Urban Growth Management for Mobility:
The Case of the Santiago, Chile Metropolitan Region

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Abstract

In an attempt to clarify the challenges to and potentials for urban growth management in a developing country context, this paper looks at the case of the Santiago de Chile metropolitan area. The paper begins with an overview of the national political and administrative structure in Chile – the institutional context within which growth management must function. The paper continues with a presentation of the Santiago metropolitan area, overviewing demographics, the economy, the transportation system, urban growth patterns, and the environment. Then, the range of current instruments used for growth management in Chile and Santiago are presented, along with other relevant influences such as the public finance system. The following section reviews the real estate market, focusing on the emergence of large developers and their associated "megaprojects," which play a major role in shaping the city's growth patterns and trends. Finally, the paper concludes with major findings, recommendations for improvements to the current growth management system, and areas for future work.

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Acronyms

AAGR	average annual growth rate
AUPD	Areas of Priority Urban Development (*Areas Urbanizables de Desarrollo Prioritario*)
CBD	central business district
CO	carbon monoxide
COMPIIT	Transportation Infrastructure Planning Commission (*Comisión de Planificación de Inversiones en Infraestructura de Transporte*)
CONAMA	National Environment Commission (*Comisión Nacional del Medio Ambiente*)
COREMA	Regional Environmental Commission (Comisión Regional del Medio Ambiente)
CORFO	Corporation to Promote Production (*Corporación de Fomento de la Producción*)
CRIOT	Regional Committees for Infrastructure and Land Planning (*Comités Regionales de Infraestructura y Ordenamiento Territorial*)
CROT	Regional Committees for Land Planning (*Comités Regionales de Ordenamiento Territorial*)
CTU	Urban Transport Comission (*Comisión de Transporte Urbano*)
DFL	Decree with Strength of Law (*Decreto con Fuerza de Ley*)
DL	Legal Decree (*Decreto Ley*)
EFE	State Railway Company (*Empresa Ferrocarriles del Estado*)
EFV	Roadway Feasibility Study (*Estudio de Factibilidad Vial*)
EIA	Environmental Impact Study (*Estudio de Impacto Ambiental*)
EI/ST	Urban Transport System Impact Studies (*Estudios de Impacto en el Sistema de Transporte Urbano*)
EIU	Urban Impact Study (*Estudio de Impacto Urbano*)
FCM	Municipal Common Fund (*Fondo Común Municipal*)
FNDR	National Fund for Regional Development (*Fondo Nacional de Desarrollo Regional*)
GoRe	Regional Government (*Gobierno Regional*)
ISAR	regionally assigned sectoral investments (*inversión sectorial de asignación regional*)
IRAL	locally assigned sectoral investments (*inversión sectorial de asignación regional*)
MINSALUD	Ministry of Health (*Ministerio de Salud*)
MINVU	Ministry of Housing and Urban Development (Ministerio de Vivienda y Urbanismo)
MINTRATEL	Ministry of Transportation and Telecommunications (Ministerio de Transportes y Telecomunicaciones)
MOP	Ministry of Public Works (Ministerio de Obras Públicas)
MIDEPLAN	Ministry of Planning and Cooperation (*Ministerio de Planificación y Cooperación*)
NOx	nitrogen oxides
O_3	ozone
OTAS	Environmentally Sustainable Territorial Planning (*Proyecto de Ordenamiento Territorial Ambientalmente Sustentable*)
PM_{10}	respirable particulates
PPDA	RM's Air Pollution Prevention and Control Plan (*Plan de Prevención y Descontaminación Atmosférica de la Región Metropolitana*)
PRC	Comuna Regulatory Plan (*Plan Regulador Comunal*)

PRDT	Regional Plans for Territorial Development (*Planes Regionales de Desarrollo Territorial*)
PRDU	Regional Urban Development Plan (*Plan Regional de Desarrollo Urbano*)
PRI	Intercomunal Regulatory Plan (*Plan Regulador Intercomunal*)
PRM	Metropolitan Regulatory Plan (*Plan Regulador Metropolitano*)
PRMS	Santiago's PRM
RM	Metropolitan Region (*Region Metropolitana*)
SECTRA	Executive Secretary of the Transportation Infrastructure Planning Commission (COMPIIT)
SECTU	Technical Secretariat of CTU
SEIA	Environmental Impact Evaluation System (*Sistema de Evaluación de Impacto Ambiental*)
SEREMI	Regional Secretary of a Ministry (*Secretaria Regional Ministerial*)
SERPLAC	Regional Secretary for Planning and Coordination (*Secretaria Regional de Planificación y Cooperación*)
SESMA	Metropolitan Health and Environment Services (*Servicios de Salud Metropolitano del Ambiente*)
TIF	tax increment financing
TSP	total suspended particulates
UGB	urban growth boundary
UOCT	Traffic Control Operating Unit (*Unidad Operativa del Control de Tránsito*)
VAT	value added tax (*impuesto de valor agregado* or *IVA*)
VOCs	volatile organic compounds
ZDUC	Zones for Conditional Urban Development (*Zonas Urbanizables con Desarrollo Condicionado*)
ZIEDC	Exclusive Industrial Zones for Conditional Development (*Zonas Industriales Exclusivas con Desarrollo Condicionado*)

1. Introduction

In industrialized countries, particularly those like the United States that have undergone massive urban transformation and suburbanization during the past half Century, efforts to effectively "manage" urban growth have increased along with the increasing complexity of the urban growth challenge. Once, zoning regulations were the principal tool deployed to ensure that land development met public goals. Along with continued urban growth, however, came an increase in its adverse consequences – loss of open space and agricultural land, inefficient provision of public infrastructure and services, deteriorating environmental quality, etc. As these impacts increased, so too has the public's concern about them, bringing demands for a broader range of instruments to manage urban growth. Today, the term urban growth management encapsulates the number of tools that can influence, regulate, guide, or control urban development.

In the developing world, urban growth challenges are often compounded by urban areas' relative speed of change. Rapid growth in income, urban population, technological change, motorization rates, and urban expansion complicate efforts to manage urban growth. Additional challenges arise due to the fact that developing countries often have relatively young institutional and legal structures (linked to decentralization), face more pressing needs related to relatively large numbers of people living in poverty, and typically have fewer available resources (both financial and human capital) to dedicate to a greater number of problems. While these challenges and constraints can hamper urban growth management initiatives, they also offer some room for potential innovation. For example, an ongoing process of institutional change provides the chance to "institutionalize" growth management, while a lack of financial resources can spur interesting potential public-private partnerships or accelerate the deployment of instruments such as impact fees.

In an attempt to clarify the challenges to and potentials for growth management in a developing country context, this paper looks at the case of the Santiago de Chile, metropolitan area. Chile is a middle income developing country which has enjoyed relatively strong economic growth for the past fifteen years. Santiago, Chile's capital, concentrates a large share of the nation's population and economic activity and has undergone continuous urban expansion. The city has a suite of growth management policies and instruments in place – both regulatory and financial – with a number of innovative tools recently coming to the fore in response to new urban growth challenges. Today, the major factors influencing urban growth include:

- a strong and growing private real estate development sector initiating "megaprojects" at an unprecedented scale,
- an evolving political and governmental structure characteristic of decentralization,
- changing consumer demands for housing and transportation services,
- entrenched spatial socioeconomic segregation,
- a continuing need to provide low income housing for a large poor population, and
- increasing concerns about quality of life, particularly environmental degradation and traffic congestion.

In its examination of growth management potentials in Santiago, this paper looks specifically at using growth management as a way to improve transportation system performance and the overall mobility/accessibility system. In reality, growth management has many important justifications, such as environmental preservation and/or social equity and our analysis inevitably touches on these issues as well. Nonetheless, without discounting the importance of other growth management goals, we focus primarily on transportation system effects; hopefully, focusing on this urban "subsystem" will provide useful lessons for the larger urban system.[1] Our emphasis on the transportation system must also be viewed within the broader range of factors that influence transportation. While urban growth certainly affects mobility patterns, other forces such as income growth, motorization, changing trip behavior, and changing demographics (such as women in the work force) likely play an even more important role. Finally, in our assessment of growth management potentials for Santiago, we have looked primarily at incremental improvements to the existing system – assessing the promise and shortfalls of existing tools and institutional structures – rather then proposing a slew of new potential instruments.

The remainder of this paper is divided into five sections after this introduction. The following section presents the Santiago case within the broader political and institutional realities of the country. We then explore the Santiago metropolitan area in detail, looking at its major demographic, economic, land use and transport trends. The fourth section outlines the major government factors influencing urban growth, including public finance, land use plans and related instruments at various levels of government, and specific fiscal interventions such as housing subsidies and impact fees. The fifth section, in recognition of the large and increasingly important role of real estate developers and the emergence of the real estate "megaproject" phenomenon, introduces general trends in real estate development and highlights some recent specific projects of note. Finally, the last section concludes the paper with a summary of recommendations, findings, and areas for further work.

2. Chile – The Broader Context

To understand the potentials for and barriers to regional growth management for mobility improvement, the Metropolitan Region of Santiago must first be contextualized within the larger political system, relevant public institutions, and national level policies. This section provides a brief overview of government structures at the national, regional and municipal level, and also summarizes the evolution of national urban policy and transportation policy.

2.1 A Brief Political & Institutional Background

Chile is a country of nearly 15 million inhabitants. The country has two principal levels of democratic institutions: at the *national* level, the Executive (President), Legislative (bi-camaral), and Judicial branches; and at the *municipal* (Municipality) level, the Executive (Mayor) and Legislative (Council) Branches. An additional government layer exists at the regional level, as the country is divided into 13 Regions, each of which has a

Regional Governor (Intendente) appointed by the President. The city of Santiago is located in Region XIII, also known as the Metropolitan Region (*Región Metropolitana* or RM). Furthermore, each region is broken down into Provincias, geographic agglomerations with unclear political implications.[2] The last decade has seen an ongoing process of political and financial decentralization and deconcentration from the national to the regional and municipal levels of government.

2.1.1 National Level Authority

The Executive Branch of government includes several Ministries, entities charged with national planning and enforcement within their respective sectors. Many Ministries contain a specific operational or "Service" arm, with powers to execute works. From the urban transport and land development perspective, the most relevant Ministries are the Ministry of Housing and Urban Development (MINVU), the Ministry of Transportation and Telecommunications (MINTRATEL), the Ministry of Public Works (MOP), and, to a lesser extent, the Ministry of Planning and Coordination (MIDEPLAN). As of mid-2000, as part of a process to reduce the overall size of the central government, MOP and MINTRATEL were being combined into one Ministry and MINVU and the Ministry of National Goods (*Bienes Nacionales*) into another. In addition, in 1994, national environmental legislation created the National Environmental Commission (*Comisión Nacional del Medio Ambiente* or CONAMA), directly linked to the President of the Republic through the General Secretary of the Presidency.

In terms of institutional responsibilities, MINVU has responsibility for urban planning and is in charge of developing regional land use plans and regulations and – through its public service arm, SERVIU – of much large urban transport facility and some housing construction. In addition, MINVU, through its Urban Development Division (*División de Desarrollo Urbano*), has the primary responsibility for urban planning at a national level. In this respect there are two relevant instruments: the national urban development policy and the General Law of Urban Development and Construction (*Ley General de Urbanismo y Construcciones*) and its related ordinances and technical norms (IG-PUC, 1999) (see Section 4.2).

MINTRATEL is in charge of transportation operations, including functions such as enforcement (of, for example, vehicle emissions), granting of bus route concessions, street sign standards, vehicle circulation bans, and other relevant policies. MOP through its Roadway Directorate (*Dirección de Vialidad*) is responsible for planning, construction, and maintenance of road infrastructure of national and regional importance, as well as relevant connector roads. In addition, MOP's Planning Directorate (*Dirección de Planeamiento*) includes transportation planning (modeling) activities. In the case of Santiago, MOP's responsibilities include the ring road Americo Vespucio, the PanAmerican Highway which passes directly through the center of Santiago, major road accesses to the city, and the infrastructure concession program, which includes several urban road projects and proposed public transport projects for Santiago (see Sections 3.5.1, 4.1.3, 4.10.1).

Among the many different environmental responsibilities of CONAMA are included the development and proposal of environmental policies and the administration of the system of environmental impact studies.

Major transportation planning and analysis ostensibly occurs under the auspices of the Transportation Infrastructure Planning Commission (*Comisión de Planificación de Inversiones en Infraestructura de Transporte* or COMPIIT), comprised of MINTRATEL, MOP, MINVU, and MIDEPLAN, with the participation of the Ministry of Finance. The COMPITT operates with the technical support of a permanent Executive Secretary (SECTRA), which develops and operates transportation planning models, and carries out and contracts major transportation planning studies and project evaluations for urban, inter-urban, and international transport (ports, roads, airports, and railways). Projects have to pass approved methodologies (regarding project economic evaluation criteria) of MIDEPLAN (see, for example, MIDEPLAN, 1992). There are also two state-owned companies directly involved in transportation provision in the Santiago Area: the Metro, Santiago's three-line urban rail system, which is owned by the Ministry of Finance (*Hacienda*) and the Corporation to Promote Production (*Corporación de Fomento de la Producción* or CORFO); and the State Railway Company (*Empresa Ferrocarriles del Estado* or EFE), which provides suburban rail service between Santiago and the city of Rancagua.

Table 2.1
Government Institutions Relevant to Transport & Land Development

	Area of Intervention	Government Entity		
		National Level	**Regional Level**	**Municipal Level**
Transportation	**Infrastruccture Construction & Maintenance**	MINVU (SERVIU) MOP		Municipalities
	Planning	MINVU MOP SECTRA MIDEPLAN	SEREMITT SERPLAC	Municipalities
	Operations	MINTRATEL METRO EFE	SEREMITT UOCT	Municipalities
Land Use	**Planning**	MINVU MIDPEPLAN	SEREMI–MINVU GoRe SERPLAC	Municipalities
	Development	SERVIU		Municipalities (Cordesan in Santiago)
Environ-ment	**Planning**	CONAMA	COREMA GoRe -(OTAS)	
	Enforcement	CONAMA MINTRATEL MINSALUD	COREMA SESMA	

Note: See Text for details and definition of acronyms.

To facilitate coordinated land planning at a regional level, in 1990 the Ministry of the Interior issued instructions for the creation of Regional Committees for Land Planning (*Comités Regionales de Ordenamiento Territorial* or CROT or, when specifically including the infrastructure sector, CRIOT). The idea behind the CROT was to create a forum which would convene the Ministries involved in planning issues in each Region and serve as a form of technical advisor to the emerging Regional Governments. For the Metropolitan Region (RM), the CRIOT was initiated in 1990 and has been involved – in an advisory role – in the formulation of land use plans at the regional and comuna level and in developing infrastructure and transportation strategies. As the capacity of the Regional Government has increased in recent years, the role of the CRIOT in the RM has apparently declined, although in 1999 there have reportedly been efforts to reinvigorate its activity through the creation of sectoral based sub-committees (SUR, 1999b).

2.1.2 Regional Authority

At the regional level, the Intendente (Governor) – appointed by the President of the Republic – is the executive authority, who presides over the Regional Council (Consejo Regional). The Regions were originally created by the military regime in 1974 to serve as decentralized entities of the central government. Efforts continue to decentralize administrative and some political authority to regional level, although legal and cultural barriers remain.[3] Currently, the members of the Regional Council are elected by the Municipal Government Councils through an Electoral College.

The principal responsibilities of the regional government are in the areas of regional planning, and social, cultural and economic development. The Intendente, as the Executive of the Region, proposes initiatives regarding regional investments and overall budgets which must be approved by the Regional Council. In addition, each national Ministry has a Regional Secretary (Secretaria Regional Ministerial or SEREMI), for each of the country's 13 regions. These SEREMIs fall under the authority of the Intendente and in theory they serve as the Intendente's cabinet. In practice, the national level Ministries play an important role in the sectoral management of most Regions via the SEREMIs. Similar to the case of the SEREMIs, there is also a regional environmental commission, COREMA, presided over by the Intendente. The Regional Governments (GoRe) do not have fiscal authority, since nearly the entirety of their spending capacity depends on contributions from the central government (a more detailed discussion of regional government finance is presented in Section 4.1.2).

Within the Regional Government of the RM there are several entities of relevance to the issues of transportation and land development. One is the COREMA, with responsibilities for approving environmental impact studies and declarations (including for land use plans, real estate projects, and transport projects). Another is an Executive Committee for Urban Transport which was formed in the RM with the specific aim of implementing regionally the President's 1996 Urban Transport Plan. The Executive Committee is comprised of representatives from the MINVU, MOP, MINTRATEL, and SECTRA, but in reality it has had little, if any, impact to-date. In addition, responsibility for the Traffic Control Operating Unit (Unidad Operativa del Control de Tránsito or UOCT) was recently transferred to the RM's Regional Government from MINTRATEL.

The primary responsibility of the UOCT is to develop and maintain Santiago's computerized traffic signal program and traffic control facilities. The Regional Secretariat of the MINTRATEL (SEREMITT) determines the basic urban road network (through consultations with the Municipal governments and must also approve all physical or operational changes to this network. Plans are for SEREMITT to also be the authority responsible for coordinating the approval process for all roadway impact studies undertaken in the RM (see Section 4.7).

Finally, the Regional Government also has a recently established Department of Territorial Planning (Ordenamiento Territorial), which has undertaken a project "Environmentally Sustainable Territorial Planning" (*Proyecto de Ordenamiento Territorial Ambientalmente Sustentable* or OTAS), aimed at improving the capacity of the Regional Government in integrated regional environmental planning.[4] The Regional Government also participates in the formulation of the Regional Urban Development Plan (PRDU) – under the responsibility of SEREMI-MINVU – and provides financial support for, and final approval of, inter-comunal and comunal land use regulatory plans (see Section 4.3).

While by law the Intendente is the senior authority in regional development and governance, the real influence of this governmental layer is not yet entirely clear. The power of the regional government is, in part, limited by its lack of financial autonomy and inability to raise its own financial resources. In addition, control over most of the real instruments for planning and project development still rests in the Ministries or their respective SEREMIs. The latter still depend on the Ministries for their budget allocation and are thus more practically accountable to the Ministries than to the Intendente. In the case of the Metropolitan Region, this situation is particularly acute due to the importance of the Region to the national economy. Finally, there are some questions regarding political accountability of the Regional Government, since neither the Intendentes nor the Regional Councils are directly elected.

2.1.3 Local Authority

The local level of government in Chile is the Municipality, consisting of a locally elected Mayor and Council. The Municipality is a directly elected government, presiding over the geographical unit known as the *comuna*, and was formally established by law in 1991. Local Municipal elections were first held in June, 1992. The Municipality is responsible for local land planning (through the development of a Comuna Regulatory Plan or PRC) and regulating land use, primarily through the issuance of building permits. It is also responsible for matters such as: collection of vehicle registration fees, issuing building permits, charging business licenses, etc.; applying the relevant construction and urbanization norms (as established by the relevant Ministry); and for building and maintaining relevant community infrastructure, including roadways, bus stops, public education and health facilities, among others (often through financial support from national authorities, as is detailed further in Section 4.1). Municipalities can also operate their own public transport services (within their comuna), establish their own norms regarding local traffic issues, and combine with other Municipalities to undertake transport initiatives (always within relevant norms and laws). While Muncipalities have

direct control over local land uses (through an office of municipal works), pending approval by SEREMI-MINVU, all decisions regarding road investment are the responsibility of SERVIU. Municipal governments have some level of financial autonomy, but most still depend on central government transfers for a significant share of operating funds (see Section 4.1)

2.2 Urban Policy

The relatively centralized structure of the Chilean government means that national-level policies have historically played an important role in urban policy and development. While the government contracted an Austrian urban planner in the late 1920s to formulate the fundamentals for a regulatory plan for Santiago, such a plan was not formally developed and approved until 30 years later. In the meantime, urban planning was guided by national legislation (dating from 1928, and for the first 25 years concerned primarily with building norms and construction standards).

