, particularly, in Bras and Bom Retiro.

As of 1987, there were nearly 2 million jobs in the tertiary sector in the city of São Paulo, representing 76 per cent of total employment. Whereas tertiary activity grew by 54 per cent between 1977 and 1987 in the municipality as a whole, it grew by 77 per cent in São Miguel and Campo Limpo and by 90 per cent in Ipiranga, Penha and Ibirapuera (Rolnik, Kowarik and Somekh, 1990). Even in the central city, where jobs in the tertiary sector grew more slowly than in the municipality as a whole, there was an increase of 170,000 jobs over the decade.

Gradually, São Paulo is being transformed into a polynuclear city, lacking a centralized structure and rigid functions. Although there still is high density employment in the CBD, the growth of minor poles is becoming more and more important and is likely to continue, with the construction of large numbers of

new shopping centres and office complexes throughout the metropolitan area (Rolnik, Kowarik and Somekh, 1990).

E. THE CITY IN THE REGIONAL AND THE NATIONAL URBAN CONTEXT

Beginning in the 1940s, the city of São Paulo began to lose its industrial primacy within the metropolitan region, falling from an 87 per cent share in 1940 to 83 per cent in 1950. At the same time, Greater São Paulo increased its participation in industrial employment in the state, accounting for more than 70 per cent of total industrial employment as of 1960. Thereafter, the situation began to change. As a result of the subsequent process of dispersal of industrial jobs from the metropolitan region to the interior regions of the state (e.g., Campinas and the Paraíba valley), industrial participation of the metropolitan region in the state total in 1980 was less than it had been in 1950.

Over the past two decades, the State of São Paulo as a whole experienced a decline in population growth—from 3.5 per cent per annum during the 1970s to about 2 per cent per annum between 1980 and 1991. Whereas there was a significant decline in the population growth rate of the São Paulo metropolitan region (from 4.5 to 1.7 per cent per annum) over the same period, the growth of the interior of São Paulo State remained more or less stable—at 2.4 per cent per annum during 1970-1980 and 2.6 per cent per annum during 1980-1991 (Taschner, 1993). However, this overall stability masked significant differentials in the growth of cities of various size classes. Whereas small and medium-sized cities in São Paulo State that either lost population or grew very slowly during the 1970s began to experience increased rates of population growth, all of the large urban agglomerations in the interior of São Paulo State experienced a decline in population growth; the growth rate of the Campinas metropolitan region, for example, declined from 6.7 per cent per annum during 1970-1980 to 3.3 per cent during 1980-1991; the growth of São José dos Campos in the Paraíba valley declined from 6.6 to 3.6 per cent per annum, while that of Santos declined from 3.9 to 1.9 per cent (Taschner, 1993).

An important trend in Brazil has been the massive concentration of its urban population in the nine metropolitan regions. Over the past several decades, however, the average rate of population growth of the metropolitan regions has continued to decline—from

4.7 per cent per annum in the 1960s to 3.8 per cent in the 1970s and to 1.9 per cent between 1980 and 1991 (Taschner, 1993). As a result, the share of the nine metropolitan regions in Brazil's total population growth declined from 41.3 per cent in 1980 to 28.8 per cent in 1991; more dramatically, the combined shares of Belo Horizonte, Rio de Janeiro and São Paulo declined from 28 per cent in 1980 to 15.7 per cent in 1991, while the share of São Paulo alone declined from 17.2 to 9.6 per cent. However, these average data mask significant differences among individual metropolitan regions. Of the nine metropolitan regions, two grew slightly faster than the national urban average, four grew more slowly, whereas three (including São Paulo) grew much more slowly. Regardless of their overall rate of population growth, all of the metropolitan regions underwent a similar

process, experiencing more rapid rates of growth in peripheral areas than in the central city, although (with the exception of Fortaleza) slower rates of growth on the periphery than in the 1970s.

Summarizing the impact to date of Brazil's national urban policy, to the extent that the policy aimed at slowing down growth in some areas and promoting it in other areas, it has not been successful. There has been a deceleration in the growth rates of all the areas in the metropolitan regions and many medium-sized cities are now growing faster than the metropolitan regions, but this is the result of spontaneous forces rather than of spatial policy. It reflects the beginnings of "polarization reversal" in a dynamic, advanced developing country such as Brazil.

III. DECENTRALIZATION AND LOCATION

A. EVOLUTION OF SPATIAL STRATEGIES

São Paulo's first city plan, the *Plano de Avenidas* (1930), was highly influential in that it set forth a plan for the construction of major transportation arteries, thereby assuring the dominance of the automobile over the next several decades. Spatial planning for the São Paulo metropolitan region dates from the mid-1950s. In the pioneering work of a team of Brazilian planners led by Father Lebreton of the *Grupo Economia e Humanismo*, São Paulo was perceived for the first time as an urban agglomeration comprised of a number of urban centres. Father Lebreton's planning exercise was also the first analysis to deal with the human dimension of São Paulo's rapid urban growth.

In 1968, the municipal government held a contest among a number of Brazilian and foreign consulting firms, with the goal of obtaining an innovative new urban plan. The winner, a Brazilian firm named ASPLAN, subsequently produced a study of the metropolitan region entitled the *Plano Urbanístico Básico* (PUB). Also, during the late 1960s, GEGRAN (the Greater São Paulo Executive Group) undertook an exploratory study for the São Paulo Metro. The first comprehensive plan for the metropolitan region, the Metropolitan Plan for Greater São Paulo (PMDI I), was issued in 1970. PMDI I consisted of a series of directives and propositions based on the *Plano Urbanístico Básico* (1968) and the Metro study. The plan recommended that high priority be assigned to problems of public transport and sanitation. In a recommendation echoed two decades later in the *Plano Diretor* (1991), PMDI I emphasized the need to orient private investment so as to bring about a more efficient urban structure. This would involve controlling horizontal expansion by promoting higher densities in certain areas (which is the cornerstone of the 1991 plan) and decentralizing employment, making it more compatible with patterns of residential settlement. The plan also recommended guiding expansion of the agglomeration towards the east and north-east and restricting growth in the south and south-east in order to protect the major water basins and to preserve ample reserves of public space for future use.

Based on PMDI I, a plan for the city of São Paulo was adopted in 1971. In 1972, a planning unit with city cabinet rank—*Coordenadoria Geral de Planejamento* (COGEP)—was established to implement the city plan. It soon became clear, however, that parts of the plan were unrealistic (it provided, for example, for the construction of 400 kilometres of expressways in the near future) and that it would be impossible to undertake the large-scale public works that it envisioned (Bolaffi, 1989). The only major recommendation that could be implemented was the zoning of the city in functional areas. The zoning laws were therefore edited, and they have essentially regulated development over the past two decades. Although PMDI I was metropolitan in scope, the zoning laws were implemented only in the city proper; a number of the smaller municipalities adopted some kind of zoning, however, and metropolitan-wide industrial zoning laws were subsequently adopted.

In 1972, the Urban Municipal Corporation (EMURB) was also created, to serve as COGEP's executive arm and to provide the city with a rapid and flexible urban intervention instrument to remodel sections of the city that were to be affected by the Metro (Bolaffi, 1989). EMURB's main goal was to purchase large plots of land in order to prevent speculation and channel the benefits of the rise in land values that inevitably would occur after the Metro's inauguration. Its second goal was to enable planners to promote higher density occupation along the metro lines, in order to optimize its benefits. From the beginning, EMURB ran into serious difficulty, since many real estate owners refused to sell their land. When EMURB resorted to expropriation, the owners took their cases to the tribunals. In spite of the fact that EMURB was paying market prices for the expropriated property, the lawsuits remained in the courts for many years. When, almost a decade later, the Supreme Court ruled in support of the city's claims, it was too late; land and construction costs had risen steeply and a construction boom had removed any rational planning possibilities in the areas affected by the Metro. After 1983, EMURB's focus tended to shift away from urban planning towards public works. COGEP's name was changed in 1983 to SEMPLA (Municipal Planning Secretariat).

Regarding the implementation of plans and programmes with impacts at the regional level, a series of actions were undertaken in the 1970s that have had lasting impacts. A pilot action programme for traffic and transport, for example, was undertaken in São Paulo in 1971 and subsequently was extended to other municipalities. Regional programmes of assistance to the smaller municipalities also began during the 1970s and continue to the present. Likewise, the regional plan for solid waste and sanitary landfills, the study for the new international airport, legislation for the protection of the area's water basins and industrial zoning laws, all have had significant spatial and environmental impacts.

The 1970 metropolitan plan was not revised until 1982. However, the revised version was not approved and was largely ignored by the various sectoral bodies, partly because it did not have sufficient financial backing. Beginning in the mid-1980s, metropolitan planning began to consist of essentially isolated actions. Currently, there is no operational plan for Greater São Paulo.

B. CURRENT SPATIAL STRATEGIES

São Paulo's major spatial initiative in recent years was the city's proposed new master plan, the *Plano Diretor*. As Paul Singer, former Secretary of Planning for the municipality, noted, "the *Plano Diretor* is a revolutionary project, which breaks with the tradition of conventional master plans that were in vogue worldwide from the 1950s through the 1970s. Rather than preparing a master plan that presents a vision of utopia, or that outlines the scenario of the ideal city—without assuring the political, social and particularly the financial means to attain it—the *Plano Diretor* recognizes the problems facing present-day São Paulo and tries to overcome them by constructing a city that is more rational and efficient for the greatest number of inhabitants" (Sinduscon, 1991).

The plan began from the premise that the urban fabric in a spatially extensive city such as São Paulo is extremely diverse. Part of the city is well-equipped with basic infrastructure (e.g., transport, water-supply, sewerage), while much of the city is badly served. Given this fact, the plan sought to promote greater densities in areas where this could be done without major investment in additional infrastructure, and to

discourage densification in parts of the city where infrastructure was scarce or non-existent. The plan differentiated between residential and non-residential stocks in determining whether an area could support higher population densities. The plan noted, for example, that the CBD could not support additional day-time commercial activity but could support higher residential densities (since the residential population would not require additional infrastructure). The plan also identified "special-interest areas" (low-income, industrial and institutional), as well as ecologically sensitive areas, and it redefined São Paulo's urban and rural boundaries, designating "established urban areas" and newly urbanized areas."