The period leading up to, and directly following, the passage of the first Regulatory Plan for Santiago in 1960 marked a time of important activity in urban planning in government, academic and professional circles. However, the change from a democratic regime to an authoritarian regime in 1973 had profound effects on the field of urban planning. Planning was viewed as statism, incompatible with the new regime's neo-liberal economic precepts. In 1979, the first Urban Development Policy was announced, which broadly reflected the government's neo-liberal policies; in Santiago, the new policy was reflected through modifications to the 1960 Plan, including through the virtual elimination of limits to urban expansion. Although in the early 1980s MINVU initiated studies aimed at establishing guidelines for the formulation of regional development plans, these efforts were not completed (CED, 1990).

In 1993, the government undertook a nationwide consultative process aimed anew at developing an urban policy. A summary document coming out of this exercise recommended five principal objectives of such a policy: administrative and governmental decentralization; improvement in environment and quality of life; greater equity in access to goods and services; economic growth and modernization; and, more a balanced distribution of population and economic activity across the country (CED, et al., 1994). To realize these objectives and effective urban management, the document highlighted specific necessary measures: capacity building, including through improvements in related programs in pre- and post-graduate university education; improvements in urban development decision-making processes and institutionality; strengthening the role of local governments (Municipalities); improvement in regional planning instruments and processes; and, improvements in urban information systems (CED, et al., 1994).

Regarding urban transportation and land use, the summary document makes specific reference to the need to internalize the external social costs of transportation, as a way of improving the efficiency of the transportation system, reducing the need for infrastructure investments, promoting the use of non-motorized transportation and shorter trips, while also promoting urban densification and mixing of land uses (CED, et al., 1994). At the same time, the document argues, this densification and mixing of land uses (via urban

revitalization and the creation of "sub-centers") should be a focus of urban management, looking towards the establishment of minimum spatial separation in order to overcome the social and functional segregation so prevalent in the nation's urban areas. The sub-center concept has continued as an important rhetorical focus in a variety of planning documents for the Metropolitan Region (PRMS, PPDA, Transport Plan; see Sections 4.3.2, 4.10.1, 4.10.2).

Despite these efforts at formulating a nationally coherent urban policy, there is still no new policy formally approved. A recent analysis of critical issues regarding urban growth management in Chile (IG-PUC, 1999) highlights this lack of national guidelines as an repercussive vacuum, leaving the nation's regions and comunas still without a clear framework for planning.

2.3 Urban Transport Policy

If no clear, consistent and coherent policy exists on the side of urban planning, for many years there existed much less on the urban transportation front. In practice, this vacuum continues to exist to a certain degree today. Up until the early 1980s, urban transportation in Chile consisted mostly of an amalgam of activities undertaken by the various authorities involved – MINVU, MINTRATEL, the Municipalities, and MOP.[5] By the early 1970s, the situation in urban areas, particularly Santiago, had arrived at a crisis point of congestion and growing air pollution. The national government responded with the creation in 1981 of the Urban Transport Comission (*Comisión de Transporte Urbano* or CTU) and its technical Secretariat (SECTU). Within a decade the reach of these organizations would be extended beyond simply urban transport and they would become COMPIIT and SECTRA, respectively (as discussed above).

While SECTU was not tasked specifically with the development of an urban transport policy, the scope of its activities and the development of its technical capacity – as part of its charge of coordinating investments in the sector – has had undeniable policy influences.[6] At the time of its formation, SECTU embarked on a two-tiered strategy: (1) develop immediate short-term solutions to the urban transport crisis and (2) embark on a process to develop a strategic plan for future system development and management. A principal philosophy behind the formation of SECTU was to separate the task of planning from those of operation and construction. A principal aim of SECTU was to bring a level of objective technical evaluation to a sector which had for many years been dominated by individual proposals and grandiose plans for massive infrastructure development (such as the original 1960s Plan for the development of Santiago's Metro), where the ultimate measure of success was almost exclusively how much infrastructure was built, not necessarily how effective such infrastructure was in solving the problem at hand.

As an example of its focus, SECTU's early works included design manuals (a road design manual and a traffic signage manual), a project evaluation manual, and an early focus on traffic management (including traffic signal synchronization) as a viable alternative to continuous infrastructure expansion. By the mid- to late-1980s, SECTU also embarked on the development of a travel forecasting model for Santiago, which would eventually be replicated for other cities in the country. Although the CTU and

SECTU lacked any formal institutionality, their influence in evaluating and coordinating proposed investments was given a boost by an important source of financing at the time – the World Bank, which began requiring that all projects financed with its support be evaluated according to SECTU's methodologies.

It is somewhat ironic that at the same time that the government was, to a large degree, distancing itself from involvement in the urban land planning arena (some might say dismantling its capacity for effective planning; see Section 2.2), it simultaneously undertook such an important effort to drastically improve its transportation planning capacity. Nonetheless, the central government's apparent disenchantment with issues of urban planning and design did transfer into its increasingly sophisticated transportation planning capacity. For a long period of time, SECTU (and later SECTRA) would discount the importance of urban land planning within its transportation planning activities. In large part this (conscious) separation of transportation planning from land use planning stemmed from the highly technical focus of SECTU/SECTRA – land planning was viewed as a relatively qualitative acitivity, those quantitative models that existed for integrating land use and transportation planning were not considered to be technically on par with transportation planning models (see, for example, Malbrán, 1994). As a result, land uses were viewed purely as an input to travel forecasting (through scenario applications), not as a realistic potential tool to enhance the mobility/accessibility system.[7] Only recently has this institutional perspective begun to change and SECTRA has recently been working to incorporate a land use model (developed at the University of Chile) into its transportation modeling for Santiago.

Perhaps the most important additional (and notorious) transportation effect of the government's strong neo-liberal economic policies in the mid-1970s and 1980s was on the public transportation system. After 1975, the government completely liberalized the bus systems in the nation's cities allowing virtually anyone with a vehicle to operate a bus route. While this policy did significantly expand the coverage and frequency of road-based public transport services, by the late 1980s it also manifested a darker side: excess supply and dangerous, competitive driving conditions; excess pollution and congestion; as well as increasing bus fares due to widespread collusion (see, for example, Correa, 1991; Thomson, 1993).[8] Only with a return to a democratic regime in the beginning of the 1990s, did the more nefarious side of the complete public transport de-regulation begin to be improved (through difficult political struggle), bringing some semblance of order to the system (recent results are summarized in Dourthé, et al., 2000).[9]

In terms of overall government urban transportation policy today, there is still no official written policy existing, although government rhetoric (echoed across most Ministries and within, for example, transportation and environmental plans) calls for ensuring equitable access to transportation services, prioritizing public transport and "rationalizing" automobile use (Frei, 1996).[10] Despite this rhetoric, however, there is no clear singular articulation of this policy in practice and there are apparent conflicts in the "schools of thought" of the various important actors involved. SECTRA, progenitor of the original focus on demand management and public transport prioritization, continues to hold strong – to a large degree – to this philosophy, with rhetorical support from CONAMA

(see, for example, SECTRA, 1994; CONAMA, 1998). On the other end of the spectrum, arguably, rests MOP, with a heavy emphasis on infrastructure expansion. The resulting conflicts with SECTRA have been such that MOP has undertaken the development and application of its own travel forecasting exercises, which in some cases seem aimed at directly undermining the activities (and authority?) of SECTRA.[11] Somewhere in between rests MINVU, with significant responsibility for planning and developing urban transport infrastructure, but without a clear methodological foundation, much less a clearly stated policy stance.

At the moment, irrespective of policy rhetoric, MOP seems to be the actor with perhaps the most practical influence in the realm, due to the size of its budget and, more importantly, due to the growing importance of its infrastructure concessions program (*Coordinación General de Concesiones*).[12] While ostensibly including a range of potential urban transportation infrastructure projects (see, for example, GdC, 2000), the program has had an undeniable focus to-date on road transportation infrastructure delivery. The policy weight of this flagship program of the central government appears to be having important influence on the overall urban strategic transport planning process (see, also, Section 4.10.1). In this case, problems will almost certainly arise; a recent examination of international experiences with urban transport infrastructure concessions concluded that the pursuit of concessions in the absence of clear urban transport policy and planning will inevitably distort the coherence of urban transport programs (Menckhoff & Zegras, 1999).

3. The Metropolitan Region

The Metropolitan Area of Santiago is located in the nation's fertile central valley, in a region aptly called the Metropolitan Region (Región Metropolitan, or RM) or Region XIII. The RM is comprised of six Provinces and 52 Comunas.[13] Although the smallest in land area of the country's 13 Regions, the RM in 1992 was home to almost 5.3 million residents, or nearly 40% of the nation's population. Nearly 90% of the RM's inhabitants reside in what is often referred to as Greater Santiago (see Figure 3.1). In 1991, the area of Greater Santiago was defined for transportation planning purposes as being made up of 34 Comunas, 32 from the Provincia of Santiago plus the contiguous Comunas of San Bernardo and Puente Alto. The same geographic area, plus three rural comunas in the south and southeast, was the subject of Santiago's 1994 Land Use Regulation Plan (*Plan Regulador Metropolitano de Santiago*); this area was subsequently expanded in 1997 through a modification which incorporated into the Plan the large Provincia of Chacabuco directly to the North of Greater Santiago. Clearly, today the historical definition of Greater Santiago has been surpassed by the realities of urban growth and regional economics and demographics, a fact which more recent studies and government efforts are now working to address.[14] In this paper, we use Greater Santiago to refer to the 34 comunas of the 1991 origin-destination survey and RM to refer to the Metropolitan Region. The size of the "true" Santiago metropolitan area lies somewhere in between.

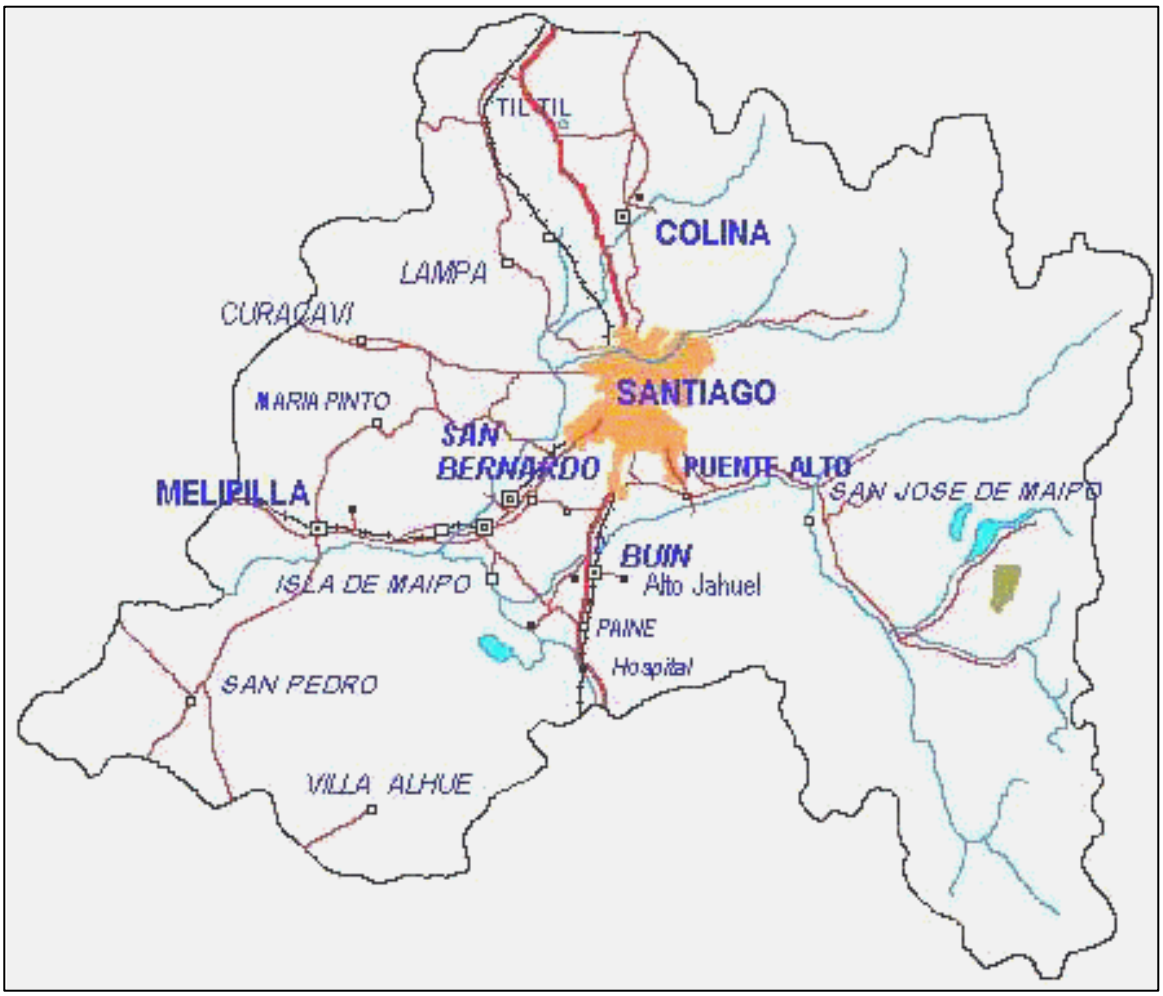
3.1 Economy

The Metropolitan Region plays a fundamental, and continuously growing role in Chile's economy, despite government intentions over the years to decentralize economic growth.[15] In the period from 1986 to 1996, the RM's economy grew at an average annual rate of 7.9% per year, compared to the nation's 6.8% growth (calculated based on data from Banco Central [1999]). As a result, the Region's contribution to national Gross Domestic Product (GDP) increased from 42% to 47% during that period (Banco Central, 1999). Several facts help to highlight the importance of the RM to the national economy: all foreign and national banks operating in the country and 46 of the nation's 47 major economic groups are headquartered in the RM; the RM concenctrates 58% of national industrial employment; and, in 1993, the RM accounted for 53% of the nation's housing stock and 55% of industrial and service building stock (De Mattos [1996] in IG-PUC, 1999). In addition, the Region contains the great majority of the country's most important higher educational centers. In terms of sectoral contribution to Gross Domestic Product (GDP), from 1986 to 1996, the RM's role in the nation's industrial activity increased from 44% to 52%, its role in national construction activity from 37% to 41%, and its role in commercial activity increased from 65% to 68% (Banco Central, 1999).

Within the RM, the major economic sectors – based on contribution to Gross Regional Product (GRP) – are commercial services, financial services, and industry, accounting for 30%, 27% and 21% of GRP, respectively (Banco Central, 1999). Transportation/ telecommunications and construction, although comprising a relatively small share of economic activity (in 1996, 10% and 5.5% of GRP, respectively), have shown to be the most dynamic sectors in the RM's economy, growing at an average annual rate of 9.8% and 9.6% (respectively) from 1986-1996. Commercial services followed close behind at an average rate of 9.5%. In terms of employment, government and social services is the leading sector, accounting for 28% of all jobs, followed by industry (23%) and commercial activities (20%). Together these sectors provided – in 1992 – 1.5 million jobs, out of a total RM workforce of slightly more than 2 million (GoRe, 1995). Despite the presence of large industrial establishments, small and medium enterprises still dominate industrial employment. According to SUR Consultores (1999a), more than 70% of the sector's jobs are in companies with less than 49 workers.

The economic crisis in Asia beginning in 1997 brought repercussions across Latin America and Chile was not immune. From 1997 to 1998, economic growth slowed to 3.4%. Between 1998 and 1999 the cooling had turned to contraction and the country experienced a negative growth rate of 1.1%; the most adversely affected sector was construction, which shrunk by 10% (Banco Central, 2000). The RM was particularly hard hit, as unemployment, which ranged from 6.7% to 7.5% between 1995 to 1998, jumped to 10.5% in 1999, higher than the national average. During the first half 2000, unemployment still hovered around 10%, although studies specific to Greater Santiago indicate (as of July, 2000) an unemployment rate of 14.4% (Banco Central, 2000). Provisional data from the first trimester of 2000 indicated a slight recovery and projections are for annual growth in the 5.5% to 6% range through 2001.

FIGURE 3.1
GREATER SANTIAGO AND THE METROPOLITAN REGION

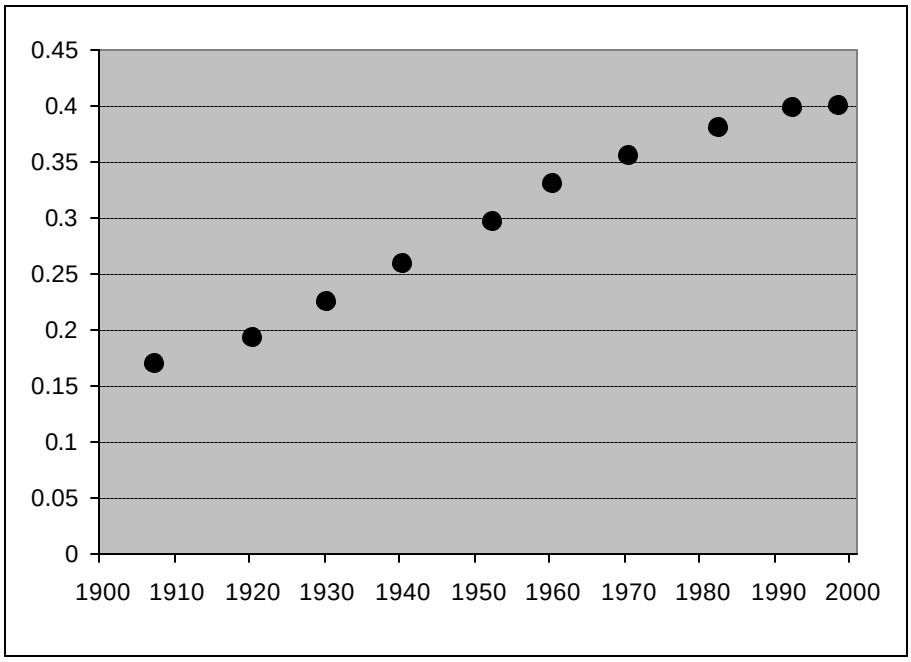


3.2 Demographics

Chile's urban population growth has long outstripped national population growth, due to classic rural-urban migration patterns. And, for an extensive period of time, Santiago's population growth rate has been higher than that of other cities in the country.[16] At the beginning of the 20th Century, Santiago's relatively heavy share of national population was due to the city's role as Chile's administrative center; by the mid-1940s, the macro-economic policy of import substitution further contributed to Santiago's population dominance, as industrial investments, followed by financial and commercial activities, focused on the city (Errázuriz, 1987). During the first half of the 20th Century, over half of the Metropolitan Region's population growth was due to migration, a share which has gradually declined to 20% during the 1970s and an estimated 8 to 10% today (CED, 1990; SUR, 1999a). As a result, the Metropolitan Region's share of national population has steadily increased, though that trend seems now to be ebbing (see Figure 3.2).

Census data indicate that the RM's population growth – mirroring national patterns – has slowed in recent years, declining from 2.62% per year from 1970-1982 to 1.97% per year from 1980-1992 (national rates were, respectively, 2.03% and 1.64%) (INE, 1997).[17] The most noteworthy characteristic of this population growth has been its area of focus – as would be expected, away from the traditional center of the city. In 1970, the Comuna of Santiago (the traditional city center) and its directly adjacent Comunas[18] accounted for 42% of the RM's population. By 1992, these same Comunas accounted for just 26% of the RM's population.[19] The city's population growth during this period was absorbed in great part by the large Comunas of Maipú (in the West), Puente Alto and San Bernardo (in the South, Southeast) and La Florida and Peñalolén (in the Southeast). Population in these five Comunas quadrupled from 1970 to 1992 and went from comprising just 10% of the RM's population to 23% (data from INE, 1970, 1982, 1992).

FIGURE 3.2
THE METROPOLITAN REGION AS A SHARE OF CHILE'S TOTAL POPULATION



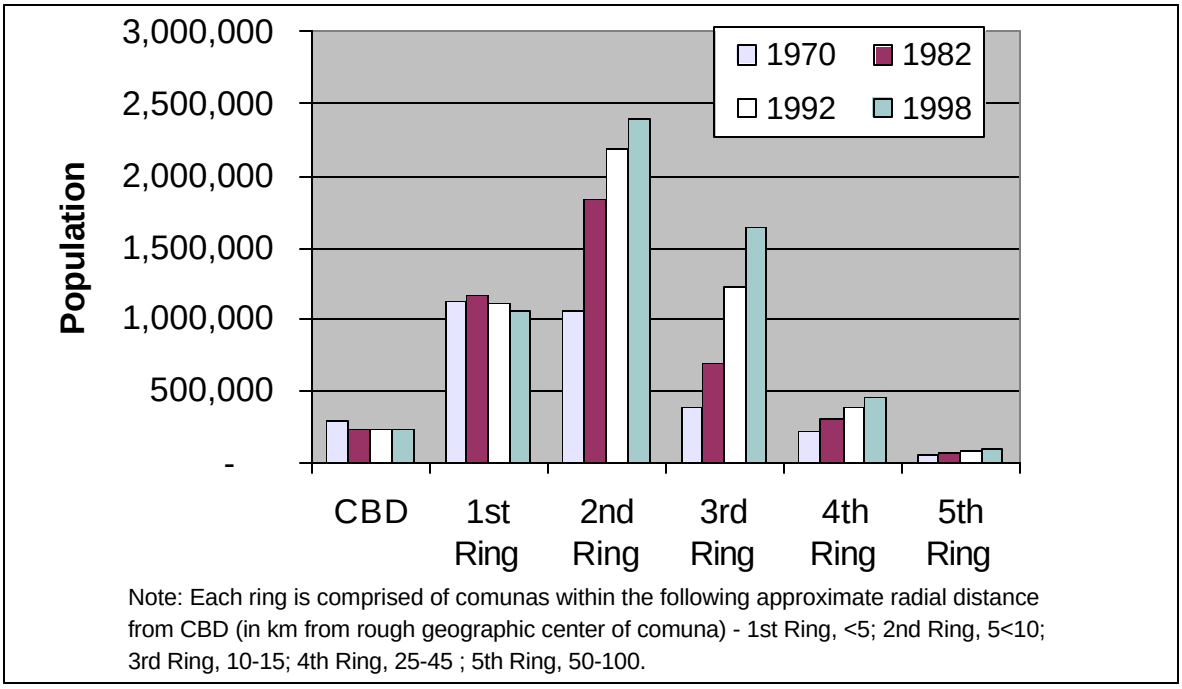
Sources: Crocco, 1950; DEC, 1960; Urbe, 1995; INE, 1998.

With only one exception (the distant RM comuna of San Pedro), the ten slowest growing comunas in the RM, were the city center and the first ring of comunas, less than 5 kms from the traditional CBD. The most rapidly growing comunas, on the other hand, were – with the exception of Colina – in the second and third rings, between 5 and 15 kms from the CBD. As a result of these trends, the second and third rings of the RM had, by 1998, become the most populous, containing 68% of the region's residents (see Figure 3.3).

While the center city and the first ring of comunas remain the most densely populated, the population loss in this part of the RM has also translated into lowered densities. The second and third rings, in contrast, have shown an increase in population densities in the

period 1970-1998, although – on average – these comunas still display lower population densities than the more central areas of the city, producing an archetypical density gradient that declines with distance from the city center (see Figure 3.4).[20] A convergence of factors have contributed to these population dynamics – low land prices on the urban periphery, which has focused government public housing efforts there; middle and upper income groups desire to escape the deteriorating center city and live on larger lots in larger homes, also more financially feasible on the urban periphery; and, importantly, a fundamental change in uses of land in some of the central comunas (particularly Santiago and Providencia), with a strong increment in commercial and service uses replacing formerly residential uses. These factors are discussed in more detail in Section 3.4 and Section 5.

FIGURE 3.3
POPULATION GROWTH IN METROPOLITAN REGION – BY RING



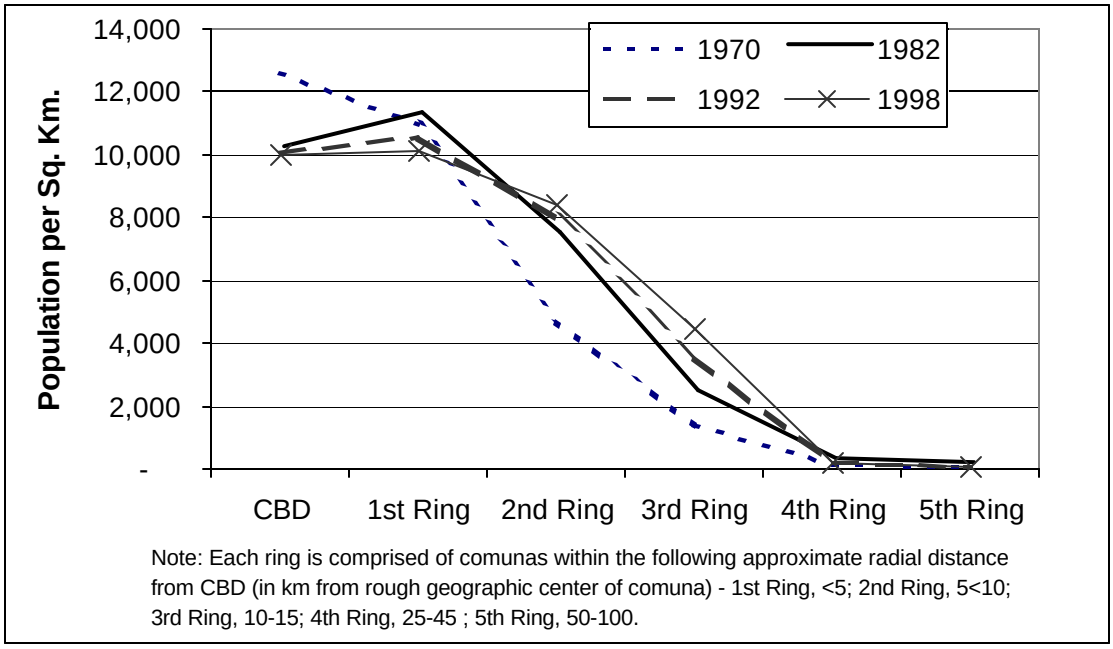
Note: Each ring is comprised of comunas within the following approximate radial distance from CBD (in km from rough geographic center of comuna) - 1st Ring, <5; 2nd Ring, 5<10; 3rd Ring, 10-15; 4th Ring, 25-45 ; 5th Ring, 50-100.

Source: INE, 1992, 1982, 1970; INE, 1998.

According to census data, the average household size in the Metropolitan Region in 1982, was 4.82 persons, with a range across comunas of 3.5 to 5.7. In general, the lower income comunas such as Lo Espejo and La Pintana had the largest household size,while the smallest household sizes were recorded in Providencia and Santiago – attributable to the fact that these comunas have relatively high incomes and a large concentration of older residents. By 1992, the average household size in the RM had declined to 4.25, with a range across comunas of 3 to 4.8 persons per home.[21] All comunas except Santiago experienced declining household sizes; the slight increase in that comuna (from 3.48 to 3.55) may, in part, be due to the program of urban renovation subsidies initiated in 1990, which has attracted more families back to the center city (see Section 4.5.3). By

2010, estimates suggest that the average household size will further decline to 3.7 persons (CIS, 2000).

FIGURE 3.4
CHANGES IN AVERAGE COMUNA POPULATION DENSITY – BY RING



Note: Each ring is comprised of comunas within the following approximate radial distance from CBD (in km from rough geographic center of comuna) - 1st Ring, <5; 2nd Ring, 5<10; 3rd Ring, 10-15; 4th Ring, 25-45 ; 5th Ring, 50-100.

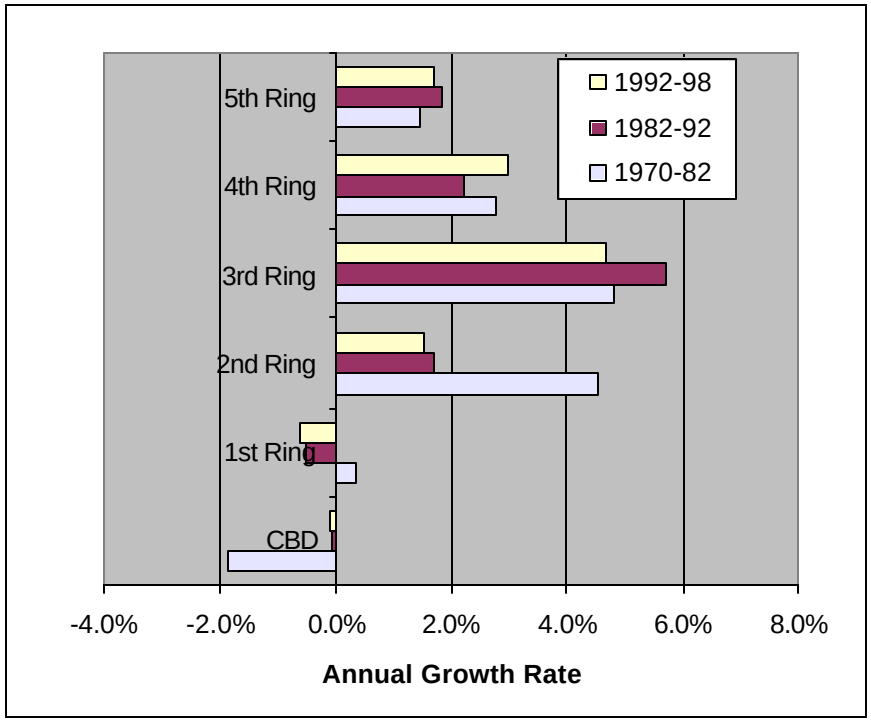
Source: INE, 1992, 1982, 1970; INE, 1998.

Regarding future population projections for the Metropolitan Region, most indications suggest that the trend towards declining rates of growth will be maintained. Nonetheless, it is expected that the RM's population will continue to grow more rapidly than that of the country. SUR Consultores (1999a), for example, estimates that the population growth rate in Greater Santiago will decline to 1.28% in 2000-05, and 1.08% in 2005-10, while for the country as a whole during the same periods the respective rates are estimated at 1.18% and 1%. According to these estimates, the population of Greater Santiago will slightly exceed 6 million residents by 2010. Urbe (1995) estimates a similar population level for Greater Santiago by the year 2010, with slightly higher growth rates expected for the Metropolitan Region – according to their estimates Greater Santiago will go from comprising 90.4% of the RM's population in 1992 to 89.2% by 2014. Depending on average annual growth rates (AAGR), the RM's population by 2020 could range from 7.3 million (AAGR of 1%) to 8.8 million (AAGR of 1.75%).[22]

Perhaps the most important question regarding future population growth of the Metropolitan Region is not what the absolute number is, but rather where the population resides. If historical trends are any indication, then the focus of growth on the periphery seems likely, particularly in the third and fourth rings, which have had the highest growth rates over the last 20 years (see Figure 3.5). In the fourth ring, the growth is heavily focused in the rapidly developing comuna of Colina (with a 6% annual population growth rate in 1992-98). In the third ring, the heaviest growth in the period 1992-1998 was

concentrated in the comunas of Puente Alto (7%), La Pintana (5.5%), Lo Barnechea (5%) and Maipú (5%). In the second ring the edge comunas of La Florida and Quilicura account for much of the growth; although their growth rates have been declining. Meanwhile, though the CBD has managed to halt the decline in its population, the rate of loss of residents in the first ring comunas is accelerating.

FIGURE 3.5
AVERAGE ANNUAL GROWTH RATES IN DISTINCT PERIODS – BY RING



Source: INE, 1992, 1982, 1970; INE, 1998.

Future population concentrations will depend in large part on government regulations and enforcement, as will be discussed further below. For example, there are thirteen comunas in Greater Santiago that still have land available for urbanization (not including areas available for population through densification or renovation). If these comunas alone urbanized their available land at the maximum densities specified by current regulations (200-600 people per hectare, as discussed further in Section 4.3.2), then they could absorb almost 2.8 million future residents. This amount is essentially equal to the additional population which would be added to the RM if it grew at an average rate of 1.75% per year from 1998 to 2020. Of course, there is little certainty that any of these areas will develop at such densities.

Ultimately, the main problem with the form of growth and concentration on the periphery is not, per se, the expansion, but rather that it is occurring in places that are not equipped to handle the demands on public infrastructure, including transportation.

3.3 Socioeconomic Characteristics

With a large concentration of international business headquarters, financial services, industries and higher education opportunities, the Metropolitan Region also has a relatively large concentration of wealthy residents. While the region accounts for 39% of the nation's households, these households account for 53% of national household income; the RM is home to over one-half of the country's richest households (top income decile) and less than one-fourth of the country's poorest (lowest income decile) (SUR, 1999a).

There is, however, significant socio-economic segregation within the Metropolitan Region. Historically, upper income households have clustered in the eastern and northeastern parts of the city (Las Condes, Vitacura, Providencia, Ñuñoa, La Reina) in a clearly defined "cone" (see Figure 3.6); low income "invasions"[23] of these comunas were eliminated by the government during the late 1970s and early 1980s (Ducci, 1999; CED, 1990).[24] In total, approximately 75% of Greater Santiago's wealthiest residents reside in just six comunas (Las Condes, Providencia, Vitacura account for 54% and Lo Barnechea, Ñuñoa and La Reina account for 20%) (Urbe, 1995). These comunas were natural extensions of the eastward migration of wealthier residents towards the Andean foothills, former farm and forest lands with considerable environmental amenities. A more subtle political economy underlies these trends as well – a concentration of higher incomes and subsequent demand leads to a wealthy Municipal ability to efficiently deliver a vast array of urban services (i.e., Tiebout sorting). This phenomena was intensified in 1981 when Greater Santiago's 17 original comunas were divided to form 34, creating socially homogeneous comunas, clearly defined along rich-poor lines (CED, 1990).[25] Middle income groups typically followed the upper income groups eastward, though more focused towards the southeast, particularly the large comuna of La Florida. In addition, the southern comuna of La Cisterna and several central comunas – including Santiago and Conchali – continue to house an important share of middle income households. Residential choice models developed for Santiago show neighborhood income level to be the dominant variable affecting location choices (Martínez, 1996), confirming the spatial self-segregation of income groups in Greater Santiago.

For lower income groups, housing has always been an acute problem, the solutions to which have typically tended to intensify segregation. In 1910 an estimated 100,000 (18%) of Santiago's population lived in precarious housing conditions (Matas & Balbontin, 1987). This problem was exacerbated throughout the first half of the 20th Century by the continuous waves of migration to the city. The poor typically located "illegally" on peripheral lands, contributing not only to ongoing urban extension, but also heightening socio-spatial segregation (Matas & Balbontin, 1987). Future government efforts to provide public housing continued these locational trends. The need to provide large amounts of housing drove the search for the cheapest lands, almost exclusively on the periphery in areas where the poor had already located.

The resulting spatial segregation does not only manifest itself through income inequalities. Broader measures of social welfare share the same geographic profile. For example, a late 1980s study measuring social welfare through indicators of housing, educational, and general socio-economic characteristics across comunas (Larraín &

Toledo, 1990) showed that the same general cone of wealth (Las Condes, Providencia, Ñuñoa, and La Reina) also had by far the highest levels of social well-being. Other studies have confirmed these great disparities across Greater Santiago, highlighting – among other factors – the differences in provision of municipal infrastructure, greenspace, etc. (see CED, 1990; SUR, 1999a). While spatial segregation continues to predominate in the metropolitan area, some researchers now suggest that the liberalization of the land market and more widespread middle class suburbanization (such as those related to agricultural parcels; see Section 4.6) are actually acting to reduce effective spatial segregation (see Sabatini, 2000).

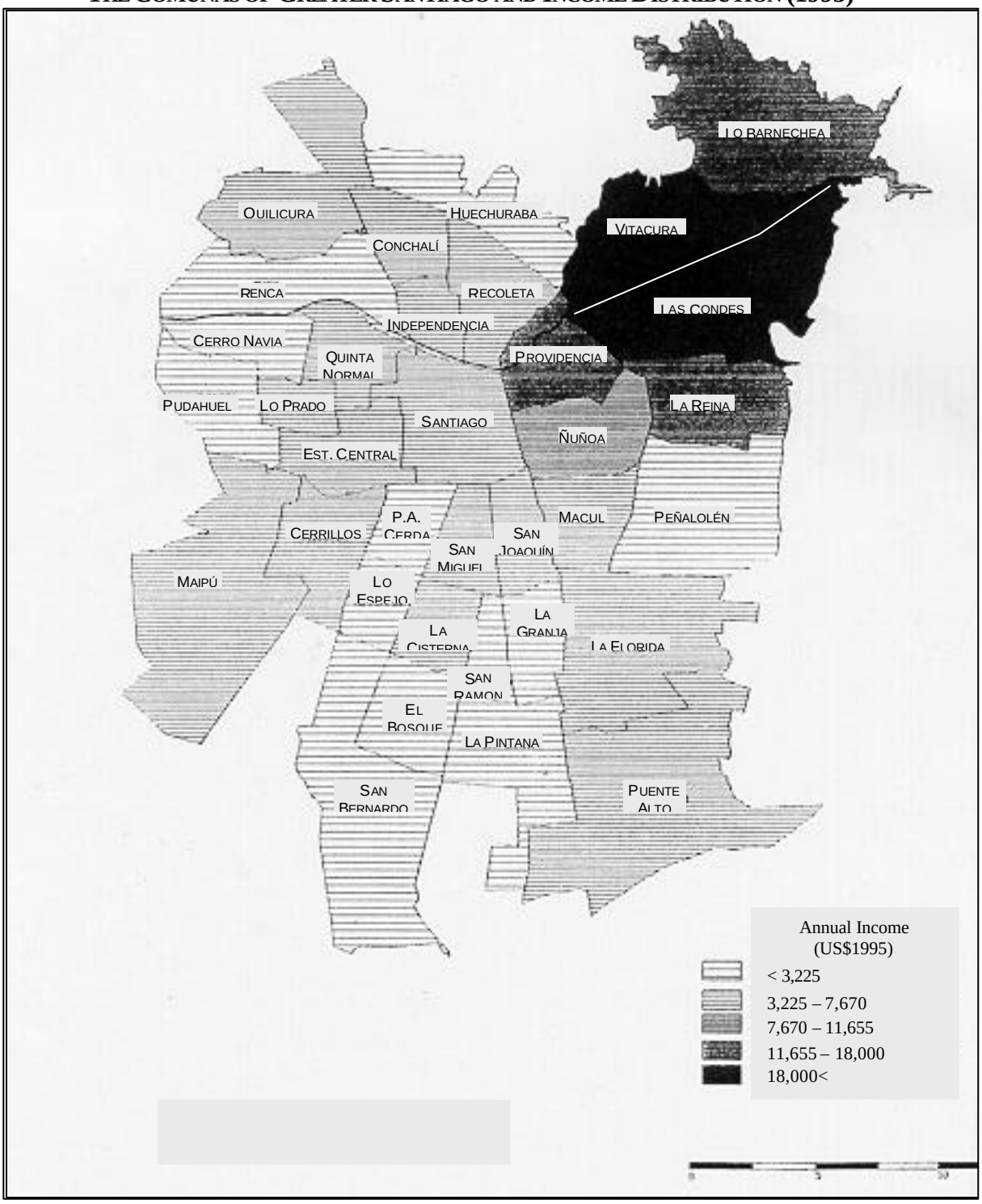
Official statistics show that overall levels of poverty in the RM have been reduced with the ongoing economic growth that the country and region have experienced. In 1987, an estimated 39% of the RM's population lived in poverty, a number which declined to 21% by 1994; the proportion of those living in extreme poverty decreased even more dramatically from 13% to 5% (GoRe, 1995). In 1991, according to household travel survey results (SECTRA, 1991), approximately 49% Greater Santiago had an annual income less than or equal to US$2,559, 34% between $2,559 and $9,247, and 10% greater than $9,247 (6% of households did not respond to the question). At least one estimate projects that by the year 2020, almost 40% of the population will have an income between $12,000 and $23,000 per year (in US$ 1994) (see Table 3.1).