The most innovative aspect of the plan is the concept of "*solo criado*" (literally, "created" land). The idea behind *solo criado* is that, whereas the supply of urban land is finite and cannot be produced, by constructing the requisite infrastructure to enable higher density settlement, land can, in a sense, be "created". Essentially, *solo criado* is a type of cross subsidy whereby contractors pay not only for the cost of construction but also for the value corresponding to the urban space. The potential is considerable; the plan noted that there are about 8 million square metres of new construction each year in São Paulo, about half of which is vertical. The additional revenue that would be collected would go to a fund that would be used to extend infrastructure to unserved, low-income areas on the periphery—ultimately helping to incorporate the irregular city into the mainstream of urban life.

Regarding how the concept works, currently, floor area ratios (FAR) (the ratio of the area of a building to the lot size) in São Paulo vary from 4 to 0.1, with most of the built-up area having a FAR of 1. (As the plan noted, in many developed country cities, such as London or New York, floor area ratios are as high as 20 or more.) Under the new plan, over a two-year period, the whole city would come down to a FAR of 1. In areas that have been determined to be unable to support higher population densities (because the existing infrastructure is insufficient for the population already living there), the FARs would not be allowed to exceed 1. However, with the construction of additional infrastructure, these areas might be able to support higher densities at some point in the future; hence, the status of these currently non-densifiable areas would be reviewed every two years. In areas that could support higher densities, contractors desiring

to construct taller buildings would be required to pay the Government in accordance with the additional square footage constructed. Theoretically, contractors would be allowed to build much higher buildings, based on a determination of total stocks available in a given area. Whereas the fee for constructing the additional stories was originally going to be based on market value, it was subsequently to be based on the property's assessed value.

Among the weaknesses of the process, there is as yet no precise way of determining the capacity of various areas to support higher densities. Whereas a general methodology has been in use, researchers at the Faculty of Architecture of the University of São Paulo are currently engaged in developing a more precise methodology. Another drawback is the fact that no fees are required for construction in areas where FARs are less than 1; because much of the periphery is built up at very low densities, with FARs as low as 0.1, no revenue will be collected from construction in these densely populated, rapidly growing areas.

The *Plano Diretor* was the subject of a series of public and technical debates. Whereas about 80 per cent of the plan is not controversial, the part about density was quite controversial and was criticized by various groups (e.g., real estate interests, business associations, professional associations (e.g., architects)). Specifically, some critics objected to the fact that the plan could raise the price of urban land (to which the drafters of the plan replied that the plan would bring about a more rational occupation of urban

space, hence would ultimately decrease the costs of urbanization). Other critics argued that the central city was already too dense and could not support higher densities. Moreover, still others complained that the fees for construction above a certain coefficient were unreasonably high. Also, because the maximum for each plot would depend upon the decision of neighbourhood councils based on the stock of building rights of that district (based on infrastructure and politics), some critics have feared that the possibility of changes in this stock would be based on political manoeuvres in the local councils. Following the change in administration in January 1993, it would appear that the future of the plan is now uncertain; the new mayor is not likely to accept the bulk of the plan's ideas.

In regard to planning in the other municipalities in the metropolitan region, according to a proposed new federal law, all municipalities in Brazil with more than 20,000 inhabitants would be required to prepare a master plan (originally, master plans were required for municipalities with more than 100,000 inhabitants; the cut-off was subsequently reduced to 50,000 and then to 20,000 inhabitants). What this means is that at least 31 of the 39 municipalities that constitute Greater São Paulo would be faced with having to prepare master plans. EMPLASA has provided technical assistance to several municipalities that do not have the necessary technical planning staff (e.g., São Caetano do Sul, Embu, Cotia, Suzano). Moreover, it has urged other municipalities to avoid hiring high-priced private consultants to draft elaborate conventional master plans, settling instead for more modest, in-house planning exercises.

IV. ISSUES AND SECTORS

A. THE LABOUR MARKET

One third of all jobs in Greater São Paulo as of 1988 were classified as industrial; 32 per cent were in the service sector, 13 per cent in commerce, 6 per cent in construction, 5 per cent in transportation, 4 per cent in public administration and 6 per cent in other categories. In the industrial sector, 524 very large companies (with more than 500 workers) employed 37 per cent of the metropolitan region's industrial labour force; another one third were employed by 2,593 medium-sized enterprises (with 100-499 employees), 28 per cent by 20,708 small companies (with 5-99 employees) and 2 per cent by 11,665 micro-industries (with 1-4 employees) (Leitmann, 1991).

Brazil's economic crisis has had serious impact on the labour market in Greater São Paulo. During the 1983 recession, São Paulo had nearly 1.5 million persons unemployed—about 20 per cent of the economically active population. The upturn in the economy in 1986 had limited effects and unemployment remained at a high level. The situation has not improved in recent years. According to the monthly survey of employment conducted by the *Departamento Intersindical de Estatística e Estudos Socio-econômicos* (DIESSE), Greater São Paulo had more than 1 million persons unemployed as of June 1990. By November 1990 the situation had improved somewhat and there were 789,000 persons out of work. During the fall of 1990 (the most recent period for which data are available), unemployment in Greater São Paulo hovered about 10 per cent, about two thirds of which was open unemployment and the rest disguised unemployment.

The unemployment rate in the outlying municipalities has been about two percentage points higher than in the city of São Paulo. This is mainly because services account for a higher proportion of jobs in the capital, whereas industrial jobs, which have been declining, predominate in the outlying municipalities. Indeed, during 1990 there was a loss of more than 200,000 industrial jobs in Greater São Paulo. Unemployment among males and household heads was up by more than 50 per cent in the fall of 1990 compared to the same period 12 months before. There was also a considerable decline in the participation of

young adults and among persons in the least skilled occupations. This was reflected in the fact that disguised unemployment grew more rapidly than open unemployment.

Recent information shows that the effect of the economic crisis in Brazil on the informal and formal labour markets did not significantly affect women's participation rates. However, there has been marked and continuing inequality by sex in São Paulo with regard to income distribution. Indeed, a study conducted by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) in a number of Latin American cities found that the greatest disparity between male and female incomes, both in the population as a whole and among heads of households, was in São Paulo, where average male income was double that of females (Arriagada, 1990). Whereas São Paulo has had one of the most spectacular increases of any Latin American city in female participation in recent years, this has been at the expense of women accepting much lower wages than their male counterparts. Indeed, the ECLAC study noted that São Paulo's female labour force essentially constituted a "stagnated labour reserve"—one made up of active workers, but with irregular work, and whose compensation was well below normal working-class levels (Arriagada, 1990).

The time employees stay in a job in São Paulo is frequently short. Indeed, the average turnover in São Paulo for industries with more than 500 employees has been about 100 per cent. Some industries have had a turnover rate as high as 400 per cent. One of the main explanations is the fact that workers, even when voluntarily changing jobs, ask to be legally dismissed in order to receive unemployment compensation.

B. URBAN LAND

The urban core of São Paulo has grown from 180 square kilometres in 1930 to 700 square kilometres in 1970, and to its present size of 900 square kilometres. In the urbanized area, 30 per cent of the land is residential, 28 per cent consists of road network, 17 per cent is vacant, 11 per cent is open space (parks, water etc.), 6 per cent is commercial, 5 per cent is industrial, and the remainder has other uses (Leitmann,

1991). Over half of the land in the urban core is privately owned.

The rapid consumption of urban land in São Paulo—the city expanded nine times in area over the past 30 years—not only has had significant impact on the land market, but also has had profound ecological consequences. The immense continuous urban area, filled with skyscrapers and a highly intensive road network, and nearly totally impermeable, has produced conditions for an island of heat, creating a temperature gradient of 10°C between the centre and the periphery (Kliass, 1990). Uncontrolled expansion has also reached some of the region's last remaining reserves of natural vegetation—steep slopes that have a high capacity for erosion.

In an effort to create ecological reserves in vulnerable areas, the Government passed legislation in 1975 and 1976 protecting the area's vast watersheds. Currently, about 550 square kilometres within the city of São Paulo and some 4,200 square kilometres (more than half of the total land area) in Greater São Paulo consists of protected areas (EMPLASA, 1988). Whereas the protected watersheds were reasonably managed until around 1980, with the economic crisis of the 1980s and increased land prices exacerbated by unenforceable restrictions on land use, squatters began to occupy the watershed areas, particularly in the south (ironically, the Workers' Party, which was recently in power in São Paulo city, was often in favour of these invasions; in fact, some of the party's leaders were actively involved) (Leitmann, 1991). Currently, an estimated 1 million people live in the watershed areas. This has caused the increasing degradation of the Billings and Guarapiranga reservoirs and prevented their use as recreational areas. Although the authorities periodically have used helicopter over-flights and have obtained satellite images (through an agreement signed with the National Institute of Space Research/INPE) to monitor illegal encroachment on protected areas, apart from warnings and modest fines, the authorities have limited powers of enforcement.

The rapid consumption of land in São Paulo has led to disorderly urban development. Currently, two thirds of development in the city of São Paulo is technically "illegal". One of the major types of illegal development involves land occupied by the city's 1,592 *favelas*. In the case of *favelas*, illegality is determined partly by the fact that the land has usually

been taken over—either gradually or, increasingly, by sudden invasions—rather than purchased. Between 1980 and 1987, for example, there were some 200 invasions, involving 100,000 squatters (Jacobi, 1991). Illegality also stems from the fact that the land on which many *favelas* lie is environmentally vulnerable. Indeed, they often occupy land with more than a 30-degree slope, which was vacant in the first place because it was prohibited by law from being developed (Kliass, 1990).

Another major type of illegal development consists of so-called "clandestine" developments. The principal characteristic of these developments is that they do not conform to São Paulo's land-use laws. Since the early 1920s, the city has attempted to regularize the opening up of new developments through standard zoning regulations (e.g., regulations referring to plot size, setbacks, floor-area ratios). Up to the 1950s, applications were handled on a case-by-case basis. Thereafter, the authorities were unable to keep pace with the sheer volume of non-conforming developments and periodic amnesties were conducted to legalize the large number that had been opened up without authorization. In 1979, however, under federal law, it became illegal to sell lots in non-conforming developments. The criminalization of the process of illegal land development made possible by the new law, along with São Paulo's worsening economic climate, had the effect of slowing down the construction of new "clandestine" developments during the 1980s. Currently, however, in the city alone, it is estimated that there are some 2,800 "clandestine" developments, and 30,000 clandestine streets (Leitmann, 1991).

Whereas for many years São Paulo grew illegally, in contravention of zoning laws, a recent initiative is to use new types of zoning laws (e.g., the concept of "*solo criado*") to promote higher densities and more efficient land use, since it is estimated that housing for 8 million inhabitants could be built on the vacant lots and low-density areas of São Paulo city (Leitmann, 1991). Cross subsidies are seen as enabling the authorities to incorporate illegally developed areas (e.g., *favelas* and "clandestine" subdivisions) into the legal city.