Table 3.1
Estimated Household Income Level in the RM to 2020

Annual Income Range (US$ 1994)	1994	2010	2020
< 3,428	45%	12%	7%
3,428 - 6,857	13%	12%	16%
6,858 - 11,429	12%	30%	20%
11,430 - 17,143	11%	17%	22%
17,144 - 22,857	9%	13%	16%
22,858 - 42,857	8%	12%	14%
42,857 <	2%	4%	5%

Source: Urbe, 1995.

FIGURE 3.6
THE COMUNAS OF GREATER SANTIAGO AND INCOME DISTRIBUTION (1995)



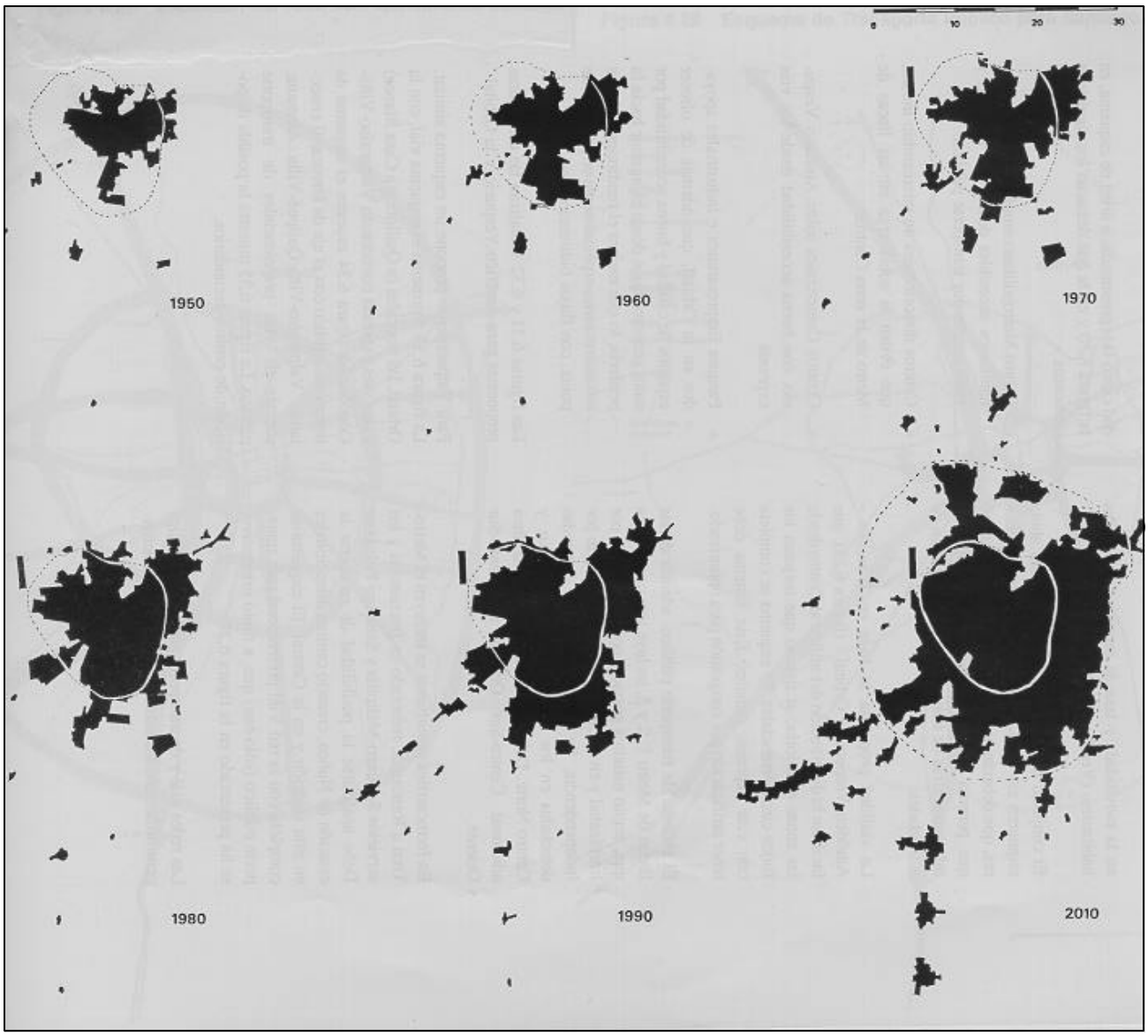
3.4 Urban Growth Trends, Urban Form & Land Uses

As has been common to most large cities across the globe, Santiago has, particularly in recent years, manifested strong urban outgrowth trends (see Figure 3.7). The major factors contributing to these trends are well known and include the increasing speed of transportation systems and growth in telecommunications systems, which have helped reduce the interaction barriers formerly caused by distance. These technological capacities – combined with increasing incomes and subsequent consumer desire for larger land and residential spaces, demographic changes, socio-economic segregation, the changing mix of economic output, local level externalities, transportation-intensive industrial activity – lead naturally to dispersion of urban populations and economic activity (see, for example, Mieszkowski & Mills, 1993; Pickrell, 1999).

While Santiago has undergone significant expansion, for many years the rate of urban outgrowth just kept pace with population growth, thus gross urban area population densities remained relatively constant throughout the first half of the 20th Century (see Figure 3.8) (although, there was an important shift in densities across the city, with the central city areas losing density at the expense of more peripheral comunas, as discussed in the previous section). Only after 1960 (the date of the first Land Regulation Plan for the city) did urban expansion begin outpacing population growth, with gross density across Greater Santiago declining throughout the decade (see Figure 3.8). This period coincided with the first large investments in transportation infrastructure and, according to Urbe (1995), at this point the city left behind its "compact" traits. During the 1970s, expansion began reaching the 1960 urban growth limit and city-wide average population density began rising again.[26]

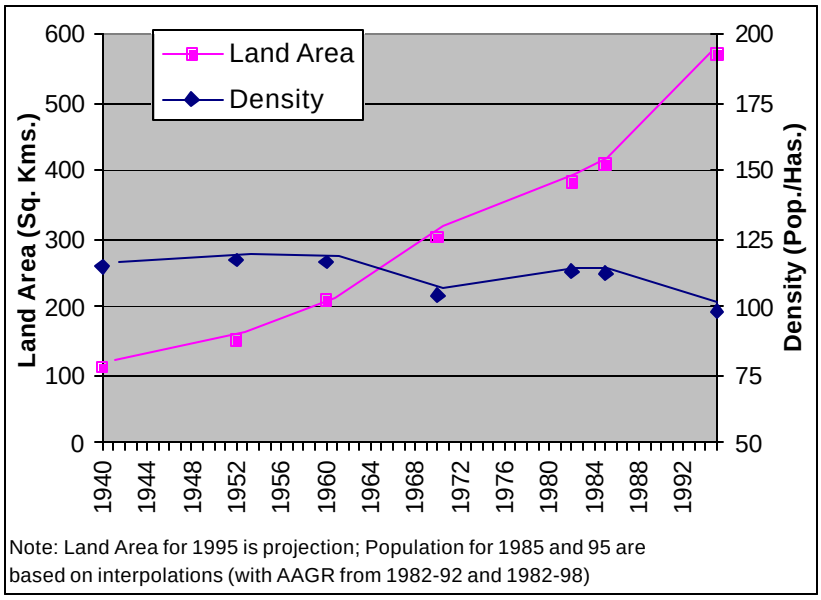
The lifting of the urban growth boundary in 1979 (part of neo-liberal economic reforms) coincided with the halting of the city's area-wide density increase of the 1970s and, after the 1981-82 economic crisis, the city expanded at a rate 70% faster than population. As a result, Greater Santiago's city-wide population density began declining more rapidly than in any other period of the previous 50 years (see Figure 3.8). Factors fueling urban expansion in recent years include re-invigorated road-building activities, low density suburban development, distant public housing projects, and squatter settlements at the urban fringe (see, for example, Browder, et al, 1995; Escudero & Lerda, 1996; Rivasplata, 1996). An increasing number of industries have also located on the outskirts of the city, particularly in southeastern, and northern sections, and more recently in the west (on the Ring Road near the airport).

FIGURE 3.7
GREATER SANTIAGO URBAN EXPANSION: 1950 – PROJECTED TO 2010



Note: Scale in Kms. Source: MECSA-INECON, 1993

FIGURE 3.8
EVOLUTION OF LAND AREA AND DENSITIES IN GREATER SANTIAGO



Source: Land area from Urbe, 1995; population from Crocco, 1950; DEC, 1960; Urbe, 1995; INE, 1992, 1982, 1970; INE, 1998.

3.4.1 Forms of Growth

The first decades of the 20th Century witnessed the first high density, one-story working class neighborhoods, with densities reportedly reaching up to 500 persons per hectare and the 1930s brought the city's first tall buildings (Matas & Balbontin, 1987). This also marked the beginning of growing rates of urban expansion (fueled by the development of rapid transportation systems plus the large influx of rural population looking for work). From 1930 to 1970, the city grew at an average rate of 500 hectares per year (Matas & Balbontin, 1987). From the 1960s onward, the rate of expansion accelerated, As a result, between 1982 and 1992, the total urbanized area of the city grew by 20% (MINVU, 1994; Lagos, 1992). From 1992 to 1997, over 8,000 hectares in Greater Santiago were urbanized – a rate of 1,600 per year. Consistent with the demographics trends outlined earlier, over 60% of this urbanization occurred in just four comunas, the peripheral comunas of Quilicura, Maipú, Puente Alto, and Peñalolén.[27]

An interesting study of the evoluation of urban forms in Santiago (Matas & Balbontin, 1987) characterizes four general models of growth in the city, which can be roughly summarized accordingly:

- the *Colonial* city – neighborhoods dating primarily to colonial Chile, with buildings with a continuos façade, typically associated with the old, historical city center and traditional surrounding ares. The urban form is marked by the

well-known Spanish colonial quadrangular street grid – a style which predominated through the 19th Century.

- the *front yard* ('antejardin') city – this form of growth coincided with a growing desire to "privatize space" and resulted in individual architectural projects being privileged over the greater public space. It first appeared in Santiago as an alternative for the wealthier classes at the end of the 19th and beginning of 20th Centuries and is the predominant form that the city took in its first rapid expansions into the previously agricultural subdivisions east of the city in today's Providencia, Ñuñoa and Las Condes. Proving to be a highly profitable real estate model (particularly for land owners), it is a model that continues to be repeated today – including in cul de sac developments – both at an individual construction level (house by house) as well as in many of the large megaprojects. By many accounts, it continues to be the desired form of residential housing today (see Section 5.3), acquiring as much importance as a consumer status symbol as a residence.
- the "*park city*" – this model refers to residential neighborhoods consisting primarily of multi-story apartment buildings, for the most part densely placed, but surrounded and linked by continuous greenspaces. This form of development came to fore in the latter half of the 20th Century, in particular through the transformation of previously *front yard* neighborhoods, via lot consolidation and densification.
- the *marginal* city – a model relating particularly to public housing and characterized by dense multi-story buildings, with minimum attention payed to urban amenities and related infrastructure. Nearly all of these neighborhoods are located on the vast expanses of the urban periphery, for those with little choice of where to locate.

Of these development models, the last three continue to be developed today. Two – the "park" city and the "front yard" city – can be fairly characterized as design preferences, while the "marginal" city responds more immediately to the dire housing needs and conditions of the urban poor. Interestingly, the colonial city – though offering many of the aesthetic pleasures of urban life such as narrow street networks, diverse building facades, mixes of land uses, and vibrant public spaces – has left little noticeable legacy among the forms of growth occurring today. In other words, Santiago's current urban growth manifests little, if any, hints of neo-traditional development.

As will be discussed further, these forms are the product of direct public investments (public housing), the various norms and plans affecting growth in time, and characteristics of the real estate market and its diverse players (from those individual lot owners constructing one house at a time, to the growing number of mega-players, urbanizing the equivalent of entire new pieces of city).

3.4.2 Land Uses

Although Greater Santiago has been expanding rapidly outward, the metropolitan area remains highly concentrated in terms of most non-residential land uses. The central comuna of Santiago accounts for 27% of Greater Santiago's commercial land uses, 30%

of educational land uses, 43% of office space, 21% of health land uses, and 15% of industrial space (see Table 3.2). On the other hand, the comuna accounts for just 4% of Greater Santiago's population.

Table 3.2
Percent Share of Metropolitan Area's Land Uses (1997)

Commercial		**Education**		**Residential**	
Comuna	*%*	*Comuna*	*%*	*Comuna*	*%*
Santiago	36.9%	Santiago	29.9%	Las Condes	9.3%
Las Condes	7.4%	Providencia	9.0%	Santiago	6.4%
Providencia	6.3%	Nunoa	6.9%	Maipu	6.3%
Recoleta	4.8%	San Miguel	4.9%	La Florida	5.9%
Nunoa	4.3%	Las Condes	4.2%	Providencia	5.7%
La Florida	3.3%	Recoleta	4.2%	Nunoa	5.7%
				Puente Alto	5.6%
Industrial		**Offices**		**Health**	
Comuna	*%*	*Comuna*	*%*	*Comuna*	*%*
Santiago	15.4%	Santiago	43.3%	Santiago	21.0%
Quilicura	8.4%	Providencia	17.6%	Providencia	20.5%
San Joaquin	7.1%	Las Condes	9.7%	Independencia	12.9%
Macul	6.5%	Quilicura	2.5%	Nunoa	6.7%
Maipu	6.1%	Nunoa	2.5%	Vitacura	6.6%
Qta. Normal	6.0%	Vitacura	1.9%	Puente Alto	6.6%
Cerrillos	5.6%				

Note: The percentage represents the comuna's share of Greater Santiago's land use by each category.
Source: MIDEPLAN, 1998a.

In terms of mixes of land uses – at a comuna-wide level – the comuna of Santiago also shows the highest degree of relative mix, followed by other central comunas, such as Independencia, Recoleta, and Providencia.[28] Other comunas which also show a relatively high indication of mixes of land uses include Huechuraba, Quinta Normal, San Miguel and Cerrillos; these comunas typically have at least an important share of another type of land use beyond residential, such as industrial and/or commercial (based on data from MIDEPLAN, 1998). As will be shown in Sections 5.3 and 5.4, recent development trends show an important shift in non-residential land use growth away from the city center and towards the comunas with higher shares of population and high population growth rates.

Some of the effects of these land use patterns on transportation will be explored in the following section.

3.5 The Transportation System and Transportation Infrastructure

As with any city, the transportation system and transportation infrastructure development have had an important ongoing influence on the Santiago Metropolitan Area's urban growth. During the second half of the 19th Century, an extensive horse tram service continuously expanded in all directions from the city center. By the turn of the Century, the city had approximately 100 kilometers of track and 200 horse trams which carried 40 million passengers per year; additional passenger transportation service was provided by two steam rail lines connecting Santiago with San Bernardo and Puente Alto (Morrison,

1992). In the early 1900s, the tram service was electrified and expanded, with tracks leading to Pudahuel, parkland at the edge of Ñuñoa, and later contributing to the development of Las Condes and Providencia, producing a phenomena not unlike the "streetcar" suburbs of North America during the same period. By the late 1930s, the city had, by some accounts, one of the most extensive electric tram networks in South America – over 220 kilometers, carrying 210 million passengers per year (Morrison, 1992). However, with private motor vehicles and buses becoming increasingly common, the government soon viewed the tram as obsolete, purchasing most services and beginning to remove tracks in 1945.

The rapid global growth in motorized vehicles from the 1930s onward brought its now well-known impacts to Santiago as well and the city soon began restructuring itself along main North-South, East-West, and Southeast and Southwest road corridors. The city urbanized along these corridors, opening up new zones to development, while also incorporating previously separate urban areas into a continuous metropolitan fabric. The resulting radial road structure, with an ultimate focus on the traditional city center has – to a large degree – prevailed to this day. By the late 1960s, the original plan for the city's Metro (urban rail) system was developed (calling for the construction of five lines) and construction was begun on the ring road Americo Vespucio (at a radius of 4-5 kms from the city center), Avenida Kennedy running east to Las Condes, and the portion of the Panamerican Highway running through the city center.

3.5.1 Infrastructure & System Management

Today, Greater Santiago's transport infrastructure is comprised of some 4,700 kms of roadways (90% paved), not including the Vespucio Ring Road (varying from three and four lanes in each direction) nor the PanAmerican Highway which cuts through the city center. There is currently only one exclusive busway in the city – a 5 km stretch on Av. Grecia in Nunoa. The principal East-West corridor (Apoquindo-Providencia-O'Higgins) has painted bus-lanes and a system of differentiated and – in the city center – physically separated bus stops. There are three Metro lines. Line 1, the main line, runs from Lo Prado in the West to Las Condes in the East directly underneath the Apoquindo-Providencia-O'Higgins corridor. Line 2, runs North-South in the western part of the city, from the city center to La Cisterna, and Line 5 (which is actually the third Metro Line to be developed) runs North-South in the Eastern part of the city, from the city center to La Florida. The system totals 40 km, with 51 stations and 68 trains and was built at a total estimated cost (in US$1999) of approximately $1.6 billion (Metro, 2000a).[29] Finally, MetroTren, is a 9-station suburban rail line running approximately 85 kms south to the city of Rancagua (Figure 3.9 shows Greater Santiago's principal transport infrastructure).

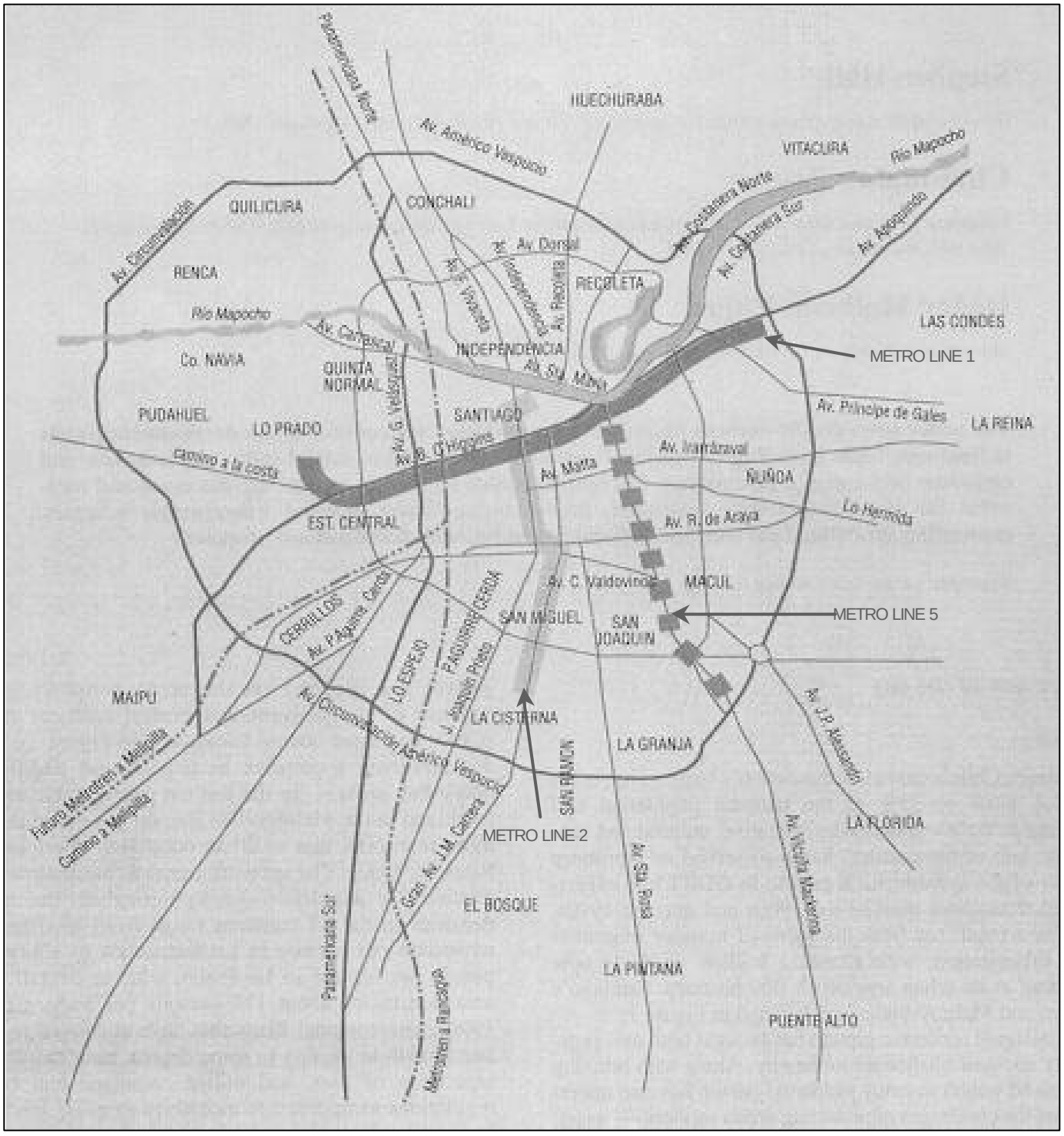
Most of Greater Santiago's streets have pedestrian facilities (except for the major intrauban highways), a number of streets and plazas in the central business district have been pedestrianized, and sidewalks and pedestrian areas in the commercializing areas of Providencia and Las Condes have also been expanded in recent years. In the most heavily urbanized areas of the city pedestrian signals exist and well-demarcated crosswalks are becoming increasingly common. Bicycle facilities, on the other hand, are virtually non-existent, confined to a few unpaved paths running through various urban

parks, an approximate 8 km bikeway in the median of a major road in the low income comuna of La Pintana, 2.5 kms of bikeway in Providencia, and some painted bikelanes in a University neighborhood in Santiago. A bicycle lane and bicycle parking project, linked to Metro stations in Estacion Central, was abandoned shortly after implementation in the early 1990s.

The combination of economic crises during the 1970s, a demand management policy focus for much of the 1980s and 1990s (see Section 2.3), and relative fiscal prudence has – arguably – contributed to a moderate overall focus on transportation infrastructure expansion in recent decades. The major road infrastructure projects in recent years include: lane additions and some strategic overpass and underpass construction on the Vespucio Ring Road, a series of overpass/underpass projects on the Kennedy Highway which runs east through Las Condes, several lane widenings and overpass projects on other structural roads and intersections in eastern parts of the city, and major upgrades to several structural roads and intersections in the rapidly growing southeastern suburbs (especially La Florida). A planned exclusive busway running south from the city center to La Pintana has been effectively held up by citizen opposition as has been a major east-west highway concession project (Costanera Norte), which would cut through the Metropolitan Park and tunnel through central city neighborhoods.

At a Regional scale, important recent works include the completion of Route 78 connecting Santiago to the port city of San Antonio; this concessioned highway to the southwest has reduced to 30 minutes the peak period travel time from Talagante to the city, facilitating intra-regional integration of the comunas of Calera de Tango, Mallaco, El Monte and Melipilla. In the other direction, the upgrade of Route 57 (also called G-15) from Santiago to Los Andes, also via tolled concession, carries important accessibility improvements for the Province of Chacabuco, as does the concessioned upgrade of the northern portion of the Panamerican Highway (Route 5). These highways carry important implications for urban expansion. Transportation infrastructure finance issues are discussed in Section 4.1.3 and additional infrastructure expansion plans are discussed in Section 4.10.1.

FIGURE 3.9
PRINCIPAL TRANSPORTATION INFRASTRUCTURE IN GREATER SANTIAGO

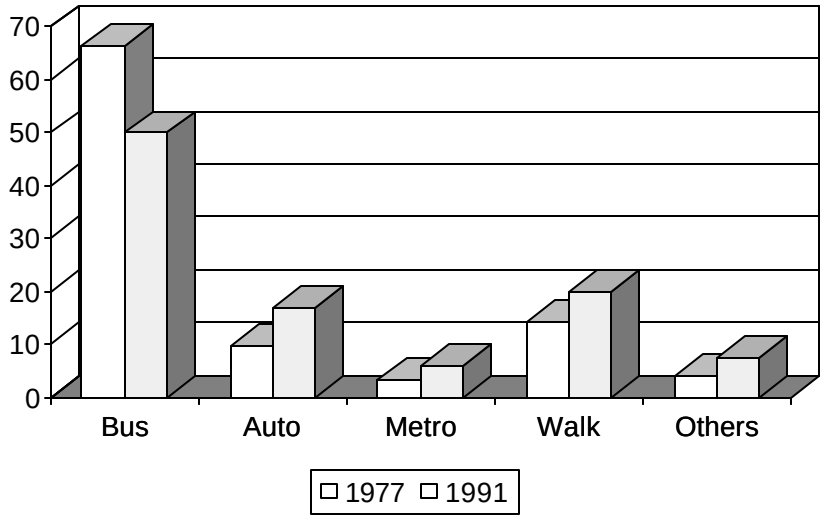


Among the most notable system management measures, beyond the bus system concessioning scheme (discussed further below), a computerized traffic signal synchronization program (operated by UOCT) has brought measurable traffic flow benefits on affected routes. In addition, a program of reversible one-way streets on crucial commute corridors has brought about effective supply expansion during peak travel periods. Also, since the late 1980s the government has employed a vehicle restriction program (*la restricción*). During the months of high air pollution risk (currently March to December), *la restricción* prevents private motor vehicles from operating on a given day of the week, according to the last digit of a vehicle's license plate (the number of vehicles subject to restriction is expanded on days with critical air pollution levels). Originally, the restriction theoretically reduced by up to 20% the number of private motor vehicles on the roads in Greater Santiago on a given day. However, since the government exempted vehicles with catalytic converters from the restriction – as a means to encourage fleet turnover – today the restriction probably reduces less than 10% the daily number of private vehicles on the city's streets.[30] Finally, during the pollution season in 2000, the government deployed a pilot program of "emergency" exclusive public transport routes, allowing only taxis and buses to operate on six primary travel corridors during morning and evening peak periods. Authorities hope to use the success of this pilot program to help build political support for the eventual development of permanent exclusive busways on these corridors.

3.5.2 Trip-making

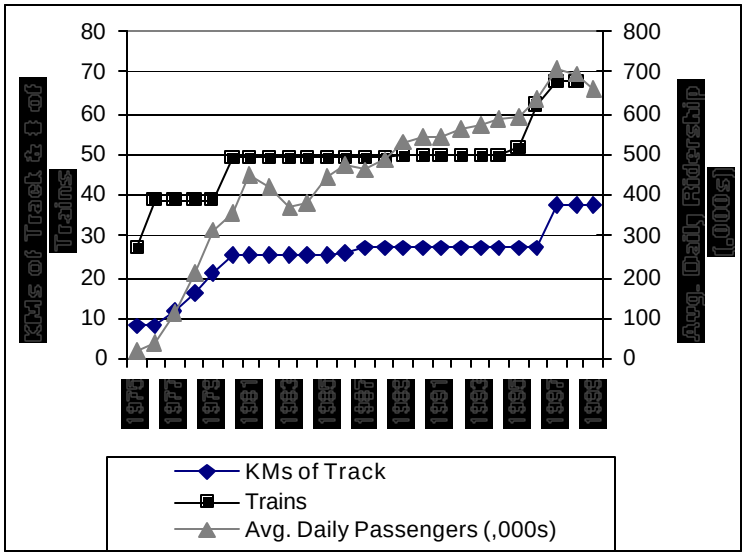
The principal transport modes in Greater Santiago[31] include walking, bicycling, private automobiles, taxis, shared fixed-route taxis ("colectivos"), buses, un urban rail system (Metro), suburban rail, and freight trucks. In recent years, automobile use has increased rapidly, Metro use has increased somewhat, while bus use has declined (see Figure 3.10).[32] According to results from the last travel survey (SECTRA, 1991), of the 8.4 million trips per work day in Greater Santiago, over 50% were public transport trips, 20% were walking trips, and 16% were automobile trips (see Figure 3.10). Bicycles, accounted for an estimated 1.6% of all trips (Iacobelli, et al, 1996). By 1998, the Metro was carrying close to 700,000 passengers per day, experiencing about a 12% ridership increase with the opening of Line 5 in 1997 (Metro, 2000b). In general, ridership growth has kept pace with Metro infrastructure development; since its opening average daily usage has only declined during periods of economic decline (1981-82 and 1998-99) (see Figure 3.11). Line 1 continues to dominate Metro ridership, accounting for 70% of all passengers carried in 1999; in the same year, Lines 2 and 5 accounted for 19% and 12%, respectively (Metro, 2000b). The MetroTren service, although experiencing increasing ridership levels in recent years, accounts for a minor portion of total trips in the RM – an average of 8,500 per day (EFE, 2000).[33]

FIGURE 3.10
EVOLUTION OF MODE SHARE IN GREATER SANTIAGO – % OF ALL TRIPS



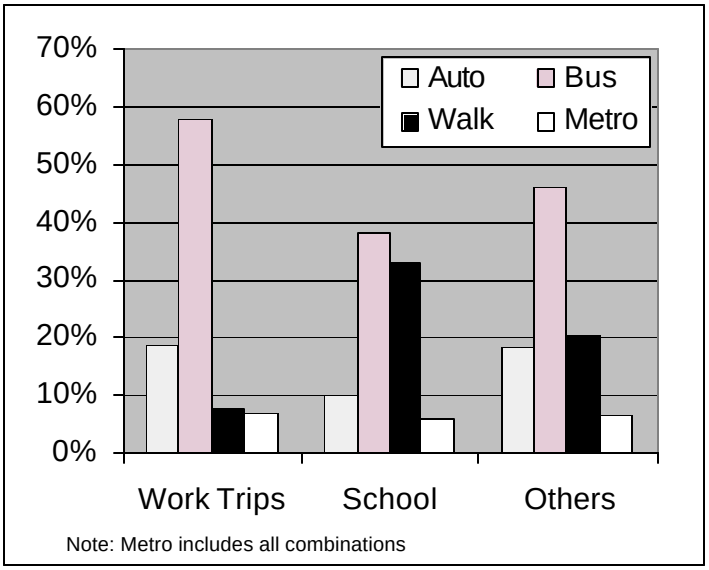
Source: SECTRA, 1991.

FIGURE 3.11
METRO RIDERSHIP AND INFRASTRUCTURE GROWTH IN TIME



Source: Metro, 2000b

FIGURE 3.12
PREDOMINANT TRAVEL MODES BY TRIP PURPOSE (1991)



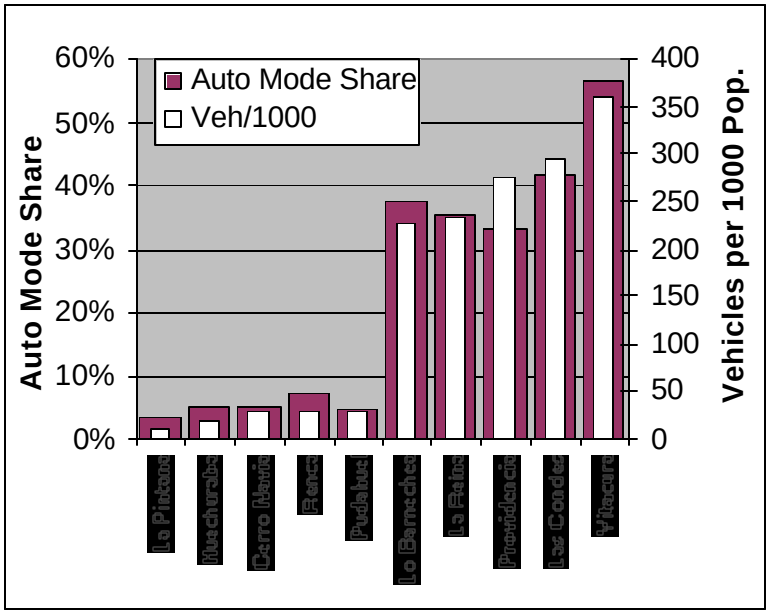
Source: SECTRA, 1991

As of 1991, trips were almost equally split between work trips (36%), school trips (32%) and other trips (32%). For all trip types, the bus in 1991 was still the primary mode, although for school trips, walking was also important (see Figure 3.12). Work and school trips predominate during the peak travel periods, while other trips remain relatively constant throughout the day.[34] Overall, in the city, trip-making has increased more rapidly than the urban population: between 1977 and 1991, total trips per capita increased by 86% and motorized trips per capita by 80%. In 1991, the city-wide average trip rate (trips per resident over 5 years old) was 2.12, ranging from 1.91 in the poorest households to 2.65 in wealthiest.

3.5.3 Vehicles and Modes

A main reason for the ongoing growth in motorized trip-making and, in particular, automobile use has been growth in income in the RM and subsequent increase in the motor vehicle fleet.[35] While relative levels of income have not allowed auto ownership rates comparable to the industrialized countries of the North, these rates have been increasing rapidly, particularly in recent years. While in 1952, the city recorded a motorization rate of just 14 vehicles per thousand population (CED, 1990), by 1977 this number reached 60 (SECTRA, 1991) and by 1998 there were an estimated 130 private vehicles per 1000 population in the RM (INE, 1998; INE, 1999).[36] By comparison, motorization rates in industrialized countries range from 300 cars per thousand people in Japan to 600 in the United States.

FIGURE 3.13
AUTO MODE SHARE & MOTORIZATION – COMUNA EXTREMES (1991)



Source: SECTRA, 1991.

Although the average RM-wide motorization rate is low, there is considerable range across income groups; indeed many of the upper income comuas exhibit motorization rates comparable to Western Europe (see Figure 3.13). These high levels of vehicle ownership are strongly correlated with high auto mode share.[37] For example, in Vitacura, the comuna with the highest motorization rate in 1991, nearly 60% of all trips are by automobile (see Figure 3.13). If impacts of income growth and vehicle fleet growth on trip-making serve as any precedent, then the future impacts of this rapid motorization on travel behavior will be significant: the 50% increase in vehicle ownership rates recorded between 1977 and 1991 coincided with a 61% increase in the automobile's share of total urban trips (see Table 3.3). If historical relationships between auto ownership and auto mode share have held constant, then private vehicles likely account for between 22% and 24% of all trips today.[38] Not only is automobile mode share growing, but the average length of motor vehicle trips is also growing, by an estimated 1.3% per year (Escudero & Lerda, 1996) – almost certainly a by-product of the ongoing expansion of the urban area.

Table 3.3
Greater Santiago – Evolution in Motorization, Auto Mode Share, Trips

	1977	1991	% Change	Annual Growth
Autos per 1000 pop.	60	90	50%	2.9%
Auto mode share	9.8%	15.8%	61%	3.4%
Trips per capita	1.14	2.12	86%	4.4%
Motorized trips/capita	0.95	1.7	79%	4.2%

Source: SECTRA, 1991

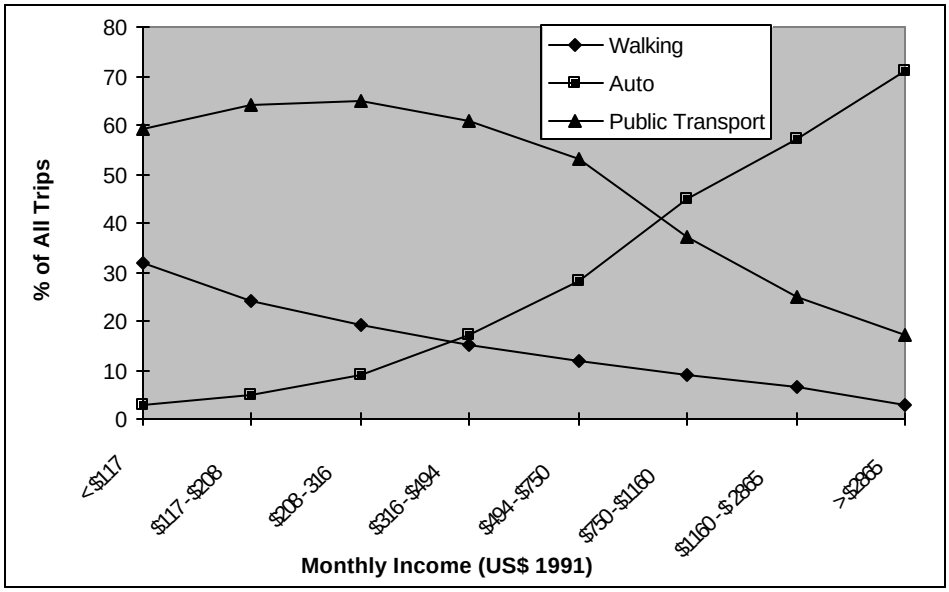
The increasing auto use has, predictably, been a major cause of the declining bus mode share. Here, the traditional vicious circle of increasing auto ownership, declining bus patronage, declining levels of service (both due to increasing congestion and reduced frequencies), and declining demand (ad infinitum…) takes hold. Just as income is positively correlated with auto use, it is – except for the lowest income groups – negatively correlated with bus use. In other words, buses exhibit the characteristics of what economists like to call an "inferior good" – its consumption declines with rising income (see Figure 3.14).

Any possible changes to this vicious circle must face the reality of the private sector operating structure of the bus system. After complete deregulation of service provision and fares during the 1970s-80s, the early 1990s brought the gradual re-introduction of regulation for road-based public transportation, with the concessioning of bus routes.[39] Through three different route concessions (1992, 1994, 1998), the government has induced incremental improvements to the bus system, reducing the overall number of vehicles (from a high of approximately 14,000 in 1992 to 9,000 today), stabilizing fares (see Figure 3.15), and improving quality of the service (see, for example, Dourthé et al., 2000). Today, the system is comprised of 355 different bus lines, 333 of which are concessioned (including 22 Metro-bus lines). Some 130 companies have concessions to operate, though not necessarily all are in operation. As of 1999, the bus system carried 4.7 million passengers per day (SECTRA, 2000). The system operates without any direct subsidy from the government.

Despite the improvements in recent years, the completely privatized system brings particular challenges to effective operation and integrated service provision and, subsequently, levels of service. The most noteworthy challenges include:

- On-street competition for passengers. Different lines compete on overlapping routes, particularly on main travel corridors, and drivers are paid, in part, according to the number of passengers carried. The result is often dangerous, aggressive driving patterns.
- Service and fare integration. There is no bus service integration, passengers must pay a fare for each bus boarded. So, instead of a system of feeder services and transfers, nearly all lines in the city run from periphery to periphery crossing the city center.[40] Not only does this system produce long and torturous routes for those on the periphery (typically the poorest), it causes duplication of services and a failure to to take full advantage of higher capacity modes on the densely traveled corridors (though still an important share of morning arrivals and evening departures from Metro occur by bus – see Table 3.4).[41]
- "Formalization" of the companies. The current bus system grew, essentially, out of the "informal" sector and many of the characteristics inherent to that sector prevail today – particularly, lack of modern business practices (proper maintenance, accounting, strategic planning, etc.). Government and bus company efforts have helped improve on this front, but problems persist (including poor training of bus drivers).