In addition to the concept of "*solo criado*", under proposed new federal legislation, municipalities in Brazil theoretically could use progressive taxation to

penalize landowners who engaged in speculation that was not "in the social interest". If land was not built upon within a designated period, the municipality would be allowed to impose a progressive tax, which would increase each year that the land lay vacant. (Although it has been argued that the authorities should be allowed to confiscate land that had remained vacant for many years, the confiscation provision has not been adopted; currently, only land that is being used to grow marijuana can be confiscated by the authorities.)

C. HOUSING

The housing situation in São Paulo has reached crisis proportions. During the 1980s, large numbers of middle-class households experienced downward mobility and were forced to abandon dwellings near the centre and to buy or rent cheaper accommodations on the periphery. At the same time, many of the city's poorest inhabitants could no longer afford housing on the periphery and crowded into *cortiços* (multi-family tenements—literally, "beehives") in the city's central areas. Currently, an estimated 7.7 million inhabitants—two thirds of São Paulo's total population—are estimated to be living in substandard housing: as many as 1 million in *favelas*, 3 million in *cortiços*, 2.4 million in illegal developments on the periphery, and another 1.3 million in other types of precarious housing.

Briefly recapping the history of public housing policies in São Paulo, most early housing regulations were adopted in order to address the city's serious health problems. São Paulo's municipal law of 1908, for example, proposed tax exemptions for structures that were rented or sold to low-income households, if they were built within acceptable norms of hygiene. For many years, the private rental sector was crucial in providing housing for São Paulo's lower income population. Indeed, as early as the 1920s, about 70 per cent of all housing in São Paulo consisted of rentals. Most of São Paulo's poorer residents rented rooms in *cortiços*, while others rented accommodations in working-class villages.

Rentals began to be regulated in São Paulo and elsewhere in Brazil during the Second World War. Rent control laws were initially designed to remedy the short-run imbalances brought about by the war, but, as the legislation was extended, it became harder

to repeal, since tenants began to consider the continuous occupation of their rental units to be a right (Silveira, 1989a). As a result, except for minor adjustments, rents remained frozen in São Paulo for nearly two decades.

Although, as a World Bank report notes, "Brazilian rent control legislation might be considered restrained when contrasted with those of other developing countries", in the long-run, rent controls managed to discourage investments in rental housing (Silveira, 1989a). During the years 1930-1964, the share of rental housing declined. Thus, the availability of the only type of formal housing which could be afforded by recent migrants was effectively reduced, a situation which encouraged an unprecedented boom in the informal housing sector.

Housing institutions in Brazil were substantially strengthened during the authoritarian years that followed the 1964 coup. Soon after the coup, the National Housing Bank (BNH) was created, with the responsibility of executing the National Housing Plan, and managing the Housing Finance System (SFH). BNH was essentially a second-line bank, and actual housing loans to the public were made through one of SFH's many financial agents. Each agent in SFH specialized in a certain class of housing. The housing companies known as COHABS, for example, that were partly owned by the state and local governments, and the mutual aid associations known as COOPHABS, mainly lent to lower income households.

BNH was originally expected to be funded mostly by a 1 per cent tax on wages. Later, in 1966, the Length of Service Guarantee Fund (FGTS) was introduced to expand the pool of funds available for housing programmes. FGTS is a scheme whereby workers contribute 8 per cent of their wages into an interest-bearing (3 per cent) inflation-indexed fund with quarterly monetary corrections, from which they can withdraw either at retirement or during periods of unemployment or illness, or for the construction of a home. By the 1970s, passbook savings (offering a 6 per cent return plus monetary corrections) had become increasingly popular as a hedge against inflation and surpassed FGTS as the major source of funding of SFH (Silveira, 1989a).

Although mortgage payments were indexed, high unemployment and sharp reductions in real wages

resulting from the recession during 1981-1983 raised the number of loan defaults to a maximum in the history of SFH. Indeed, by 1984, about 50 per cent of accounts were in one-month arrears. In 1985, one year after the return to civilian government, the so-called Cruzado Stabilization Plan was put into action, which weakened further the viability of the housing system (Silveira, 1989a). In an effort to salvage the system, the Government intervened by closing BNH in November 1986 and transferring its responsibilities to the Federal Savings Bank (Caixa Economica Federal/CEF) and to the Central Bank.

To fill the gap caused by the closure of BNH, the government of São Paulo State has become more active in the area of housing finance, mainly through the Financing and Investment Fund (Fundo de Financiamento e Investimento), which is capitalized by the sale of bonds in financial markets. The state government also has allocated 1 per cent of the goods circulation tax (ICM) for housing programmes (Silveira, 1989a). In addition, it has operated a system of direct subsidies for lower income households.

Currently, formal sector housing has been unable to meet the needs of São Paulo's rapidly expanding population. The number of two-bedroom apartments built every year decreased from about 12,500 units in 1980 to a little over 8,000 in 1989—at a time when 3 million people were added to the city's population (Leitmann, 1991). Rental regulations continue to keep landlords from investing in new stock and making improvements, causing a deterioration in the quality of the rental stock and causing São Paulo to have the second highest cost of renting (after Brasília) in the country.

The record of the public sector in São Paulo in housing construction also has been quite poor. Whereas the target of the state Housing and Urban Development Company was to construct 250,000 new housing units, only about 60,000 units were actually constructed. Between 1965 and 1989, the state Housing Company constructed some 100,000 houses. However, a majority were constructed on unsuitable land. Moreover, given the necessity for the extension of service networks and the cost of earthworks and recuperation from erosion, the cost per unit was comparable to that of middle-class housing.

The majority of São Paulo residents have been served by the informal housing sector. Whereas many of the *favelas* in Rio de Janeiro date from the 1920s, until 25 years ago there were few *favelas* in São Paulo. A major explanation is the fact that, whereas *cortiços* are no longer an important feature of the housing market in most Brazilian cities, they continue to account for a significant share of the São Paulo housing market.

A census of *favelas* conducted in the city of São Paulo by SEHAB in 1987 (previous censuses were conducted in 1973 and 1980) found that, whereas the population of São Paulo as a whole grew by 60 per cent between 1973 and 1987, the population residing in *favelas* grew by more than 1,000 per cent, reaching 820,000 in 1988. The city was found to be dotted with small pockets of *favelas*. Indeed, 60 per cent of *favelas* had between 2 and 49 dwellings, whereas less than 1 per cent had over 1,000 dwellings (Prefeitura de São Paulo, 1988). Many were located in precarious areas subject to flooding; nearly 800 were located along streams or rivers. Others were located in areas subject to landslides (512), on steep hillsides (466), or in areas prone to severe erosion (385). *Favelas* were also located along expressways and rail lines, whereas some 30 *favelas*—housing about 2,500 families—were located on landfills and garbage dumps. Increasingly, São Paulo's *favelas* are located on public rather than on private land: only 17 per cent were found to be located on private land in 1987, down from 59 per cent in 1973 (Veras and Taschner, 1990). The largest number (738, or 46 per cent) were located in the south, particularly in Campo Limpo and Santo Amaro, followed by the south-east (20.5 per cent), north (19 per cent) and east (12.4 per cent). Less than 2 per cent of *favelas* were located in the central city (Prefeitura de São Paulo, 1988).

The 1987 survey of *favelas* confirmed what was found in earlier field surveys—namely, that São Paulo's *favelas* were not temporary settlements housing recent migrants, who eventually would move on to more permanent housing. Rather, they were a creative response to the housing deficit by São Paulo's working poor. Many *favela* residents were found to be long-standing São Paulo residents who in some instances had experienced downward mobility as a result of unemployment or the inability to pay rising rents. The survey found that 76 per cent of heads of

households in *favelas* had been in São Paulo for 10 years or longer (only 1.3 per cent had been in São Paulo less than one year). Moreover, more than half had resided previously in a single-family dwelling. Far from being unemployed, 66.5 per cent of household heads interviewed were employed in the formal labour market and had social security. However, nearly three quarters of those interviewed (73.5 per cent) received less than three minimum salaries (Prefeitura de São Paulo, 1988).

Likewise, whereas it was commonly believed that the structures themselves were temporary—i.e., they were constructed of flimsy material and lacked infrastructure—the survey found that more than 50 per cent of *favela* dwellings in São Paulo were constructed of masonry, 92 per cent had access to piped water, 19 per cent were connected to the sewerage network, 98 per cent had electricity hookups, and 72 per cent had regular garbage collection (Veras and Taschner, 1990).

Government policy towards São Paulo's *favelas* has oscillated over the years. During 1967-1970, the policy was to remove *favelas*, particularly from central areas and areas slated for improvements. Beginning in 1971, with the establishment of the Ministry of Social Welfare, emphasis was placed on the construction of provisional housing. During 1975-1979, the Government adopted a number of new policies, including urbanized lots and area upgrading, while maintaining its policy of removals and construction of provisional housing. One major innovation was the establishment of the Fund for the Population in Substandard Housing (FUNAPS/Fundo de Atendimento a População Moradora em Habitações Subnormais). During 1979-1983, Government policy focused on the urbanization and improvement of *favelas*. However, during 1986-1988, a number of institutional changes, including the abolition of the Ministry of Social Welfare, led to a number of policy changes, with the preferred policy once again being that of removing *favelas* (Veras and Taschner, 1990).

The Government's current policy is to regularize *favelas*, where possible, giving 90-year leases, and to provide infrastructure to those located on public property. SEHAB's principal activities during 1989 were the provision of infrastructure (including drainage ditches and the re-blocking of roads) in more than 100 *favelas* and the initiation of a process of regularization of some 150 others. In 1990, the municipality

invested \$US 400 million in 40 upgrading projects. It transferred the residents of 240 *favelas* (2,100 families) that were located in high risk areas (e.g., in areas subject to flooding or landslides) and began transferring the residents of another 400 *favelas* (about 60 per cent of whom resisted the transfer).

As previously noted, *cortiços* (dilapidated multi-family dwellings) continue to be an important aspect of the housing profile of São Paulo. Each family typically occupies one or two rooms, with a common kitchen and washing areas. In contrast to the *favelas*, where periodic censuses have been conducted, the size of the *cortiço* population is difficult to measure. Assuming that *cortiços* grew at about the same rate as *favelas*, the authorities estimate that *cortiços* housed about 1.7 million inhabitants in 1980 and 3 million in 1990 (Rolnik, Kowarik and Somekh, 1990).