FIGURE 3.14
THE RELATIONSHIP BETWEEN INCOME AND MODE SHARE IN SANTIAGO

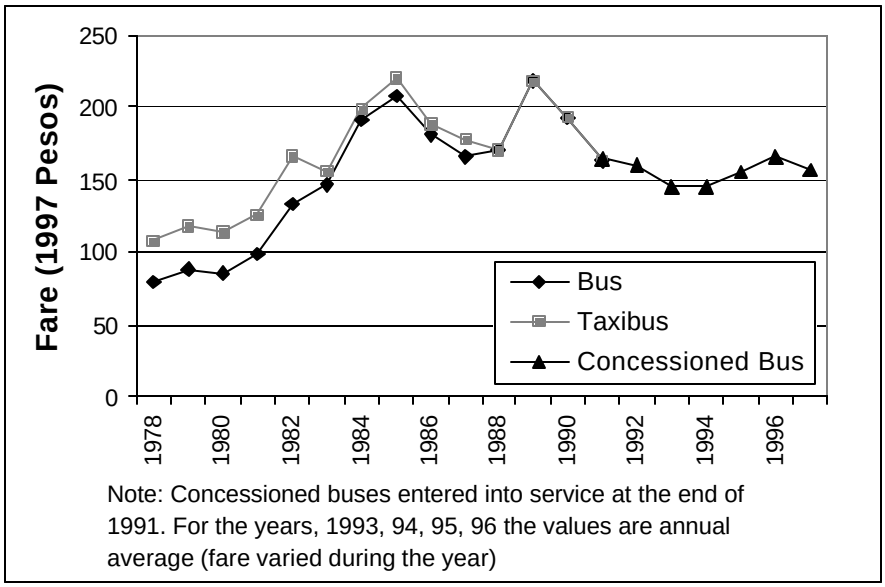


Source: Farah, et al., 1993

In addition to the above, other problems remain, which are not necessarily directly related to the private sector nature of the system. These include:

- Service and fare differentiation. There is no diversification of bus service offerings, instead one level of service quality prevails. While the fares (which have remained relatively constant in real terms during the 1990s – see Figure 3.15) are relatively affordable to the lower income groups in the city, for higher income groups these low fares translate into a relatively low service quality, which cannot compete with the alternative (the private car).[42] This suggests that room exists for a higher quality service geared towards professionals, such as an executive bus service.[43]
- Travel times and wait time. On average, bus travel times are 70% longer than automobile travel times (SECTRA, 1991). While this difference may in part be due to bus users' longer travel distances,[44] the slower travel speeds associated with congestion and frequent bus stops further deteriorates the competitiveness of the bus vis a vis the auto, especially when wait times at stops are included. There is a clear need for segregated rights of way for buses (i.e., exclusive bus lanes), plus accurate bus schedule information to reduce the uncertainty of wait times, to improve this situation.
- Overall public perception and status. In a rapidly industrializing country, auto ownership conveys a particularly important level of social status, while, conversely, bus use is stigmatized. Buses are viewed as uncomfortable, inconvient, and unsafe (both in terms of traffic safety and personal safety). It is often said that once someone acquires an auto, s/he will never get back on the bus.

FIGURE 3.15
EVOLUTION OF BUS FARES IN GREATER SANTIAGO



Source: Dourthé, et al., 2000.

Transportation authorities have long recognized these challenges to sustaining bus use and have made important strides in trying to overcome them. Nonetheless, the problems largely remain and the perception of the system in the eyes of most users (and many public authorities, particularly Municipal officials) is likely worse than actual system performance. Unless this situation is reversed, it seems difficult to reverse the trends towards continuosly declining bus patronage. The bus will be an option only for those with no other option and the commercial viability of bus enterprises will disappear.

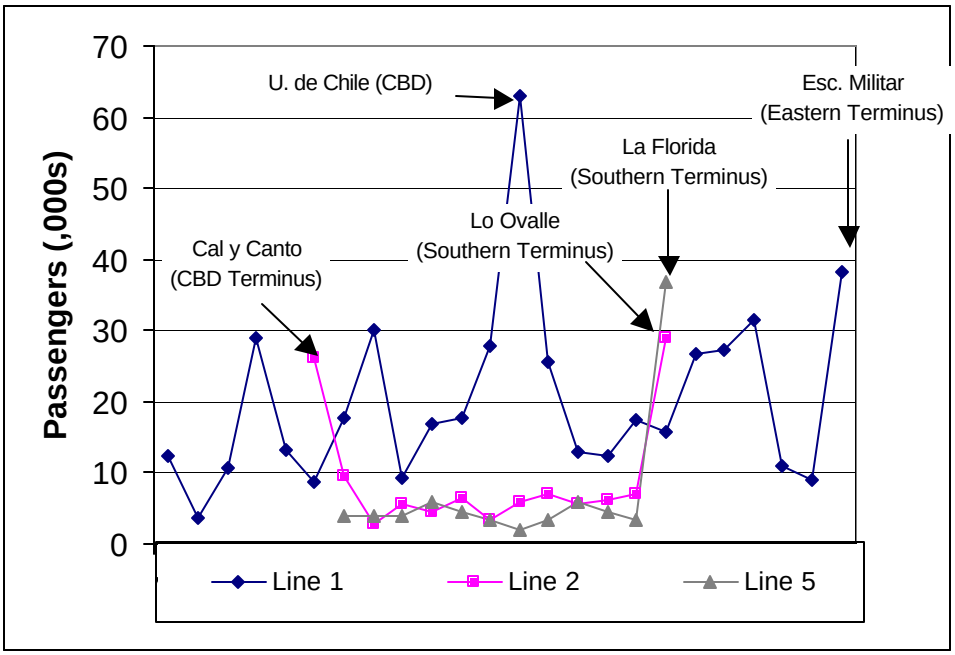
While relative road-based public transport usage has been in decline, the Metro has, in general, continued to increase its share in daily trip-making, although its role is limited by the relatively limited coverage of its network. Anecdotal evidence that the Metro does provide a viable alternative to driving for auto owners seems supported by empirical evidence. For example, at the aggregate comuna level, public transport mode share – controlling for auto ownership – is positively correlated with the presence of the Metro.[45] This is substantiated by data showing that in Metro's "areas of influence," public transport mode share increases to 76% (Metro 52%, bus 24%) (Metro, 2000a). Furthermore, in the morning and evening peak periods, nearly 20% of users are university-educated professionals, many of whom are likely auto owners (Metro, 2000b).

As mentioned earlier (and indicated in Figure 3.11), Metro has increased its ridership levels over time, in part through infrastructure and rolling stock expansion. Another important indicator of the system's success is its ability to cover annual operating costs through revenues, one of only a handful of Metro systems in the world to achieve this.[46] This result is due to a variety of factors including good system planning and efficient operations, plus the fact that Metro's fare policy is designed explicitly to cover operating

costs (including depreciation); maximizing social benefits is a second priority in terms of fare-setting policy. Regarding system financing, the central government funds all civil works construction (tunnels, tracks, stations), and the Metro itself finances the rolling stock, traffic control systems and related equipment, primarily via credit from various French banks (Metro uses French technology). Metro has experimented with some private sector financing of station improvements and is exploring various concession schemes for future station development.

Despite the successful financial operations of the Metro, the system's infrastructure – particularly Lines 2 and 5 – is underutilized. Peak demands on Line 1 approach 70% of the system's maximum theoretical capacity (50,000 passengers per hour per direction), but those on the other two lines fall far short (less than 30% of capacity) (Metro, 2000b). Interestingly, the success of Line 1, the first Metro line built, parallels experiences in other cities (such as Mexico City) where initial Metro lines often prove to be by far the most successful.

FIGURE 3.16
DAILY PASSENGER ARRIVALS AT METRO STATIONS (1999)



Source: Metro, 2000b

Line 1's high utilization can, in large part, be explained by the usage levels at each line's stations. Line 1 has seven stations with more than 25,000 passengers entering per day, while for Line 2 this level is reached only at the two terminal stations and for Line 5 it is only reached at the southern terminal station in La Florida (see Figure 3.16). These station usage profiles derive, in turn, from the land uses within each station's area of influence. As discussed earlier, Line 1 runs directly under the city's main East-West corridor – home to the most important concentration of the city's commercial and services land uses, along with a substantial share of housing. A main portion of Line 2,

on the other hand, runs for a considerable length in the median of the urban portion of the Panamerican Highway, effectively isolated from the surrounding urban area, while Line 5 also lacks integration into the urban fabric along much of its route.[47] As the great majority of trips on Metro during most periods of the day start and end as pedestrian trips (see Table 3.4), the lack of major origins and destinations within walking distance of the stations of Lines 2 and 5 certainly limits the system's patronage.

Table 3.4
Principal Modes of Metro Access/Egress by Time of Day (Work Day)

	Mode	8 – 9 am	11 am – noon	1 – 2 pm	4 – 5 pm	6^{30} – 7^{30} pm	9 – 10 pm
Access	Walk	36%	67%	73%	75%	79%	79%
	Bus	26%	16%	16%	13%	11%	9%
	Colectivo	13%	5%	3%	4%	3%	2%
Egress	Walk	87%	79%	75%	69%	50%	45%
	Bus	8%	12%	14%	16%	23%	22%
	Colectivo	2%	3%	4%	6%	14%	18%

Note: Bus does not include Metrobus. Source: Metro, 2000b.

Despite Metro's minimal service integration with surface-based public transport (as discussed earlier), buses and colectivos provide an important morning peak feeder service and, conversely, evening return service (see Table 3.4). These trips are mostly to-work and school trips (61% and 24%, respectively) and the subsequent return commutes (Metro, 2000b). As part of an effort to further build on this service integration, the government recently announced plans for so-called "mini-extensions" of the current network, extending Line 2 South to the Americo Vespucio Ring Road and Line 5 West to Quinta Normal. According to plans, both of these terminals and a revamped Line 1 eastern terminal (at Escuela Militar) would become large transfer stations, concessioned to the private sector.[48] Other plans for Metro development, under preliminary study phases, include extensions of Line 5 south to highly populated Puente Alto, extensions of the system north through Recoleta or Independencia, and/or a new line southwest to heavily populated Maipú. As part of the studies for these future potential projects, Metro will reportedly explore alternative technologies (such as light rail) as well as the use of concessions, at least for station construction.

Among the other motorized transport modes, there are two other passenger modes of importance, colectivos and school buses. Approximately 3% of trips are school bus trips, an important and growing mode of transport (SECTRA, 2000). Official data also indicate that the use of colectivos has also increased significantly, from less than 2% of all trips in 1991 to close to 6% today (SECTRA, 2000). With a distance-based fare, the colectivo provides important services to lower-density, suburban locations where buses run less frequently, if at all.

Among the non-motorized modes, walking dominates and – according to the results of Santiago's two travel surveys – overall walking trip share actually increased between 1977 and 1991, from 16% to 20%.[49] As mentioned earlier (see also Figure 3.12), walking accounts for an important share of school trips (33%) and non-school/work trips (20%) and, based on reported travel times, the average walk trip in Greater Santiago is approximately 1.5 kilometers.[50] Beyond serving its own trip ends, walking also provides critical access to public transportation, including the Metro (see Table 3.4).

Despite its prevalence in trip making in Greater Santiago, walking predominates typically among lower income groups. Similar to the case of buses, walking is apparently an inferior good, although its rate of decline at higher levels of income is not as drastic as in the case of buses (see Figure 3.13). While income does effect walking choice, it does not substantially affect walking trip times: average walking trip times range from 16 minutes in the highest income group to 19 minutes in the lowest. Farah, et al. (1993) interpret this result to mean that people that travel by foot in the city tend to stay within a given distance, irrespective of income. The fact that lower income travelers are restricted in many ways to foot travel and that distances by foot remain relatively constant across income classes indirectly indicates the lower overall levels of accessibility suffered by lower income groups.[51]

Non-motorized vehicles – especially bicycles for commuting and various forms of hand carts and tricycles for hauling light freight and for vending – are commonly used by lower income workers. An increasing number of middle and upper-income residents use bicycles recreationally. Unfortunately, no official statistics on bicycle ownership levels exist, and bicycle usage has not been accounted for in any travel surveys to-date in Santiago. A recent bicycle trip demand study commissioned by SECTRA, however, estimates that in 1991 approximately 1.6% of all passenger trips, or over 133,000, were by bicycle (Iacobelli, et al., 1996). Applying a household, in-person survey, the study found that the most likely bicycle users for daily trips are young people of low income, without an auto in the house, and with low educational level. Using stated preference techniques, the survey found that with implementation of a relatively dense bicycle network across the city (3.2 km of separated bikeways per km^2) and an extended Metro network (facilitating bike-metro transfers), over 13% of trip-makers would have been willing to consider the bicycle for daily trips and bicycle mode share by 2005 would approach 6%.[52] The majority of bicycle users would be trip-makers that otherwise would use motorized modes (primarily bus) and the second largest group would be students for school trips.[53]

3.5.4 Transportation, Land Use and Urban Form

Transportation has well recognized effects on urban growth and urban form. Transportation investments can bring significant changes in an area's relative accessibility levels and thus in land values and attractiveness for different land uses. Such investments, for example, can open up new areas for development (i.e., in the case of a highway on the urban fringe) or they can facilitate the densification of existing areas (i.e., in the case of a Metro increasing relative accessibility of an already urbanized area). Transportation investments and services, however, have other effects on urban growth

through externalities associated with traffic noise, air pollution, and safety risks. These "externalities" might well reduce the attractiveness of the affected area, driving down land values and influencing location choices.

Anecdotally, the Santiago metropolitan area's transportation system has manifested each of the above-mentioned effects on urban growth. As discussed in the previous section, historical evidence suggests that the early tram and railway systems played an important role in opening up new areas of the city for development as well as structuring radial urban growth. These patterns would later be repeated through motorization and road and highway system development. In the last three decades road upgrades leading to the east and southeastern suburbs have played a role in the rapid suburban growth there, the completion of the Vespucio Ring Road upgrade has carried alongside important industrial and commercial/office development in the north and northwest, and recent highway upgrades in the north are coinciding with rapid residential and industrial growth in that region of the RM. Have these highway and road improvements caused Santiago's accelerating urban expansion?

Questions about the influence of highway development on urban expansion in the RM parallel a longstanding historical debate in the U.S. about whether highways cause urban "sprawl" or whether highways simply serve a "sprawl" that would have occurred anyway (see Boarnet & Haughwout, 2000). Empirical attempts to answer such questions are confounded by methodological and data challenges. Early results from Martínez' (1996) application of an integrated land use-transport model to Santiago indicated that other factors (such as neighborhood income level or household size) might dominate household-level "accessibility" in residential choice decisions. For firms, measures of transportation "attractiveness" were shown to be significant for retail firms only. These apparently mixed effects of transportation variables on land use decisions suggest that the real answer to whether highways serve or cause "sprawl" lies somewhere in the middle ground. Development in the eastern suburbs of Lo Barnechea was already underway in the late 1980s when the government expanded an important roadway access to the area (at the urging of real estate developers, see Section 5.3.1), leading to widespread suburbanization there through much of the 1990s. The middle class suburb of La Florida underwent rapid suburbanization even before major upgrades to the radial roads leading there. Chacabuco Province has already seen some degree of suburbanization, although the major planned projects cannot proceed without the major roadways planned (including the concessioned highway proposed by the private sector). In the end, highways in the RM might not be "causing" urban expansion, but they are certainly accelerating and intensifying it. The ultimate effects depend largely on how sensitive different firms and households are to transport costs (relative to other factors) and how these relative sensitivities evolve in time.

In the case of Santiago's Metro, the "evidence" of effects on urban growth is equally inconclusive. Significant densification occurred above the eastern portion of Line 1, with some urban transformation (such as Providencia's commercial center) linked explicitly to the arrival of the Metro in the mid-1970s. Development along Line 1 west of the city center has been much less pronounced, however, and Line 2 has been sharply criticized

for not generating anticipated land development. Line 5, which has only been in operation since 1997, has had marginal impacts to date on land development. Much of the major commercial development at Line 5's southern terminal station existed before the Line was built, although more recent intensification may have been influenced by the Line's completion.

Kain and Liu (1994) suggest that if Metro "investment did not come at the expense of other urban transport investments for Santiago that might have increased mobility by more" then Metro's "first order" effects were to encourage suburbanization. In fact, as will be discussed in Section 4.1.4, Metro investments in Santiago may well have substituted for other transportation investments in the metropolitan area, so that Metro may have actually discouraged suburbanization. Kain and Liu (1994) also suggest that, while the Metro may have increased center city employment (if employers were otherwise discouraged from locating there due to high transportation costs), it may have also caused the linear employment densification along Line 1's eastern portion. In this case, Kain and Liu posit, the Metro may have planted "the seeds of its own destruction" by reducing the importance of the city center and thus reducing radial travel demand that the Metro best serves. Line 1's station ridership profile (see Figure 3.15), however, suggests that high usage levels at eastern intermediate stations actually increases the Line's viability.

In the end, the debate about Metro's effects on land use hinges on the same theories and empirical questions as those outlined for highways above. In large part, it depends on the importance of travel costs relative to other factors which influence different land consumers' choices. The relative importance of travel costs will vary by socio-economic class as well as by land use type (services, retail, industry). Metro's accessibility may explain a large share of the retail concentration along the eastern portion of Line 1, while that same area's high income concentration may have played a more important role in office and service concentration.

We have not found any studies examining the effects of transportation's "external" impacts (i.e., noise and traffic safety) on land use patterns in Santiago, although observations suggest that in some areas of the city these effects might be significant. Land uses along densely traveled corridors (such as the east-west corridor Apoquindo-Providencia-O'Higgins) certainly suffer from traffic noise, while dense traffic and high rise buildings exacerbate air pollution concentrations in the city center. Further study would be required to determine whether the improved accessibility brought to these areas by heavy transportation flows more than outweighs the negative effects. If the negative effects outweigh the positive, then the metro area's middle ground (literally, mediterranean) comunas are suffering at the expense of the outlying comunas – a problem which will only be exacerbated by new radial highways and road expansions which serve the outlying areas and cut through the city center.

3.5.5 Land Use, Urban Form and Transportation

As transportation infrastructure and investments impact land uses, land uses and urban form also influence the transportation system. Indeed, at the metropolitan level, the

spatial distribution of residences, offices, schools, etc. and the associated distribution of trip generators and attractors is the underlying foundation which drives virtually all transportation activity.

Several characteristics of Santiago's land use system have continuously been cited as predominant factors influencing transportation system performance, including (see, for example, CED, 1990; CONAMA, 1998):

- a historical concentration of trip attractions in the city center;
- socio-economic segregation, which produces long work, school, and shopping trips from lower income neighborhoods to upper income neighborhoods where better employment, shopping and educational opportunities are often concentrated; and,
- functional segregation, which results in many, often long, trips from less well-equipped zones to those areas with a greater diversity of land uses and activities.

As seen in Section 3.4.2, the metropolitan area still focuses a large share of non-residential uses in the city center comuna of Santiago (see, also, Table 3.2), meaning that that comuna continues to be an important focus of trip destinations in the metro area. In looking at overall urban form factors, researchers often make note of the so-called jobs/housing balance – comparing the number of jobs in a given zone with the number of residents – since work trips comprise an important share of peak period travel and thus traffic congestion. Kain and Liu (1994), using data on the number of morning worktrip origins and destinations by comuna (from the Greater Santiago 1991 origin-destination survey) show that the comuna of Santiago had seven times more jobs than residents, followed by Providencia, with almost four. Thirteen comunas had a jobs/housing ratio of between 1.8 and 0.8, showing some relative measure of balance, while 19 comunas showed a "shortage" in jobs, with 0.2 to 0.7 jobs per resident.