Cortiços are the oldest type of substandard housing in São Paulo, dating from the last quarter of the nineteenth century. Until the 1950s, when rentals were the most common type of housing for all social classes, *cortiços* represented the only alternative type of housing for the poor, even though they were prohibited by various municipal codes. During the 1960s and 1970s, the growth of *cortiços* was closely related to the process of self-help construction on the periphery by low-income households. In order to finance the progressive construction of their houses, or to make payments for their lots, owners frequently added on a room and then rented it out to families that did not have access to a lot of their own. Indeed, a number of neighbourhoods, e.g., Móoca, Vila Matilde, Vila Prudente, Saúde, Vila Maria, were built up in just this manner (Rolnik, Kowarik and Somekh, 1990).

Cortiços in many instances are very profitable for the middlemen, some of whom receive rents from as many as 40 properties. Until recently, there have been no programmes for upgrading *cortiços* in São Paulo. Several pilot projects have been conducted under the auspices of the Catholic Church (one in a *cortiço* in the central city housing some 60 families).

As the process of downward mobility continues in São Paulo, with many members of the middle class forced to sell out and move to the periphery, and many residents of the periphery obliged to move to *cortiços*, some of the city's poorest families who formerly lived in *cortiços* are now homeless. It is estimated that there

are as many as 100,000 homeless living on the streets and under viaducts and bridges. Although about 70 per cent of the homeless are single men, there are growing numbers of homeless families. Currently, there are about 3,000 beds allocated for the homeless in São Paulo, divided among various programmes. The longest a person who does not have mental problems can stay in any one facility is one week. The municipality's work in this area is relatively recent. It currently operates two shelters and five drop-in centres.

São Paulo, as is the case in a number of other Brazilian cities, has a large population of so-called street children. The authorities have established a number of open houses where the children can sleep at night. In addition, the authorities have sponsored a number of innovative programmes targeted at homeless children, including a training school for circus performers.

D. WATER-SUPPLY AND ENVIRONMENTAL PROBLEMS

São Paulo is served by a vast network of river basins and man-made reservoirs. The three main river basins—the Alto Tiête, the Piracicaba and the Baixada Santista—are hydraulically connected through the Cantareira system, which serves São Paulo's north and centre, supplying 29 cubic metres per second and accounting for 58 per cent of total production (Bezerril, 1990). The Guarapiranga reservoir, which was built in 1906 as part of a long-term programme to develop the area's hydroelectric potential, supplies 24 per cent of the total and serves the south and west. The Billings reservoir (1926), also originally constructed to produce hydroelectric power, supplies 7 per cent of the total, while the Rio Claro system provides roughly the same amount (Bezerril, 1990).

Currently, an impressive 95 per cent of the population of the city of São Paulo and 91.5 per cent of the population of Greater São Paulo have piped inside water. Despite the fact that there is a good service network, many areas of the city receive an intermittent supply. The situation is most serious in the poorer areas to the east and south, where water is received roughly two thirds of the time, in comparison to 80 per cent of the time in the city's more affluent areas (Rolnik, Kowarik and Somekh, 1990). In some areas of São Paulo, the water supply is rationed on a daily basis (e.g., three days with water, one day without),

particularly during the humid summer season when demand outstrips supply.

With financial assistance from the World Bank, the Government has undertaken a number of major projects designed to expand the distribution system. Initially, an additional 5 cubic metres per second (m^3/sec) will be diverted from the Capivari River to the Guarapiranga System. Other projects include improving the Cabucu-Engordador system, which serves the northern part of the capital, expanding the capacity of the Rio Grande system (which mainly serves the ABC area), and improving the Guarau treatment system and the Cantareira system (SABESP, 1989).

After 1994, the Alto and Medio Capivari dams will be constructed, and will supply an additional 5 m^3/sec , which will be sent to the Guarapiranga reservoir and then treated in the Alto do Boa Vista station. By the conclusion of the last stage of the project, in 2005, the Alto Tiête system is expected to produce about 15 m^3/sec . With this additional supply, SABESP plans to be able to provide water to a service population of 22 million inhabitants. In addition, some 970 kilometres of distribution network are planned to be constructed and 187,000 domestic hook-ups provided, benefiting more than 1 million inhabitants. Efforts are also under way to reduce systems losses, which are currently estimated at 34 per cent (Leitmann, 1991).

The cost of water in São Paulo remains low. In 1989, the cost for residential connections was 12 new cruzados (\$Cz) per m^3 for up to the first 10 m^3 , falling to less than \$Cz 2 for 10-20 m^3 (and then increasing to \$Cz 3.5 for 20-50 m^3 and to \$Cz 5 for over 50 m^3) (SABESP, September 1989). Currently, tariffs barely cover operating costs. In 1981, a programme was begun to attempt to increase revenues by regularizing the large number of illegal water connections throughout São Paulo.

Sanitation is one of the major challenges facing planners in São Paulo. Currently, 70 per cent of residents of the city of São Paulo and 65 per cent of residents of Greater São Paulo are connected to the sewerage network. Throughout the metropolitan region, two secondary/biological, one primary/mechanical, and five smaller wastewater treatment plants processed 621,000 m^3/day as of 1989, or 26 per cent

of the total daily load of 2.4 million m³ (90 per cent of which was municipal and 10 per cent industrial). These plants removed 90 per cent of the organic load, leaving a relatively high 10 per cent of the organic effluents intact (Leitmann, 1991). Thus, less than a quarter of the metropolitan area's sewage is fully processed. As a World Bank expert noted, "if and when a sewage master plan, known as SANEGRA, is fully implemented, the city will have to cope with both the remaining untreated waste problem and the disposal of 500 tons of activated sludge per day" (Leitmann, 1991). As a means of coping with São Paulo's growing environmental challenges, EMPLASA is spearheading a state-of-the-art search for the next generation of sewerage technology and has agreed to mount a demonstration project (interview with Jorge Wilhelm, November 1991).

Drainage is one of São Paulo's most serious problems. During the summer and fall of 1991, rainfall was the highest ever recorded in the state (indeed, rainfall during March 1991 was 250 times greater than the average since record-keeping began in 1944) (*Jornal do Tarde*, 29 March, 1991). With the reservoirs already 99 per cent full, the city experienced the worst flooding in its history, which set off landslides, inundated homes and businesses, created massive traffic jams and brought the city to a virtual standstill.

The drainage problem arises from the fact that, as the surface area of the city has been built up steadily with asphalt roads and other impermeable surfaces, there is less and less ground area to absorb rainwater run-off. Indeed, the city of São Paulo covers an area of about 1,500 square kilometres, 950 of which are impermeable, with the result that a 100 mm rain traps 150 million tons of water in the urban basin (Dowbor, 1993). Many of São Paulo's current drainage problems are the result of past ill-conceived engineering projects. During the 1930s, for example, São Paulo's rivers were channelled into enclosed tubes, with avenues running along the top. Rainwater run-off on the asphalt surfaces, however, was much faster than engineers had anticipated and led to serious flooding. (EMPLASA has proposed prohibiting the channelling of rivers in the eastern part of the SPMA; to prevent flooding, rivers would be required to remain open, with parks along the embankments and roads located farther out.) The problem of flooding is compounded

by the fact that, because land is cheaper in the flood-prone parts of the city, the areas covered with water and sewage are the most densely populated, usually by the poor. About half of the city's 1,600 *favelas* are located along streams and tributaries. This not only has resulted in garbage clogging the streams but also has caused erosion of the banks which has led in turn to silting and exacerbated flooding. Many of São Paulo's storm-water drains were constructed more than 50 years ago and are now inadequate. Moreover, it has been estimated that there are some 100 kilometres of "lost" storm drains (that were either broken up by construction projects or are clogged by debris) beneath the central city (*Folha de São Paulo*, 1 April 1991).

In terms of policies to improve drainage and alleviate flooding, in 1983, EMPLASA identified some 500 critical points throughout the metropolitan area (outside the municipality of São Paulo) where flooding was likely to occur. Although an emergency programme was formulated, it was only partially implemented. By 1991, the number of critical points in the metropolitan area had increased to 949, with 420 in the city and 529 in the surrounding municipalities. The authorities estimate that it will cost more than US\$ 700 million and take nearly 20 years to complete the necessary flood protection projects in São Paulo (*Jornal do Tarde*, 27 March, 1991). Since 1990, the authorities have operated an early warning system, whereby radar tracks potentially dangerous weather systems, broadcasting flood alerts through radio and television at least four hours in advance.

The collection of the 12,000 tons of municipal solid waste generated daily in the city of São Paulo (and about 14,000 tons of municipal solid waste and more than 6,000 tons of industrial solid waste generated in Greater São Paulo) is undertaken by three large private garbage contractors that are also responsible for street cleaning. The Urban Waste Management Department of São Paulo (LIMPURB) is responsible for competitive bidding, hiring of contractors and monitoring of services (Leitmann, 1991). Collection is more or less adequate; in 1988, almost 95 per cent of households in the metropolitan area reported that their waste was collected, although the regularity and reliability of the service was not assessed (Leitmann, 1991). The people of São Paulo, except those in slums and poor outlying districts, facilitate the collection of domestic

solid waste. Indeed, 70 per cent of household waste is put out for collection already packed in plastic bags (Leitmann, 1991).

Disposal, however, remains a serious problem. The city is served by three sanitary landfills (out of 13 proposed to be constructed), three incineration plants, two composting plants and a recycling centre. The entire system is now saturated. One of the incineration plants is obsolete and was recently shut down. Whereas one sanitary landfill has an estimated life-span of less than one year, the other has a life-span of less than four.

Many of São Paulo's dumping sites are badly situated. There are eight major dumping sites, for example, in proximity to the international airport. Some dumps already have more than 30 million tons of accumulated material. Leachates from the 120 tons of garbage collected daily at a dumping site in Embu have contaminated one of the main tributaries leading to the reservoir. Because of growing environmental awareness, a number of municipalities have passed ordinances not only forbidding landfills from being constructed, but also prohibiting compactor vehicles from passing through their territory.

Given the growing amount of solid waste and the shrinking capacity of São Paulo's landfills, the Government is giving greater emphasis to recycling activities. In December 1988 the city government launched a "Selective Garbage Collection" programme, involving door-to-door collection of paper, glass, plastic and metals. Four complementary aspects of the project were voluntary sorting of this domestic household waste in 50 schools; placing recycling containers in public places such as supermarkets; recycling in squatter settlements in collaboration with residents' associations and health clinics; and introducing fees for collection of industrial waste, with timetables to induce industries to internalize more of their waste treatment functions (Perlman, 1990). Collection of material for recycling has more than doubled each year, and the Government is optimistic that recycling will play a major role in future waste collection efforts.

As in other rapidly growing metropolises in the developing world, the quantity of harmful emissions in São Paulo far exceeds the natural self-cleansing capacity of the city's environment. Air quality in São

Paulo is degraded by the presence of excessive levels of carbon monoxide, ozone and particulates. Increases in air pollution levels have been associated with increases in morbidity and mortality and with an increased incidence of respiratory and cardio-vascular diseases. Whereas industry has been an important source of environmental pollution, producing more than half of the suspended particulate matter, most air pollutants are a product of vehicular exhaust (primarily from gasoline-powered transport in the case of carbon monoxide and hydrocarbons, and diesel-powered trucks in the case of nitrogen oxides and sulfur dioxide). The impact of these emissions has been monitored since 1976 by the Environmental Protection Agency (CETESB) of the State of São Paulo. During 1989, health warnings due to air pollution from carbon monoxide were issued for a total of 250 days; ozone warnings were issued for 108 days, and health warnings due to particulate materials for 54 days (Leitmann, 1991).

The problem of water pollution is equally serious. The three most important rivers in Greater São Paulo, as well as their associated reservoirs, are seriously affected by urban sewage and industrial waste-water. Some 40 m³/sec of raw sewage and industrial effluent are discharged into the Tiête river, for example, which is almost completely dead. Moreover, an estimated 39,000 industries discharge effluent directly into the Tiête, with 2,180 major polluters responsible for 80 per cent of industrial waste-water emissions (Leitmann, 1991). The rivers also suffer from high levels of faecal coliform, biochemical oxygen demand (BOD), nitrogen and phosphorus; the reservoirs have significant amounts of dissolved oxygen and certain toxic substances, as well as high faecal coliform counts (Leitmann, 1991). Health hazards from this pollution not only include communicable diseases such as hepatitis, typhoid fever, dysentery and meningitis, but also include carcinogenic and mutagenic effects from toxic metals in the water-supply (Townroe and Thomas, 1982).

Although a policy response to pollution and environmental degradation was relatively slow in coming in Brazil, a number of measures have been adopted since the mid-1970s. In 1976, the federal Government issued regulations which set water quality standards, establishing permissible levels of industrial effluents. Additional regulations set minimum air quality standards for the four main pollutants: particulates, sulfur dioxide, carbon monoxide and photochemical oxides.

São Paulo's Environmental Protection Agency, CETESB, was established out of an existing agency in 1975. CETESB was given the power to require that any new industrial investment be sanctioned by two licenses: one before the investment was installed and the other before the machinery was brought into use. If an enterprise did not comply with environmental standards, it became liable for a fine and eventually for closure (Townroe and Thomas, 1982). In reality, however, the closure of a plant that fails to meet environmental standards has rarely been implemented.

Legislation passed in 1976 by the State of São Paulo defined air and water quality standards. Air pollution was tackled by the definition of 11 "air quality control areas" in the state, which corresponded to the major administrative regions. Each area was classified as saturated or not saturated for each of the main pollutants. Relocation of polluting industries out of the saturated areas was encouraged. Moreover, licenses were given to new investments in the saturated areas only if the resulting increase in pollution was very small (Townroe and Thomas, 1982). Under a 1978 law, the municipal government also set out land-use zones for industry. New plants for the production of iron, asphalt, sugar and cellulose, all of which are major polluters, were prevented from opening throughout Greater São Paulo. Subsequently, in 1985, licensing permits and environmental impact assessments (known as EIA/RIMA) were mandated at the state level for all new investments.

Enforcement of the environmental standards established in São Paulo since 1976 has been relatively successful in reducing overall levels of industrial air pollution, especially during a period of rapid industrial growth. As a result of enforcement of emission standards, provision of loans for industrial pollution control equipment, mandating the use of best available practice for the largest sources of industrial air pollution, there have been large reductions in sulphur dioxide, carbon monoxide and nitrogen oxide levels. Between 1978 and 1985, particulate emissions in the metropolitan area declined from 412 to 130 tons per day and sulfur dioxide emissions declined from 554 to 80 tons per day (Leitmann, 1991). Much of the decrease in the latter is due to CETESB's successful negotiations with PETROBRAS to limit the amount of high sulphur content fuels sold in the metropolitan region. Ironically, São Paulo's recession, which has slowed industrial activity, also has played a role in reducing sources of environmental pollution.

Whereas industrial pollution has been reduced by about 90 per cent in recent years, ambient pollution remains a serious problem. Currently, there are more than 2 million private motorized vehicles in the metropolitan area, a fleet that is growing at a rate of 5 per cent per annum. Despite the fact that about half of the cars run on less-polluting alcohol, vehicles account for 90 per cent of carbon dioxide emissions, 77 per cent of hydrocarbons, 89 per cent of nitrogen oxides, 73 per cent of sulphur dioxide, and 31 per cent of particulates (Leitmann, 1991). As of 1989, motorized vehicles produced 835,000 tons per annum of carbon monoxide and 78 tons of hydrocarbons (Derisio, 1990). CETESB maintains two monitoring systems: a manual network composed of 14 stations that measures sulphur dioxide and particulate matters, and an automatic network composed of 22 stations that measure a larger group of pollutants. A Programme for the Control of Air Pollution for Automotive Vehicles, which was initiated by CETESB and then implemented at the federal level in 1986, mandates that all automobiles manufactured after 1997 must be built according to emissions standards that are as strict as those in Japan and the United States of America, resulting in a targeted 60 per cent reduction in motor vehicle emissions by the year 2000.

In an attempt not only to reduce harmful emissions but also to move Brazil away from its dependency upon imported oil, the federal Government has undertaken steps to move the population of road vehicles from the use of gasoline and diesel fuel to the use of alcohol manufactured from sugar cane. Currently, about 45 per cent of vehicles in São Paulo run on alcohol, a proportion targeted to reach 50 per cent by 1997; the other 55 per cent run on gasoline blended with 30 per cent ethyl alcohol. In addition, in 1983, the São Paulo Municipal Secretariat of Transportation opened the first plant in Brazil to convert garbage to methane gas. The 1,000 cubic metres of gas produced daily was sufficient to power 100 buses as of 1987 (Perlman, 1990). During the subsequent administration, however, the project was discontinued.

Under the Campaign for Air Quality Improvement, four emissions-testing stations were set up in São Paulo to allow voluntary automobile emissions testing and to raise public awareness of environmental issues. The authorities also have distributed leaflets urging motorists to voluntarily refrain from using their automobiles one day a week. In addition, 15 air-quality monitors have been installed on the major access

roads, informing motorists of daily levels of air pollution. São Paulo's so-called "Alert II" project uses the digital pollution monitors with the intention of reducing congestion and improving air quality. The monitors show five standards of air quality (regular, bad, very bad, alert I and alert II), with normal readings in the winter being bad and very bad and normal readings in the summer being "regular". Radio announcements report pollution readings daily, generating public support for a number of traffic control measures such as adjusting office hours to reduce downtown traffic. During an emergency, no privately owned cars may enter the central business district. In an interesting example of South-North technical cooperation, in October 1991, as a means of generating public support for meeting standards of air quality mandated in the United States as of 1994 by the federal Government's Clean Air Act, New York City authorities signed a technical cooperation agreement with the city of São Paulo to assist in the installation of a number of pollution metres, in an experimental project modelled directly upon Alert II ("New York to install pollution metres on the streets," *New York Times*, 1991).

The media in São Paulo have played an important role in supporting various environmental initiatives. In the fall of 1988, following wide media coverage regarding the hazards of winter-time air pollution, motorists in São Paulo were encouraged by the authorities to leave their vehicles outside the central business district on a designated day; the one-day experiment was considered a great success since more than 90 per cent of São Paulo motorists complied. Another major environmental movement that has relied on popular support has been the clean-up campaign for the Tiête river, which was started by a São Paulo radio station in 1991 and now has formally begun with a US\$ 450 million loan from the Inter-American Development Bank (IDB).

E. POWER

Historically, the availability of abundant hydropower was one of the major reasons for the rapid industrial growth of São Paulo. At the beginning of the century, two huge reservoirs—the Guarapiranga and the Billings reservoirs—were constructed in the south at the end of the plateau, taking advantage of the topographical difference in height between São Paulo and the coast (Kliass, 1990). Unfortunately, providing

hydropower for São Paulo has had serious environmental impacts. In order to have enough water for the system, the flow of the Tiête and Pinheiros rivers was reversed towards the Billings reservoir, bringing pollution from the rivers into the reservoir, and accounting for much of its degraded condition (Leitmann, 1991).

Currently, electricity is supplied through Eletropaulo, a state-run company. There is a great deal of interdependence with the surrounding municipalities because the existing network permits the exchange of energy among them. São Paulo has a high level of service, even in *favelas*. Indeed, virtually all São Paulo households are connected to the electricity grid, either formally or informally.

The growth in demand in areas of São Paulo where density is already high will necessitate the construction of new substations and require large new investments. The energy consumption of Shopping East, a large new shopping complex, for example, is equivalent to that of about 100,000 residential customers, while the consumption of the Shopping West plaza is equivalent to that of about 60,000 (Rolnik, Kowarik and Somekh, 1990).

Comgas, another state-run company, traditionally has furnished coke gas to consumers in São Paulo obtained from coal. Recently, some natural gas has come from the new offshore wells in the Campos basin located south of Rio, albeit at a high transport cost. Currently, two major pipelines are under construction that will finally bring natural gas to São Paulo. The section of the first pipeline from the Santos basin offshore platforms to the coast has been completed, whereas the section running from Santos to São Paulo is nearing completion. The second pipeline will bring natural gas from Bolivia under an agreement that is still being negotiated between the two countries and multilateral agencies.

F. HEALTH AND EDUCATION

Access to health-care services in São Paulo is highly skewed, with higher income households served by modern, private clinics and poorer households relegated to crowded municipal hospitals. Almost all workers employed in the formal sector belong to an obligatory social security scheme, under which medical services are provided to participating workers by both

public and private hospitals. Nearly three quarters of the 54,000 hospital beds available in the metropolitan region in 1984 were provided by the private sector. However, most private hospitals sell their services to the National Institute of Social Security (INSS) and are thus dependent on a governmental institution (Leitmann, 1991).