While work trips do make up an important share of morning peak trips, so do school trips – a relative school/housing imbalance also exists in Greater Santiago, particularly for lower income peripheral residents. Many lower income schoolchildren are thus forced to make long school trips to other comunas; at the same time, middle income residents also often choose to send their children to schools in other comunas, often prestigious private schools located either in the city center or in upper class neighborhoods. The resulting dense school trip flows have been a point of concern for authorities; SECTRA, for example, has been recently exploring school location policy as a transportation system improvement measure. Beyond public investments in educational facilities in the poorest comunas, another idea that has emerged in practice (in, for example, the new suburbs of Chacabuco) is the development of private school affiliates across the metro area. The problem is not easily solved, however, since many parents prefer to send their children to prestigious schools (or at least schools in higher income comunas) due to social contact "externalities" (contacts made during pre-university schooling have long been regarded as key to future success in Chile).

Authorities and planners have also identified the creation of metropolitan "subcenters" (see, also, Section 4.3.2) as a way to decrease the service and employment deficits in

many comunas and thereby alleviate travel burdens, particularly on the city center. A lack of instruments, however, has hampered the government's ability to move most of these sub-centers beyond their appearance on Plan maps.

Recent urban growth trends, as exhibited by issuances of building permit types, suggest that some other land uses may finally be following the massive residential outgrowth seen over the last 30 years (see Section 3.2). As discussed in more detail in Section 5 (see, particularly, Tables 5.6 and 5.7), the 1990s have seen a growing focus of commercial and industrial development in non-central comunas, although Santiago still concentrates a heavy share. Office building activity, which has focused heavily on Las Condes and Providencia in recent years, is also noticeably spreading to Vitacura, plus the northern comunas of Huechuraba and Quilicura. Some large office and industrial megaprojects currently underway (see Section 5.4) seem to confirm the emergence of this "edge city" phenomenon. While potentially alleviating the heavy central city focus of current trip flows, the subsequent trip patterns that might result from a pronounced "edge city" emergence in Santiago may well produce suburb-to-suburb travel patterns that even more heavily burden the existing transportation system.

Beyond metropolitan level land uses, more "local" urban form factors – including densities, local distribution of land uses, street design and layout – can also affect travel behavior. Among researchers of the subject, however, little consensus exists on the overall importance of these factors on outcomes such as travel mode choice, trip frequency, and distances traveled by vehicles. Newman and Kenworthy (1989), for example, use an international comparison of urban areas to support the argument that denser cities result in lower automobile use (as measured, for example, through per capita gasoline consumption). This result is not surprising. In a denser city, locations are relatively closer together, resulting in a lower average trip length. Furthermore, the denser clusters of users' origins and destinations may also improve the service levels and reduce the unit operating costs of public transport, thus making it a more attractive mode. Shorter trip distances also encourage more use of non-motorized modes.

While intuitively attractive, such arguments are not easily supported by careful empirical analysis due to the difficulty in separating the effects of urban form from other influencing factors such as household size, relative travel costs, socioeconomic characteristics, etc. Furthermore, Crane (1999), in a recent attempt to systematically review and characterize the literature and empirical work on the relationship between urban form and travel, criticizes the lack of a microeconomic behavioral theory underlying most of the relevant analysis. Without such a conceptual framework, it is difficult to use the data to support any causal conclusions. Although most studies may suggest that local urban form factors play a role on travel behavior, the relationships are "highly specific to each community" and there are "few if any" generalizable "transparent influences of the built environment on travel behavior" (Crane, 1999).

So, even if analysis in the United States shows that higher urban density (controlling for household income, household size, and urban area size) can reduce auto use (measured by vehicle distances traveled and automobile mode share), particularly at density levels

still common to developments in the Santiago metropolitan area (see Pickrell, 1999), these results cannot be extrapolated to the Chilean case. At the same time, little work has been conducted in Santiago exploring the impact of urban form and related factors on passenger travel behavior. Kain and Liu (1994), in a series of regression formulations on comuna-aggregate data in Greater Santiago, find little evidence to support the role of density in determining public transport mode share. At a similar, aggregate comuna level analysis, we find no statistically significant relationship between the simple measures of density and either public transport or walking trips (holding auto ownership constant). Interestingly, a comuna's relative mix of land uses – a rough measure of a comuna's land use "diversity" (see Section 3.4.2) – is negatively correlated with walking use (holding auto ownership constant).[54] In other words, comunas with high walk mode share, which also tend to be the poorest (see Figure 3.13), have a lower relative mix of origins and destinations, lending further credence to the suggestion in Section 3.5.3 that these comunas suffer from lower overall levels of accessibility.

Few concrete conclusions can be drawn from this comuna-level aggregate analysis for Greater Santiago. For example, the measures of both residential comuna density and relative mix of land use are too aggregate and roughly estimated to reflect actual local conditions which might really impact travel behavior.[55] Further research needs to be carried out on the influence of urban form and travel behavior in the Santiago metropolitan area. The 1991 origin-destination survey provides a rich data source as a starting point for just such an analysis. Not only would such work improve understanding for the Santiago case and subsequent policy-making, but also lend further substance to the larger body of empirical work continuing around the world.

3.6 The Environment

As with any human settlement that has undergone rapid industrialization, economic development, population growth, motorization, and spatial expansion, the RM exerts considerable pressures on its natural environment. Although detailed treatment of Santiago's environmental problems are beyond the scope of this paper,[56] they need to be mentioned because they carry important implications and justifications for urban growth management and transportation system management.

Santiago's most notorious environmental problem is air pollution; the city holds the dubious distinction – along with Mexico City and São Paulo – of suffering from the worst air pollution levels in Latin America. Much of the RM's pollution problem stems from the city's climate and topography. A thermal inversion acts as a cap over the city during the fall and winter, inhibiting – together with the city's location in a mountain-throned valley – the dispersion of pollutants. The first major efforts to address the problem date to the late 1980s and were strengthened first by the formation of the Special Commission for Pollution Reduction in the RM and later by the 1994 passing of national environmental legislation and the subsequent empowerment of CONAMA and COREMA.

Based on the 1994 environmental legislation, the RM was declared in violation (*zona saturada*) of established norms for total suspended particulates (TSP), respirable

particulates (PM_{10}), ozone (O_3), and carbon monoxide (CO) and at risk of violation (*zona latente*) for NO_2.[57] As can be seen in Table 3.5, transportation is by far the principal source of CO and PM_{10} (when road dust is considered) as well as virtually a majority source of ozone, a photochemical product of NOx and volatile organic compounds (VOCs) – especially since transport accounts for such a high portion of NO_x, which apparently is the key pollutant to control to reduce the probability of ozone formation.[58]

Table 3.5
Transportation Contribution to Pollutants in the RM

Vehicle Type	PM_{10}	CO	NO_x	VOCs	SO_2
Private Vehicles	0.5%	46.2%	21.6%	21.8%	1.3%
Commercial Vehicles	0.8%	25.6%	12.1%	12.2%	1.9%
Taxis	0.1%	10.5%	4.4%	4.8%	0.5%
Trucks	2.3%	7.7%	19.9%	4.4%	6.4%
Buses	2.8%	2.0%	12.5%	2.1%	4.8%
Motorcycles	0.0%	0.3%	0.0%	0.4%	0.0%
All Vehicle Types	85.5%*	92.3%	70.6%	45.7%	14.9%

*Note: For PM_{10} the transportation total contribution includes fugitive road dust, which in the table is not attributed to individual vehicle types. Source: CONAMA, 1998.

The first half of the 1990s showed improvements in dangerous concentrations of respirable particulates: in the period 1989-95, emergency conditions declined from 10 to 0 and pre-emergency from 30 to 10. Days in violation of CO concentrations also declined by one half to 56 in the three years up to 1995. Ozone has been more persistent, although concentrations vary consiberably across the region.[59]

The many additional environmental problems facing the city include (CONAMA, 2000b):

- land conversion – the loss of quality agricultural land in the fertile Mapocho and Maipo River valleys (see also Lagos, 1992; Ormazábal, 1994), urbanization pressures on the RM's few wetlands, and the loss of fragile foothill ecosystems with important implications for erosion, flood control, species loss, and the region's microclimate (see also Romero, et al., 1995);
- water pollution and depletion– irrigation and river water (both the Maipo and Mapocho) polluted by untreated residential and industrial sewage,[60] groundwater supplies vulnerable to nitrate deposition (particularly in the north and southwest), and groundwater supplies at risk of depletion, especially in the Province of Chacabuco;
- noise pollution – 80% of the population living or working along the city's principal transportation arteries suffers some risk of hearing loss[61] and nearly 70% of residential or mixed residential land is, according to international standards, considered inadequate for these uses due to noise levels (see also, Intendencia, 1989);
- solid waste disposal – 80% of domestic solid waste makes it to landfills although at least 100 illegal landfills operate in the RM and per capita household solid

waste disposal has been growing at 2% per year, the majority of industrial waste is subject to no controls and is disposed of illegally;

- open spaces – less than 2.5% of the RM's urbanized area is dedicated to greenspaces, resulting in a per capita average 40% lower than the internationally recommended norm.[62]

4. Government Interventions & Influences

4.1 Public Finance

Public finance, both a government's revenue-raising activity and its spending (on infrastructure and services), plays an important role in urban development patterns. Among the relevant aspects of public finance that can have effects on urban growth and settlement patterns are: differential tax systems between jurisdictions, various tax breaks and incentives for housing or other land uses, spending on services (i.e., education and health), service delivery levels (and pricing for those services), and transportation investments (see, for example, Nivola, 1999; Mieszkowski & Mills, 1993). Here, we overview these and other factors at the central, regional, and local government levels in Chile. While we primarily focus on the effects these factors have on development patterns within the RM, we also touch on what role they might play on encouraging/discouraging migration to the RM from other parts of the country.

4.1.1 Central Government

The central government remains the most important level of government in terms of public finance, not only accounting for 95% of all taxes collected nationally (Barra & Jorratt, 1998), but also investing a large share of these resources, devising the mechanisms for redistributing these funds to regional and municipal governments, and setting the rules by which municipal governments can raise revenue (regional governments have no direct revenue-raising mechanisms). The central government raises almost 60% of *its* revenues through consumption taxes (44% through the value added tax [VAT] and 15% through other special consumer taxes), almost one-third through income taxes (18% and 9% from corporate and personal, respectively), and another 12% through customs duties (Barra & Jorratt, 1998). These revenue-raising mechanisms have virtually neutral spatial effects; residents' income or sales tax incidence do not vary depending on where they live.[63]

As far as central government spending is concerned, controlling for tax payments, poverty, and income redistribution, the RM apparently subsidizes the other regions – at least concerning public expenditures on education and health (Glaeser, 1994). The only exception to this is the case of higher education – the nation's most prestigious public (subsidized) universities are in the RM, which stimulates some level of migration to the region. Rough evidence presented in Section 4.1.4 below suggests that the RM also subsidizes transportation investments in other parts of the country.

4.1.2 Regional Government

As mentioned, regional governments in Chile have virtually no independent revenue-raising capability, depending almost completely on government transfers for investment and operating resources. The Intendente of the region has responsibility for formulating the annual budget proposal, for approval by the Regional Council, and submission to the National Government (according to its budget priorities and capacties). A major portion of the regional budget proposal specifies the spending of the National Fund for Regional Development (*Fondo Nacional de Desarrollo Regional* or FNDR). The FNDR was originally created together with the Regional Government structure in 1975. At the time a minimum floor of 5% of national income was to be dedicated to the FNDR, a minimum that was later removed due to concerns about limiting the central government's fiscal independence (Boisier, 2000). Today, the total amount of FNDR resources available is determined at the national level and then is distributed to each region according to the following criteria (Subdere, 1993):

- 45% based on a region's socioeconomic characteristics (infant mortality, income per capita, etc.);
- 45% based on specific regional characteristics such as differential infrastructure construction costs, distance from the RM, environmental conditions, etc.;
- 5% based on measures of efficiency of past years' investments; and
- 5% for emergencies.

The other principal component of the regional budget is sectorially specific – regionally assigned sectoral investments (*inversión sectorial de asignación regional* or ISAR). These investments are assigned to a particular sector (of a Ministry's responsibility), but allocated to a particular region. The regional government determines how to distribute ISAR resources among projects approved by the respective Ministry in the following sectors: road maintenance, road paving, basic housing, and sports facilities. A similar mechanism – locally assigned sectoral investments (*inversión sectorial de asignación regional* or IRAL) – exists designed to funnel revenues through the regional government to sectoral investments to be made by municipal authorities. Finally, regional governments can form special agreements with national Ministries for multi-year projects, jointly financed by each entity, in areas such as housing or educational facilities.

In the Metropolitan Region, regional investments through FNDR, ISAR, and IRAL over the period 1993-1997 totaled approximately US$140 million, with both FNDR and ISAR comprising 43.5% of the total, and IRAL comprising 13% (GoRe, 2000). At least in the case of the FNDR, these investments have apparently favored the rural comunas of the RM over the 34 comunas of Greater Santiago – per capita FNDR spending was 4.5 times higher in the former (SERPLAC-RM, 1999b). This indicates some attempt by regional authorities to use their available resources to favor the typically poorer rural comunas.

As part of government plans to decentralize administrative power, the President announced in 1996 plans to increase the level of regional decision-making, so that regionally-determined investments comprised 42% of all public spending by the year 2000. Although regional investments have been increasing at a rate of 6% per year,

expenditures in the RM are distant from the Presidential goal – in 1998, FNDR, ISAL, and IRAL spending accounted for just 8% of total public investments in the region (SERPLAC-RM, 1999b).[64] Furthermore, and as alluded to in Section 2.1.2, there are indications that the distribution of ISAR funds is more closely tied to Ministerial priorities than regional government priorities (IG-PUC, 1999).

4.1.3 Local Government

Unlike the regional governments, Municipalities do have some level of fiscal autonomy, although their revenue-raising and spending capabilities are constrained somewhat by central government dictates and redistributive objectives. On the revenue side, the principal sources of income for Municipal governments are: the property tax, motor vehicle registration fees, various business licenses, a used motor vehicle transfer tax, fees for services (such as garbage collection), revenues from fines, and transfers from the central and regional governments. Ignoring transfers, property taxes comprise the largest single source of municipal revenues – in 1997, at an aggregate level, property taxes accounted for 76% of total Municipal government revenues, followed by vehicle registration fees at 14%, business licenses at 7%, and used vehicle transfer taxes at 3% (Barra & Jorratt, 1998).

The property tax, levied on the capital value of land and buildings, is collected annually by the central government's General Treasury (*Tesorería General de la Republica*). The government returns 40% directly to the Municipality and keeps the remaining 60% for redistribution via the Municipal Common Fund (*Fondo Común Municipal* of FCM, discussed further below). The property tax is based on government assessed value, which legally should be revalued every 10 years. Re-appraisals have, however, been sporadic, at best. As of 1994, Youngman & Malme (1994) reported that property re-appraisal had not occurred since 1977 for non-agricultural properties and 1980 for agricultural properties.

Table 4.1
Property Tax Structure

Property Type	Base Rate	Additional Central Government Surcharge
Commercial, Industrial	1.4%	0.025%
Residential Appraised Value < $19,000	Exempt	Exempt
Residential $19,000 < Appraised Value < $68,000	1.2%	Exempt
Residential $68,000 < Appraised Value	1.4%	0.025%

Note: Figures denoted in US$1995, based on average exchange rate in 1995.
Source: ACHM, 1995.

In 1995, the government passed a law which gave comunas two options regarding revaluation, essentially attempting to compensate for the lack of re-appraisals and

simultaneously trying to stimulate re-appraisals.[65] Technically, as of January 2000 all properties in all comunas should have been re-appraised, although we were unable to confirm whether this has actually occurred. As seen in Table 4.1, the current property tax structure indicates a slightly progressive structure, with commercial/industrial uses and high value residential properties paying a higher rate, plus a slight central government surcharge (surcharge revenues do not go into the FCM); furthermore all properties valued under $19,000 (US$1995) are exempt from taxes. As of 1994, 69% of all properties in the country were exempt from property tax payments (ACHM, 1995). The 1995 law also implemented a surcharge on undeveloped urban land to stimulate its development.[66] All property tax appraisal values are subjected to an automatic annual adjustment based on inflation (ACHM, 1995).

The second most important source of Municipal revenues, vehicle registration fees, also constitute a relatively rapidly growing (buoyant) source due to the country's rapid motorization rate. The central government sets the rate at which this fee is set, which ranges from 1% of assessed value for private motor vehicles worth less than $2,700 and up to 4.5% of assessed value for vehicles worth more than $18,000. The average per vehicle fee is $121 annually. Taxis, buses and colectivos pay approximately $50 and trucks pay in the range of $25 to $150 according to weight. Fifty percent of revenues collected via the registration fee must be passed along to the central government for subsequent redistribution via the FCM. Even with this redistribution, the Municipalities clearly view vehicle registration fees as an important revenue source – in the relatively highly motorized comuna of Providencia, for example, registration fees after contribution to the FCM still account for 20% of annual Municipal revenues (Zegras & Litman, 1997a) – and actively compete for registrations.[67]

Business license (*patente*) fees also play an important role in comuna finance. In this case, Municipalities have some freedom to set the relevant charge – within a range of 0.25% to 0.5% of the business' declared capital value. There are, however, both minimum and maximum amounts which can be charged to any business, currently $52 and US$208,000, respectively. Four comunas in the country are required to contribute a share of business license fees to the FCM: Santiago must contribute 55% of license fees collected and Providencia, Las Condes and Vitacura must contribute 65%. In the case of used vehicle transfer fees, half of the collected funds must also be contributed to the FCM.

Municipalities also charge households for garbage collection (business garbage collection fees are included within the business license). This charge is made three times per year; Municipalities are supposed to set the fee based on average service costs, with the freedom to differentiate tariffs according to garbage production rates and socioeconomic conditions of residents. All housing appraised at less than $1,300 (in 1995) is exempt from paying garbage collection. Finally, Municipalities have several other minor revenue sources (such as drivers licenses, renting of public advertising space) (ACHM, 1995).

As might be expected, given the vast socioeconomic disparities across comunas (see Section 3.3) and high concentration of businesses and motor vehicles in certain comunas

(see Sections 3.4.2 and 3.5.3), there is a great disparity in revenues across Municipalities. Nationwide, the comunas of Santiago, Providencia, Vitacura, and Las Condes account for 21% of all Municipal income generated from vehicle registrations, 39% of all income from business licenses, and 36% of all income from property taxes. The top ten percent of the nation's richest comunas account for 39% of income from vehicle registrations, 49% from business licenses, and 54% from property taxes (Subdere, 2000a). Within the RM, Providencia generates 61 times more resources per capita than Cerro Navia or La Pintana (Subdere, 2000a). To address this disparity, in 1991 the central government established the FCM. The FCM – as mentioned – draws its financing from portions of several Municipal revenue sources and is then distributed according to criteria of equity and efficiency (see Table 4.2).