Whereas the city of São Paulo has 3.4 hospital beds per 1,000 inhabitants, many of the other municipalities in Greater São Paulo are not as well served (EMPLASA, 1988). Although the average availability of hospital beds in the metropolitan area was 2.7 per 1,000 in 1985, the poorest peripheral areas had only 0.4 hospital beds per 1,000. Moreover, there were 11 municipalities in the metropolitan area (with a combined population of more than 500,000) that had no hospital beds (Leitmann, 1991).

Health conditions in low-income areas of São Paulo are very poor. A recent study of habitat and health in the city of São Paulo found that at least one member of each tenement family had some illness linked to housing problems (Jacobi, 1992). Residents of *favelas* typically complained about the lack of sidewalks, sewerage, canalization of gullies and drains for storm-water, as well as the presence of informal dumps in their neighbourhoods where insects and rats bred (Leitmann, 1991). Draughts of cold air, cold floors of make-shift houses, dampness and a lack of ventilation were the principal causes of high levels of bronchial illness, colds and pneumonia, particularly among children (Jacobi 1992). Poor sanitary conditions in low-income areas also have contributed to the high incidence of diarrhoeal diseases, dehydration, worms and skin diseases (Jacobi, 1991). Recent studies have found a strong correlation between the concentration of poverty in various areas of São Paulo, access to water-supply and sewerage, and levels of infant mortality (Rolnik, Kowarik and Somekh, 1990).

Acquired immunodeficiency syndrome (AIDS) has become an increasingly serious public health issue in São Paulo. Currently, Brazil reports about half of all the cases from Latin America and the Caribbean. The pandemic has affected mainly the south-east region of the country, and principally São Paulo State, which had about 3,000 cases in 1991—70 per cent of all reported cases—and a cumulative total of about 14,000 cases—62 per cent of Brazil's cumulative total of

22,583 cases as of 1991 (*Epidemiological Bulletin*. Pan American Health Organization, 1992). The relative weight of the modes of transmission in Brazil has been shifting from year to year. In 1985, more than 80 per cent of the cases were attributed to homosexual and bisexual behaviour; in 1990 and 1991 this category had declined to 40 per cent. The most notable increases in cases have been among intravenous drug-users, from 1.8 per cent of the cases reported in 1985 to 30.5 per cent in 1990 and 1991. In addition, the proportion of cases attributable to heterosexual contact rose to 22 per cent in 1991 (Pan American Health Organization, 1992). In response, the authorities in São Paulo have mounted a public education campaign, distributing a newsletter containing AIDS-awareness messages from various entertainers and celebrities.

São Paulo has experienced a significant decline in fertility in recent years, partly as a result of increased contraceptive usage. There are major differentials in contraceptive usage, according to income group. Less than half of women with household incomes under one minimum wage use any method of contraception. Usage increases steadily with income, with nearly 70 per cent of women in households with more than five minimum wages using contraception (Barroso, 1986). Higher income groups tend also to use more effective contraceptive methods. Only 6 per cent of women in the lowest income group use the pill, compared to 22 per cent in the higher income group. Similarly, only 5 per cent of women in the lowest income group have been sterilized, compared to 22 per cent of women in the higher income group (Barroso, 1986).

Greater São Paulo has some 40,000 teachers, who work long hours (40-50 hours per week) for low wages. Schools in low-income areas are badly equipped. As in the case of access to sanitary infrastructure, areas of the city with 50 per cent or more of the population living below the poverty line have comparatively low levels of school attendance, with 60-80 per cent of children aged 7-14 attending school, compared to about 100 per cent in the more affluent areas (Rolnik, Kowarik and Somekh, 1990).

São Paulo is one of Brazil's major centres of higher education. The University of São Paulo, which has a number of highly renowned research centres, has some 50,000 students.

G. TRANSPORT

The transport sector in São Paulo is currently in a state of crisis, with declining quality of service, scarce resources, a high level of subsidies, a lack of coordinated planning, and the presence of numerous transportation agencies with overlapping functions. There has been rapid growth in the number of private vehicles, causing severe traffic congestion. The public bus system is poorly maintained, slow, crowded and a major source of air pollution. The São Paulo Metro, although well-planned and well-maintained, still accounts for only about 5 per cent of total person trips in the metropolitan region and is unlikely to increase its share in the near future.

Whereas there has been little modernization of the transport sector in São Paulo over the past few decades, there have been major changes in patterns of transport demand, reflecting a number of underlying economic and social changes taking place. To begin with, despite the country's economic crisis, there has been continuing growth in the number of private vehicles—spurred in part by large-scale public investments in expressways, elevated freeways and parking lots over the past several decades. The share of private transport increased from 32 per cent in 1967 to 45 per cent in 1987 (Rolnik, Kowarik and Somekh, 1990). Meanwhile, the number of private automobiles increased from 493,000 to 1,986,000. As a result, with nearly 2 million private automobiles, 38,000 taxis and 12,000 buses, most of São Paulo's main traffic corridors are close to total saturation for long periods of the day. Another important, insufficiently studied problem is that, owing to the enormous distances, people often spend more than three hours a day commuting to work (Dowbor, 1993).

As the number of private vehicles in São Paulo has increased, the share of public transport has declined—from 68 per cent in 1967 to 61 per cent in 1977 and to 55 per cent in 1987, primarily owing to a loss in bus ridership (Rolnik, Kowarik and Somekh, 1990). Indeed, between 1977 and 1987, there was an absolute loss in the number of bus passengers—from 8.6 million to about 8.1 million passengers daily.

São Paulo residents generally have been commuting less. More than 65 per cent of all trips are currently between macro-zones rather than to the city centre.

Moreover, there has been only a small change in the median trip length over the past decade, despite the fact that the size of the urbanized area has continued to increase. São Paulo's most recent origin-destination survey (1987) found that the number of motorized trips per capita declined from 1.5 in 1977 to 1.1 in 1987—a level of mobility close to that of 20 years earlier (1.0 per capita in 1967).

Another interesting development is the fact that São Paulo residents have been walking more rather than taking public transport to their destinations. Whereas the share of walking trips to total trips increased from 25 to 36 per cent between 1977 and 1987, the number of daily trips by foot more than doubled (Rolnik, Kowarik and Somekh, 1990). This is partly explained not only by the growing inability of the poor to pay rising public transport costs but also by the fact that many of the poor now live in densely populated central areas. However, it also reflects the growing decentralization of the tertiary sector. Households increasingly are able to satisfy their consumer needs closer to home rather than having to travel to the city centre.

Briefly examining the history of transport planning in São Paulo, for the past three quarters of a century there has been an ongoing debate concerning the relative priority to be assigned to rail versus motorized transport. The proposal for a Metro was first put forth in 1927 by the São Paulo Tramway Light and Power Company, although the idea did not gain wide support until the late 1960s. Instead, the first city plan, the *Plano de Avenidas* (1930), which envisioned a city that would be built around the automobile, essentially set the course for the next several decades. After 1940, rail and tram services deteriorated owing to increased competition from public buses and private automobiles. The greater flexibility of motorized vehicles not only increased their comparative advantage over fixed-route transportation modes, but also enabled private land developers to open up vast new areas around São Paulo. The process of suburbanization was further fuelled by the growth in the domestic production of motor vehicles beginning in the mid-1950s (Barat, 1989).

During the late 1960s, the issue of roads versus rails was once again debated. The 1968 *Plano Urbanístico Básico/PUB* proposed constructing a metro of some 650 kilometres in length. During the same period, the DERMU project proposed a vast system of express-

ways. Although neither plan was implemented in its entirety, the embryo of both projects was in fact implemented: a Metro, with a reduced network of only 45 kilometres, and a limited number of expressways, e.g., the highways along the Tiête and Pinheiros rivers and the *Avenida 23 de maio*.

During the 1960s, a decade in which São Paulo's population grew by more than 2 million inhabitants, planners increasingly lobbied for a rapid transit system. A number of background studies were conducted in the late 1960s and construction finally began on the São Paulo Metro, the third such system in Latin America. The first sections of the Metro opened in 1974. Operating under the aegis of the state government, the Metro is responsible for transporting some 1.2 million passengers daily. Currently, there are three lines in operation. The newest line, the Paulista line, is the first that does not have radial characteristics, as it links the west and east without passing through the city centre.

Although the São Paulo Metro is a small network that mainly serves short distances, with stations distributed at average distances of less than 1 kilometre apart, it is one of the world's most crowded, carrying 17.6 million passengers per annum per kilometre of line. The east-west line has one of the world's highest figures for the number of passengers carried, reaching 65,000 passengers per hour in one direction at peak periods (Companhia do Metropolitano de São Paulo, 1989).

At 1983 prices, the total cost of the system was \$2,338 million. Construction has been taking place at the rate of about 2 kilometres per annum—at a cost of \$96 million per kilometre. Current plans call for the expansion of the system to 95 kilometres and 80 stations. Although new lines and a number of new stations are under construction, further large-scale expansion has been postponed because of the difficulty of arranging financing. However, even with a tripling of passengers over the next 20 years, the Metro will still have a low share of total ridership (Popoutchi, 1990).

The rail network in São Paulo consists of two main networks: the old Santos-Jundiaí line and the Brazil Central, with 168 kilometres, now operated by CBTU, and the Fepasa network to the west, with 60 kilo-

metres (Popoutchi, 1990). Trains currently transport about 1 million passengers daily. A major problem is the fact that, as in the case of the first two Metro lines, the rail network has a pronounced radial configuration. This does not coincide with current patterns of transport demand, which are characterized by increasing numbers of trips within macro zones rather than from the periphery to the centre.

Since the 1950s, São Paulo also has had a system of trolleys that currently transport about 300,000 passengers daily. Following the 1970s energy crisis, an electrically-operated medium-capacity trolley system seemed to be an ideal solution to the city's transport problems, and the trolley's lines were expanded. Subsequently, however, the Government's decision to raise electricity rates and to impose the highest rates during peak commuting periods adversely affected the trolley system, making it non-competitive with diesel-operated buses.

Buses continue to be the major transportation mode for São Paulo's lower income households, transporting about 2 million passengers daily. Bus routes cover the entire metropolitan area, reaching even non-paved streets. Because of lack of revenue and a poor record of maintenance, the quality of the public bus service has been declining. Overcrowding is a very serious problem. Owing to lack of investment, there are the same number of buses today as there were 10 years ago, although congestion has been increasing by about 20 per cent per annum. Whereas most buses carry a maximum of 36 passengers seated and 40 standing, during rush hour buses may carry 90-120 passengers, sometimes causing trampling or fights (Leitmann, 1991).

Buses in São Paulo are operated both by the municipal transport company (CMTC) and by some 50 public companies, which are overseen by the municipality. CMTC is currently in a grave financial situation, partly as a result of the fact that the private companies have traditionally monopolized the more profitable routes.

In an effort to maintain better control of the private operators, the metropolitan area was divided into 23 bus operation zones in 1978 (Barat, 1989). Beginning in 1980, a metro-bus integration system was introduced, involving the re-definition of bus routes to

feed selected metro stations, the creation of integrated fares, the introduction of bus lanes along selected urban corridors, and bus priority traffic lights. The north-south Metro line is currently linked to 146 bus lines, whereas the east-west line is linked to 106 bus lines and two commuter railway lines.

One of the major problems in the transport sector has been the fragmentation of institutions. The local bus system is mainly municipal, with limited participation by the metropolitan area. Inter-municipal bus lines are administered by the state through the Ministry of Housing and Urban Development and *Empresa Metropolitana de Transportes Urbanos* (EMTU), which also operates the trolley network. Suburban trains are operated both by the state (Fepasa) and the federal Government (CBTU). The metro is under the aegis of the state-run *Companhia do Metropolitano de São Paulo*. There currently is no effective coordination among these agencies. Each obtains its own resources and formulates its own plans for expansion and modernization, with no consultation with other agencies regarding the allocation of investment, and with no identification of priorities at the metropolitan level. Even their respective routes have historically been determined by the specific policy and interests of each agency (Popoutchi, 1990).

Regarding the financing of the transport sector, there traditionally has been a high level of subsidies (which, in the case of city buses, represents a transfer of resources from the public to the private sector). The level of the subsidy varies. CBTU recovers less than 11 per cent of its operating costs, Fepasa recovers 30-40 per cent, whereas the Metro, with a more aggressive fare policy, recovers about 70-80 per cent of its operating costs (Popoutchi, 1990).

Currently, planners in São Paulo are exploring new ways of capturing resources through non-conventional means. A first initiative by the Metro is a station

being built by a private commercial group in conjunction with a new shopping centre. A similar project involves a large subterranean mall linked to several new Metro stations.

Historically, São Paulo's road network was one of the major determinants of its expansion. Unfortunately, beginning in the 1950s, public policy followed the concept of channelling the watercourses and building avenues in the river beds, resulting in more roads for individual transit—but at the expense of making much of the flood plain impermeable and degrading the environment. Currently, a process of rapid, disorderly urbanization is taking place along the major intermunicipal axes. (This strip development is punctuated at various intervals by a typical configuration consisting of a bakery, a building-materials supply store and other basic stores clustered around a bus terminal.)

There are a number of major problems with the road network. The agglomeration is divided into sections that are poorly connected. There are virtually no major north-south links and poor connections between the north and east. The worst situation is in the west, where the road network has a fishbone configuration, with the principal axis linked to the centre by numerous small roads that cannot handle the volume of traffic. The absence of links is not only between corridors but also between residential areas and employment centres (e.g., ABC, Guarulhos).

There also is competing usage on the major highways between the various modalities, e.g., collective transport, cargo and general traffic. Moreover, many of the major corridors are deteriorating. In 1987, when it was opened, the *9 de julho* corridor had a traffic speed of 25 kilometres per hour. Currently, because of numerous potholes and lack of pedestrian crossings, its speed is only about 14 kilometres per hour.

V. RESOURCES AND MANAGEMENT

A. PUBLIC INVESTMENT

During 1988-1990, the state of São Paulo invested 1.5 billion cruzados (\$Cz) annually in Greater São Paulo for various public works and another \$Cz 3 billion in the areas of education, health and public security (Cintra, 1990). The 38 municipalities invested another \$Cz 1.5 billion annually (about half of which came from transfers of the share of the goods circulation tax (ICM) from the state government). This brought total public investment to about \$Cz 6 billion per annum (Cintra, 1990).

At the municipal level, various public works activities conducted under the aegis of the state Secretariats of Regional Administration, Highways, and Services and Works, accounted for 32 per cent of total municipal expenditure as of 1990. Specific activities included: construction and repair of expressways, avenues, roads, parks and green spaces; drainage works, including the channelling of rivers and construction and repair of bridges, storm drains and retaining walls; street lighting; and sanitation, including street cleaning and collection and disposal of domestic, industrial and hospital waste (Rolnik, Kowarik and Somekh, 1990).

The activities of the Secretariats of Education, Welfare, Culture and Sports accounted for another 21 per cent of municipal expenditure. Specific activities included the extensive network of primary schools, an adult education programme, nurseries, day-care centres, youth centres, children's libraries, cultural centres, and municipal sport centres and pools. Activities under the aegis of the Secretariat of Health, including operation and maintenance of hospitals, health centres and emergency medical facilities, and prevention and control of AIDS, accounted for 11 per cent of total expenditure. Transport-related programmes accounted for another 14 per cent of municipal expenditure as of 1990. Specific expenditure included subsidies to CMTC buses (to bridge the gap between revenues received and operating costs), maintenance of traffic signals, public parking lots, and the cost of the city's transit police.

The above expenditure was mainly for ongoing maintenance and operations, rather than for new

investment. Investment funds have come mainly from borrowing, which has become more difficult in recent years because of tightened credit markets during the economic crisis.

B. RESOURCE GENERATION

Given the likely increasing demand for public services during the 1990s, one of the greatest challenges facing Brazil's cities will be mobilizing sufficient financial resources. There have been a number of changes in municipal finance in recent years. The tributary reform put in motion by the Constitution of 1988 not only gave the municipalities more fiscal autonomy but also increased some federal transfers (e.g., the share of the goods circulation tax allocated to the municipalities increased from 20 per cent to 25 per cent). At the same time, however, responsibility for a number of municipal services has been transferred to the municipalities, so, in the end, the municipalities may not be better off (interview with Paul Singer, Prefeitura de São Paulo, 1991).

Revenue growth in São Paulo has not kept pace with population growth. Between 1980 and 1988, the revenue of the municipalities in Greater São Paulo decreased by over 10 per cent while the population increased by almost 5 million inhabitants (Leitmann, 1991). In the city of São Paulo, per capita revenue declined from a base of 100 in 1980 to 51 in 1988. During this period, revenues from the metropolitan area's principal source of funds, the goods circulation tax, dropped by 22 per cent, whereas municipal debt grew by 63 per cent. There was also a net outflow of taxes to the state and federal levels. From 1980 to 1988, only 8 per cent of federal taxes paid in São Paulo city were returned to it and less than 1 per cent of state taxes were returned to the city (Leitmann, 1991). With the new federal structure, attempts are being made to create a more equitable distribution of tax revenues.

The main tax revenues under the authority of local governments in Brazil have been the property tax on land and buildings (IPTU) and the local tax on services (ISS). For the past two decades, these local revenues have been declining relative to the role of transfers from the state and federal governments. Between 1978

and 1990, for example, there was a decline of 45 per cent in real terms in locally generated revenues, whereas there was an increase of 17 per cent in real terms in the amount of transfers (Rolnik, Kowarik and Somekh, 1990).

Currently, the tax on services represents the largest source of non-transfer revenues for local governments, accounting for more than 20 per cent of the city of São Paulo's total revenues as of 1987. ISS has grown over the past decade, keeping pace with inflation. Indeed, using 1978 as the base year, the index of ISS revenues rose to 109 in 1989, whereas the index of revenues from the property tax plunged to 13 (Rolnik, Kowarik and Somekh, 1990). Whereas local governments enjoy total autonomy in so far as imposing ISS tax rates, the list of dutiable services remains restrictive (Silveira, 1989b). Unlike the property tax, which is a direct tax, ISS has benefited greatly from being an indirect tax (and therefore politically expedient). Also, the relatively high buoyancy of ISS is largely due to the rapid growth in the output of services (Silveira, 1989b).

Property taxes are low in São Paulo, as they are not based on market value but rather on the technical value of the building and land (quality, size, location etc.) (Leitmann, 1991). Property taxes accounted for 6.5 per cent of total revenues in São Paulo municipality as of 1987; the contribution of the property tax was generally lower in the smaller municipalities. A major problem with the property tax is that property values change rapidly in Brazil, partly owing to real increases in property values but primarily to high rates of inflation. In an inflationary environment, valuations are obsolete soon after they are made, and it is necessary to make major annual increases in assessments, merely to sustain property tax revenues in real terms.

In contrast to the British approach of holding valuations constant and annually raising tax rates, Brazil's municipalities generally hold rates constant and enact annual across-the-board increases in valuations. Municipalities are permitted to make annual increases in valuations at a uniform percentage rate without physical inspection of individual properties. In practice, however, annual adjustments tend to lag behind actual inflation levels, resulting in a gradual decline in assessments in real terms (Silveira, 1989b).

The transfer of part of the goods circulation tax, which is in reality a traditional value-added tax that is charged whenever most merchandise is sold, is the major single source of revenue in São Paulo, accounting for about 30 per cent of total municipal revenue throughout the 1980s. Recently, its share has increased slightly—to 36 per cent as of 1989—partly because of the increase in the amount given to the municipalities. Taken together, ISS, IPTU and the share of ICM accounted for 55 per cent of total tax receipts in São Paulo as of 1989. The next most important sources of revenue were the tax on real estate property transfers, which accounted for 1.8 per cent, and the tax on the sale of oil and gas, which accounted for 1.5 per cent. The remainder of the revenues were divided among a total of 46 taxes.

In spite of the size of São Paulo and the scale of its problems, there is no decentralized international cooperation structure that would enable the city to have access to international funding; greatly needed resources for flood protection measures, for example, were negotiated in recent years with the Inter-American Development Bank, only to be blocked because the central government was late covering local expenditures on other projects (Dowbor, 1993).

C. INSTITUTIONAL CONTEXT

Local governments in Brazil—termed municipalities—are one of the three levels (federal, state and municipal) of government in the country's federal structure. By the standards of many developing countries, Brazil's municipalities enjoy a high degree of autonomy. All have a mayor-council form of government, and both mayor and council are locally elected.

The functional responsibilities of municipalities in Brazil are not well-defined. The large municipalities such as São Paulo lost the role they once played in providing water, sewerage and, in some cases, electricity, when state-level utilities took over these functions during the 1960s. Responsibility for primary education is shared with state governments through a variety of complex arrangements, which have produced parallel systems in some municipalities and fluctuating

cost-sharing agreements in others (Dillinger, 1989). Public health is similarly a joint responsibility. Only the collection of solid waste and the construction and maintenance of local roads and related drainage works and street lighting are unambiguously municipal.

The absence of intergovernmental coordination is particularly acute in regard to environmental management. With respect to sanitation, there are several municipalities in the metropolitan area where sewage collection is a municipal responsibility, whereas sewage treatment is the domain of the state government; in these cases, the municipalities' sewage goes untreated, as it is not connected to the state system (Leitmann, 1991). Similarly, whereas solid waste collection and disposal are the responsibility of the municipalities, a number of municipalities (e.g., those located inside protected watershed areas) have no available land for waste disposal. Although there have been attempts to work out solutions, this has been constrained by the fact that many municipal governments have continued to maintain a position of "not in my backyard" (Leitmann, 1991).

With regard to planning institutions, although its planning functions have been limited and annual inflation rates of as high as 1,000 per cent have caused many of its budgets to become political fiction, the Municipal Planning Secretariat (SEMPLA, formerly COGEP) has made a positive contribution. Over the years, it has systematically gathered relevant data about São Paulo and produced a number of interesting studies. As one expert notes, "[although] administrative discontinuity frequently interrupted the process and even caused some important studies to be lost...the second rank officers and professionals were maintained and with them a remarkable body of knowledge about the city is being preserved" (Bolaffi, 1989).

One of the most significant institutional landmarks in São Paulo was the establishment in 1967 of a Greater São Paulo Executive Group (GEGRAN) to coordinate the three levels of governance. Made up of representatives from the State Secretariats of transport, public works and others, GEGRAN represented a first step towards conceiving the São Paulo metropolitan area as a legal territorial area. However, whereas the city of São Paulo was represented, the other municipalities had no representation on the council.

In 1973, the federal Government enacted a national urban development law establishing basic guidelines for the creation of nine metropolitan regions. In 1975, following federal guidelines, the State of São Paulo created a metropolitan planning and administrative system composed of a Secretariat of Metropolitan Affairs, a Planning and Coordinating Unit (EMPLASA), a Metropolitan Financial Fund (FUMEFI) (whose role in municipal finance was and continues to be insignificant), and two councils, one with decision-making powers and the other a consultative board. The deliberative body (CODEGRAN) had membership made up of the Governor of São Paulo and five additional members nominated by the Governor, with one representing the city of São Paulo and another representing the remaining 38 municipalities. The consultative council (CONSULTI), whose role, as its name suggests, was merely to make suggestions and to give opinions, was composed of a representative from each of the municipalities.

EMPLASA's fortunes have changed many times over the years. Originally part of GEGRAN in the 1960s, during the 1970s and 1980s EMPLASA served as the state secretariat in charge of planning for metropolitan São Paulo. In this capacity, EMPLASA was the only state body linked to a single region; all the others were sectoral. In 1987, EMPLASA was subsumed under the State Secretariat of Housing and Urban Development. This institution gradually became a building secretariat, however, and planning was assigned a secondary role (indeed, EMPLASA was nearly closed twice during this period). Currently linked to the new State Secretariat for Planning and Management, EMPLASA has in a way come back to its origins. It has been strengthened (Jorge Wilhelm, one of Brazil's best-known urban planners, is now its head) and, theoretically, state corporations and secretariats now have to coordinate their targets with those of Planning and Management.

This would mark a major breakthrough for, until the present time, coordinated planning in São Paulo simply has not existed. There has been no system, for example, linking national plans with regional or local plans. Indeed, planning has been largely a vertical process. The National Housing Bank, for example, would construct 1,000 houses in Greater São Paulo without any consultation with or participation of the metropoli-

tan administration. The one effort at undertaking more integrated planning was the establishment of EMTU (Empresa Metropolitana de Transportes Urbanos), and this was abolished less than two years after it was established.

The 39 municipalities that constitute Greater São Paulo have achieved representation mainly through

their various secretariats of works, transport, education, health and so forth. Although a number of the large state-run companies—e.g., the Metro, PEPASA, SABESP, CETESB, Eletropaulo, Cômegas, CDHU—have competent planning offices, there has been no coordination of their activities. Indeed, a majority of institutions, whether municipal, state or federal, secretariats or state-run companies, have planned in their individual capacities, or at best sectorally.

CONCLUSION

São Paulo is one of the world's most spectacular examples of rapid urban population growth. From its founding in 1554 to 1872, the city grew very slowly—from about 100 to 31,400 inhabitants. As EMLASA (1982) has noted, the city's annual population increment over its first three centuries was equivalent to São Paulo's growth in about two hours by the early 1980s. Thereafter, spurred by large-scale immigration in the last quarter of the nineteenth century, São Paulo experienced increasingly rapid population growth.

By the 1950s, São Paulo was one of the world's most rapidly growing metropolitan areas, a phenomenon reflected in contemporary popular slogans such as "São Paulo cannot stop" (Rolnik, Kowarik and Somekh, 1990). With the end of the Brazilian "economic miracle", however, the city's spectacular economic performance began to fade, ushering in a period of slower growth, de-industrialization and decentralization of economic activities to outer areas of the metropolitan region and beyond. Economists at ECLAC have referred to the 1980s in São Paulo as the "lost decade", in which poverty was accentuated, with average real wages declining from US\$ 570 in the late 1970s to US\$ 290 by the late 1980s.

The changes in São Paulo's economic fortunes have been reflected in a number of far-reaching demographic changes. São Paulo is no longer a mecca for migrants from the interior of the state and from other regions of Brazil. Many areas of the city of São Paulo have been experiencing negative growth. Moreover, the growth of nearly all of the peripheral municipalities in Greater São Paulo has slowed progressively over the past three decades. Along with the decline in in-migration, there has been a continuing decline in fertility to the point that there has been a decline in the absolute number of births. Whereas the average annual rate of population growth in the city was about 5 per cent during 1960-1970, and 4.7 per cent during 1970-1980, it declined to 1.0 per cent during 1980-1991. Over the same three decades, the growth of Greater São Paulo declined from 5.4 per cent to 4.5 per cent and then to 1.7 per cent (Taschner, 1993). As a result of the decline in natural increase and the slowdown in the migration of young adults, the population has been steadily ageing—as is occur-

ring in many other Latin American cities. Currently, for example, about 7 per cent of São Paulo's population (7.4 per cent in the city and 6.7 per cent in Greater São Paulo, or about 800,000 persons) are over age 60, and will require a broad new range of services.

In addition to its impacts on population growth, Brazil's economic crisis has had profound effects on patterns of population distribution. During the 1970s, São Paulo's peripheral areas grew very rapidly—by about 13 per cent per annum. Subsequently, because of such factors as the rising prices of land and the slowdown in auto-construction, the peripheral areas grew much more slowly—by less than 4 per cent per annum. At the same time, whereas the central areas of São Paulo city had been growing very slowly, there have been changes in the composition of their population in recent years. These changes reflect a breakdown of economic segregation as a result of growing poverty, and not of rising prosperity. As many middle-class residents have experienced a decline in their standard of living and have moved to the less expensive periphery, many of the poor on the periphery have moved back into the centre to live in *cortiços*, whereas many of the poorest families have become homeless. These shifts are vividly reflected in recent patterns of infant mortality, which is currently as high in many central areas as on the traditionally poorer periphery.

Regarding land use, aside from early attempts by the authorities to protect the river basins, land use in São Paulo has been quite chaotic, with very rapid growth spreading continuously into areas where the soil is unsuitable and highly prone to serious erosion. Whereas tightened up land-use laws (e.g., those aimed at illegal subdivisions) have had some effect on slowing peripheral growth, the Government is now trying to guide development to designated areas, largely by means of land-use controls.

Public housing in São Paulo has been a massive failure. Whereas the city's more affluent households have been served by private developers, public housing has reached only a small proportion of lower income households. The city has been built up mainly over the years by auto construction, with lower income residents opening up illegal subdivisions or construct-

ing *favelas* on vacant, often environmentally fragile land. Over the years, most of these *favelas*—which largely house long-term residents and tend to be constructed of durable building materials—have become permanent and have been extended essential services (e.g., water, electricity hook-ups). After years of oscillating policy responses to the *favela* problem, the Government now recognizes that they can do little else but upgrade the *favelas*, incorporating them into the "legal" city by means of cross subsidies.

São Paulo is served by a vast network of river basins and man-made reservoirs. Currently, an impressive 95 per cent of the population of the city of São Paulo and 91.5 per cent of the population of Greater São Paulo have piped inside water. Sanitation, however, is one of the major challenges facing planners, with less than a quarter of the metropolitan area's sewage currently being fully processed.

Whereas collection of solid waste is more or less adequate, disposal remains a serious problem. The city is served by three sanitary landfills, three incineration plants, two composting plants, and a recycling centre. The entire system is currently saturated. Whereas one sanitary landfill has an estimated life-span of less than one year, the other has a life-span of less than four. Many of São Paulo's dumping sites are badly situated. Leachates from one dumping site have contaminated the main tributaries leading to a major reservoir. Because of growing environmental awareness, a number of municipalities have passed ordinances not only forbidding landfills from being constructed, but also have prohibited compactor vehicles from passing through their territory.

Regarding air pollution, air quality in São Paulo is degraded by the presence of excessive levels of carbon monoxide, ozone and particulates. Increases in air pollution levels have been associated with increases in morbidity and mortality, and with an increased incidence of respiratory and cardiovascular diseases. Whereas industrial pollution has been reduced by about 90 per cent in recent years, ambient pollution remains a serious problem. Currently, there are more than 2 million private motorized vehicles in the metropolitan area, a fleet that is growing at a rate of 5 per cent per annum. Despite the fact that about half of the cars run on less-polluting alcohol, as of 1989 motorized vehicles produced more than 800,000 tons of carbon monoxide.

The whole issue of what planners in São Paulo have termed "environmental chaos", involving landslides, erosion, siltage, degradation of the watersheds, flooding, and air pollution, is of, course, closely interlinked with the city's economic and social problems. The poor, for example, settle on slopes, leading to deforestation and landslides, or along the rivers, causing sediment and flooding.

As São Paulo's planners have noted, this is not because of lack of planning. For many years, there has been no lack of plans and ordinances for occupation of lots and construction of buildings in São Paulo. However, the real city has little to do with these plans and ordinances, which are based on the one third of lots and buildings in the "legal city." Planners have emphasized that a master plan that does not deal with the reality of the other two thirds—the Paulistas who live in the "illegal city"—is merely a paper plan that is destined to be a failure.

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