Table 4.2
The FCM - Contribution Schedule and Criteria for Distribution

Contribution Schedule	Criteria for Distribution
• 60% of Property Tax Revenues • 50% of Vehicle Registration Fees • 55% of Santiago's Business license revenues; 65% of those from Providencia, Las Condes, Vitacura • 50% from used vehicle transfers • Central Government contribution	• 10% equal across Municipalities • 10% according to poverty levels • 15% according to population • 30% according to land exempt from property tax • 35% according to Municipal per capita revenue relative to national average • 5% based on criteria of Municipal management efficiency[68] • 5% for emergencies

Even with the FCM in operation, disparities among comunas remain high, counting FCM transfers the richest comunas in the RM still have 8 times more income per person than the poorest (Subdere, 2000a). To address this, the government has been moving forward a Municipal finance reform, whose principal components are doubling the maximum business license fee to $416,000, increasing to 75% the share of vehicle registration fees to go to the FCM, and increasing from 60% to 65% the share of property tax revenues to be contributed to the FCM from the comunas of Santiago, Providencia, Vitacura and Las Condes. Estimates show that no Municipality will suffer reduced revenues from this reform, the poorest third of comunas in the country will increase their incomes by between 5% and 15% and the disparity in per capita revenues between the poorest and richest comunas in the RM will be reduced from 8 to 7 (Subdere, 2000a).

The increase in comuna revenues will be critical if the Municipalities are to assume a larger portion of spending responsibility. Relevant operating expenditures include those on Municipal personnel; costs of street light operations and maintenance; maintenance of public spaces, streets signs and traffic signals; and operating expenditures for education and health services. Furthermore, Municipalities must undertake certain investments, such as street paving, street light installation, parks, sewerage and water supply infrastructure, roads and bridges, education and health facilities, etc. Many of these investment responsibilities are supported by national and/or regional finances (beyond the

previously mentioned transfers). In addition, in the last two decades, real estate developers have been called on to make investments in infrastructure related to their subdivisions (in-kind exactions); while originally these were primarily in roads, street-lighting, and public space, recent requirements have moved to extend the reach of these in-kind exactions to include education and health facilities and other infrastructure related to urbanization and population growth (see Section 4.9).

Current law prohibits Municipalities from going into debt (i.e., issuing bonds), although they can effectively bypass this prohibition by indebting themselves to private contractors undertaking public works. Reportedly, Municipal governments in the past were able to use the equivalent of tax increment financing (TIF) – whereby infrastructure improvements in a specific area are financed by the eventual increase in tax revenues generated by property appreciation due to the improvements. It is unclear whether this instrument was used at a time when Municipal governments had bond issuance powers, but SUR (1999a) reports that this instrument was widely used for infrastructure development during the 1940s.

4.1.4 Transportation Finance

Transportation system finance has important spatial effects, both due to potential subsidies between regions in the country and due to effects of investments within a region. Further, transportation pricing, for both highways and public transport, can have impacts on urban land use patterns (Lee, 1999). In Chile, the relevant revenue mechanisms in the transport system are fuel excise taxes (a dedicated road user tax, beyond the VAT, is charged to gasoline and diesel),[69] road tolls, vehicle registration fees, and public transport fares.

In terms of expenditures, at the national level in Chile, aggregate road user charges tend to greatly exceed aggregate road expenditures (by an average of almost US$300 million per year during the 1980s) (World Bank, 1994).[70] In comparison with the rest of the country, the RM apparently contributes more road user revenues than it gets in return. According to INECON (1997), the RM was to receive about 22% of ministerial, municipal and private sector programmed road expenditures in the country between 1996 and 2000. Since revenues likely closely correlate to number of motor vehicles, and the RM concentrates 45% of the nation's motor vehicle fleet (INE, 1999), these percentages suggest that Santiago contributes roughly twice as much revenue than it receives in road transport infrastructure expenditures, especially considering that land costs and infrastructure provision are likely higher in the relatively densely populated RM. For another perspective, Zegras & Litman (1997a) estimate that roadway users in the 34 comunas of Greater Santiago paid $220 million more than related direct government roadway expenditures in 1994.[71] These calculations omit, however, national government expenditures on Santiago's Metro construction. Capital costs for construction of Line 5, for example, averaged roughly US$100 million per year over its initial construction period in the mid-1990s. So, road users in Greater Santiago essentially subsidize Santiago's Metro construction[72] and still contribute more in revenues than the transport system gets through government expenditures.

This apparent positive net contribution of RM road users to government coffers has several interpretations:

- the roadway user revenues are used for general income re-distribution purposes, across regions and/or income groups (including via the FCM);[73]
- the excess roadway user revenues serve as a proxy charge for transportation's "external costs," such as air and noise pollution – by one estimate, in 1994, motor vehicle air pollution in Greater Santiago implied minimum external costs in the range of US$165 to $520 million (Zegras & Litman, 1997a);[74]
- a shortfall in government spending for roadway maintenance and, perhaps, expansion in the RM.

Regarding the last point – potential under-investment in infrastructure expansion – this cannot be confirmed without accounting for the inefficiencies that arise from the use of specific roadways during periods of peak demand – or congestion. Without charging users for congestion, the allegation of under-investment in road infrastructure is tenuous; setting prices below the marginal cost[75] (i.e, not charging for congestion) will result in an over-investment in infrastructure (see, for example, Lee, 1997). So, the apparent under-investment in road infrastructure expansion (but not maintenance) in Greater Santiago might be justified as a way of compensating for the lack of congestion charges in the city. Clearly, however, this approach is less efficient than implementing congestion pricing; furthermore, the presence of unpriced congestion likely contributes to urban outgrowth and dispersion of activities, by making the center city less attractive, particularly for employment (Kain & Liu, 1994). Efficient pricing would ultimately produce an intensification of land uses in the urban area, less land dedicated to transportation infrastructure and a more compact overall metropolitan area (Lee, 1999).

Unfortunately, the government has been unsuccessful in moving forward its congestion pricing proposal, so rough second- or third-best pricing and investment policies remain in place. To a small degree, this stands to change with the development of urban highway concessions in the RM, which will likely ensure long-run marginal cost pricing on at least a few facilities in the region (see, also, Sections 2.3 & 4.10.1); but, without a comprehensive pricing policy in place, this program could just as easily exacerbate the current situation by distorting overall sector policy and strategy (Menckhoff & Zegras, 1999).

In terms of public transport user fees, the private sector operated bus system ostensibly charges competitive fares (fares are part of the route bidding award criteria), but these are not true marginal cost prices. Fares do not vary by distance or by peak- and off-peak travel periods, creating potential spatial distortions (encouraging urban expansion), producing inequities among users, and threatening the long-run viability of operators.[76] As mentioned in Section 3.5.3, the Metro recovers its operating costs through farebox revenues; the Metro also varies fares according to travel period, but not according to distance.

Metro infrastructure, however, is financed entirely by the central government (perhaps via an indirect subsidy from RM motor vehicle users, as discussed above), except for the

case of improvements made to the southern terminal station (*Bellavista de La Florida*) of Line 5. In this case, Metro officials expropriated land for the development of a Metrobus transfer station and then, via a concession, granted development rights to a supermarket chain. The company invested approximately US$3.7 million to develop the underground transfer station in return for the rights to use the surface above for 40 years.[77] Metro plans to more actively use station concessions in the future, especially to strengthen its efforts to build other inter-modal transfer stations. For example, at the eastern terminal station of Line 1 (*Escuela Militar*), the government has developed plans for a vast remodeling, incorporating a mini-mall, with 138 stores (each approximately 20 m^2). The government would concession the development of the project, with an estimated investment cost of almost US$3.5 million (Metro, 1999), to a private sector developer who would have ten years to recover costs via store leases and other mechanisms.

4.1.5 Challenges & Comments

Chile currently finds itself in the midst of a process of administrative and political decentralization/deconcentration and an accompanying level of fiscal decentralization. Empirical evidence suggests that fiscal decentralization accompanies development (Bahl & Linn, 1992), so further moves on this front in Chile's future seems likely. Already, Municipal governments have a good share of financial responsibility, although with considerable central government supervision. Additional autonomy for Municipal governments will only come with increased capacity in local government officials (which itself might require more "prestige" and remuneration associated with local government work[78]) and increased accountability and responsibility for budget management. Unfortunately, the latter can only truly come when Municipal government income levels become more equalized in the country (to reduce the need for such high redistributive transfers) and/or a transfer system that can hold local governments more accountable is devised – no small feat.[79]

For regional governments, fiscal autonomy (i.e., revenue raising powers) can only fairly come when this government level becomes more directly representative. The process of true regional government creation, however, is hampered by a history of strong central government and the fact that the military government of the 1970s created the current regional government structure as a direct central government administrative appendage (see, Boisier, 2000; also Section 6.2.1). Until they become politically legitimized, regional governments will maintain complete dependance on transfers and the lack of autonomy in spending that these transfers still imply.

At the local government level, there are several public finance challenges. Perhaps most important is the inconsistent and infrequent process of property value re-appraisal. Without improvements in this process, the government (both Municipal and central) remains limited in its ability to recoup public investment costs, such as road or Metro construction, through increased tax revenues due to land appreciation. A further problem with the property tax system stems from the high percentage of exempt (low-income) properties, particularly since these are concentrated in the poorest comunas. As a result these comunas must provide public services (education, health, maintenance, street-lighting, etc.) without concurrent revenues. Though the FCM considers exempt

properties within its distribution formula, many observers suggest that the resulting transfers still are not sufficient to adequately cover operating costs (see, for example, CED, et al., 1994; IG-PUC, 1999). SUR (1999a) reports cases of Muncipal governments actually rejecting offers to construct education and health facilities due to concerns of not having the necessary operating revenues. In the case of some of the real estate megaprojects planned under new regulations for Chacabuco (see Section 4.8), there are concerns that Municipal governments will not be able to operate or maintain the facilities that the private sector will be required to provide.

In a study of Chile's political economy, Glaeser (1994) highlights a lack of competition by local governments to attract new residents (by, for example, changing service levels). In the United States, such competition is often seen as hampering coordinated metropolitan growth and contributing to urban outgrowth (as localities compete with each other to expand their tax base). At the same time, such competition can lead to efficiencies in delivering and paying for appropriate levels of local services as demanded by different population groups (i.e., "Tiebout sorting," see Tiebout, 1956). In part Glaeser's assertion is true, with a limited degree of control over their own finances, Municipalities lack both the incentives and the resources to compete. This situation is changing however, particularly among the higher income comunas and even poorer comunas with more foresight. Las Condes and Vitacura, for example, are in the process of putting utility lines underground, in the belief that this will further attract development in these comunas. Furthermore, many Municipal governments often advertise the fact that vehicle registration fees are going towards local-level road widening and other improvement schemes and infrastructure (and service) quality is indeed highly variable across comunas.

Primary and secondary educational opportunities also vary significantly across comunas – both due to comuna investment in education as well as the presence of subsidized and unsubsidized private schools. In this case, however, the differences in educational quality do not have the same locational effects as are often claimed in the United States – with metropolitan area households fleeing to the wealthiest possible suburban enclaves, in part, due to the high-quality public education opportunities there. In Chile, residents are not geographically restricted to attend public schools in their comunas, which likely dampens to some degree the influence of comuna educational opportunities on household location decision.[80]

4.2 General Law of Urban Planning and Construction[81]

The primary national legislation affecting urban development in the country is the General Law of Urban Planning and Construction (*Ley General de Urbanismo y Construcción*), the first version of which was issued in 1928 in response to an earthquake which destroyed the city of Talca. Due to its origins in this natural disaster, the initial legislation focused on technical norms, to improve construction quality and security. Over time, the legislation was expanded and modified through new norms and regulations in 1953, 1960, 1963, and 1976. Among the major modifications introduced in 1976, the most relevant include: changes in the requirments for professional registration (engineers and architects); a clarification of professional responsibilities and

lines of authority; the establishment of a hierarchy of planning instruments (from national to local level, as discussed in Section 4.3); and the definition of concepts related to urban growth limits, land uses, urbanization and subdivisions, and urban renewal.

In general, the legislation operates on three levels:
1. The General Law (*Ley General*) contains the principles, attributes, sanctions, and other norms that govern the organizations and professionals involved in urban planning, urbanization, and construction;
2. The General Ordinance (*Ordenanza General*) contains the regulations regarding the administrative procedures, planning processes, and relevant technical design standards (including roadway classification); and
3. Technical norms which define the technical characteristics relating to projects and urbanization and construction materials and systems.

The Ministry of Housing and Urban Development (MINVU) is responsible for proposing, to the President, modifications to the Law, ensuring the technical relevance of the General Ordinance (approved by Supreme Decree), and approving relevant plans and technical norms (related to, for example, street paving). Through its Regional Secretaries (SEREMIs), MINVU operates in a supervisory role ensuring that administrative and technical norms are met and approving local land regulation plans. Municipal governments, on the other hand, are responsible for the actual application of the Law, the General Ordinance, Technical Norms and other regulations.

4.2.1 Modifications

There is a process underway to introduce new Legislation regarding urban development and construction, since the current law is now over 20 years old. Among the major shortcomings to the existing law include:

- the piecemeal series of modifications to the actual text, which makes interpretation and implementation of the law uncertain;
- poor attention paid to rural areas within the legislation, with negative consequences for their subsequent urbanization;
- obsolescence regarding the dramatic evolution of the real estate sector in the country;
- in general, the continuing perception of poor quality of life in many of the country's urban areas.

In response to these, and other, shortcomings MINVU has developed a proposed modification to the General Law. The MINVU proposal must still undergo a broad consultative process before being presented formally to the legislature, thus the specific contents of the final proposed law are not yet formalized. Nonetheless, the general aim of the modifications can be characterized accordingly:[82]

- Construction quality – clarify builder, seller, and owner rights and responsibilities; types and definitions of penalties; relevant legal processes; and public sector roles and duties regarding inspections.

- Rural areas – extend the regulatory reach of Comuna Land Use Plans to include all the land within in a comuna, as opposed to simply the urban land in a comuna, thereby implementing the concept of regional planning instead of simply urban planning.
- Planning instruments and authorities – clarify the hierarchy of the different planning instruments and the role of sectional plans; improve and clarify the process of plan approval and the roles and limits of authorities' powers.
- Property rights – limit the effective period for an unfulfilled expropiation; allow the trading of building rights associated with historic preservation; limit the amount of required cessations.
- Private sector initiatives and responsibilities – require minimum investments in historic preservation; develop the possibility for partial public sector capture of land appreciation (*plusvalía*) derived from public infrastructure expansion; legalize the existence of Conditioned Urban Development Zones (ZDUC, as detailed in Section 4.9).

4.3 Planning Interventions

The General Law discussed in the previous section establishes three relevant levels of planning instruments, as well as the processes, responsibilities and norms regarding their development. The three instruments are the Regional Plan for Urban Development (PRDU); the Intercomunal Plan; and the Comunal Plan. In addition, at the Regional level a new instrument, Environmental Sustainable Regional Planning (*Ordenamiento Territorial Ambientalmente Sustentable* or OTAS), has been recently initiated. OTAS is a guiding instrument, aimed at cross-sectoral integration of environmental issues in planning, but carries no legal weight, although it could be integrated into the newest version of the LGUC.

4.3.1 Regional Plan for Urban Development

This Plan (*Plan Regional de Desarrollo Urbano* or PRDU) is the regional urban development plan, which should be – according to law –developed by each of the country's regions. The objective of the PRDU is to coordinate the region's urban development in accordance with regional socio-economic development policy, establishing the urban centers, their relationships (including transport links), growth goals, etc. SEREMI-MINVU is responsible for developing the PRDU, with approval by MINVU, the Intendente, and the Regional Government. Technically, the contents of the PRDU should guide the development of Metropolitan (Intercomunal) and Comunal plans, nonetheless in practice this does not really occur, essentially because no formally approved PRDU exists (at least in the case of the Metropolitan Region). Boisier (2000) claims that regional planning in Chile has never effectively occurred.

The PRDU is intended as a guiding (indicative, not normative) instrument and it does offer a potential tool for urban coordination across the region. One of the criticisms of the PRDU (beyond the fact that one has not yet been formally approved) is that, by its name alone, it only stands to address urban development in a region, potentially ignoring

the urban-rural relationship. As such, the modification to the General Law also proposes to change the PRDU to Regional Plans for Territorial Development (PRDT).

4.3.2 Plan Regulador Metropolitano – 1960, 1994 & Modifications

For a group of comunas that comprise a unified urban area, the urban land use plan is an Intercomunal Regulatory Plan or Metropolitan Regulatory Plan (PRI or PRM).[83] This plan is developed by the SEREMI-Vivienda and is approved by MINVU after authorization of the Intendente. The PRI or PRM is a normative instrument, utilizing general land use zoning, urban growth limits, densities, urban infrastructure, etc.

For Greater Santiago, the relevant instrument in effect is the Regulatory Plan of Metropolitan Santiago (*Plan Regulador Metropolitano de Santiago de 1994* or PRMS) (MINVU, 1994). Approved in October 1994, the PRMS replaced the last major regulatory plan for Santiago (the *Plan Regulador Intercomunal de Santiago*) which dated to 1960. While the 1960 Plan was supposed to be revised every ten years, the only major change in the plan occurred in 1979, when the allowable area of urban development was expanded from 38,000 hectares to 99,935 hectares. The 1979 modifications of the 1960 Plan greatly liberalized the region's land market and accelerated the horizontal expansion of the urban area (see Section 3.4), resulting in lowered densities, intensifying socio-economic segregation, and exacerbating the problem of public service and infrastructure provision to new developments. The 1994 PRMS aimed specifically at addressing these problems.

The 1994 PRMS provides the normative framework to guide land development in the 34 municipalities of Greater Santiago, plus the three municipalities of San José de Maipo, Calera de Tango, and Pirque (with the Provincia of Chacabuco added through a Plan modification in 1997, as discussed below). Overall, the 1994 Plan reduced Greater Santiago's maximum allowable developable land to 59,330 hectares, although this was subsequently revised with the addition of Chacabuco. The Plan distinguishes between urbanized areas – for which norms should be devised to promote densification through urban renewal and rehabilitation – and urbanizable areas – land generally on the periphery, for which urban infrastructure provision is viable to allow for future urban growth. The main strategic lines of the PRMS for managing urban growth are:

- establishing maximum urban growth limits of the Metropolitan Region and relevant municipalities;
- raising urban densities;
- specifying the intensity of land uses and the zoning of residential, commercial, industrial and other land use areas;
- establishing greenspaces, preservation areas, and other restricted zones.

Based on the established urbanizable land within Greater Santiago (59,330 has.) and an estimated 2020 population of 8,700,000, the PRMS calculates a minimum gross city-wide density of 150 people per hectare. The exceptions to this minimum include the peripheral areas on the edge of the urban growth boundary (San José de Maipo, Pirque, Calera de Tango and parts of Pudahuel and San Bernardo), with a minimum gross density of 100

persons per hectare. The gross maximum allowable density for each municipality varies; in the wealthier eastern municipalities (Lo Barnechea, Las Condes, Vitacura, La Reina) the maximum is 300 persons per hectare; to the south and southeast (portions of Peñalolén, La Florida, Puente Alto, and San Bernardo), the allowable maximum rises to 450 people per hectare; and in most of the rest of Greater Santiago, the maximum is 600. Finally, certain peripheral parts of municipalities in the south (Puente Alto), southwest (San Bernardo), north (Quilicura), and west (Maipú) have a maximum density of 10 persons per hectare.

The PRMS also "freezes" the expansion of exclusive industrial zones within the Ring Road Américo Vespucio; within this part of the city "offensive" (*molesta*) industries cannot be expanded nor additional ones installed. This regulation has, in part, contributed to the rapid rise of new industrial areas in the municipality of Quilicura and along the region's northern section of the Panamerican Highway (see Section 5.4). Certain municipalities have, however, petitioned to keep certain industrial zones; no decisions have yet been made on these requests.

Transportation. In terms of transportation considerations, the PRMS establishes two principal road systems within Greater Santiago's roadway hierarchy: the Metropolitan Road System, comprised of the city's access highways and three rings (Americo Vespucio, Av. Dorsal, and the Central Ring); and the Intercomunal Roadway System, grouped into four sectors (North, South, East and West). The PRMS also establishes parking minimums for different land uses, with the minimums varying according to comuna income and location and little additional parking allowed in the CBD, and sets requirements regarding the location and conditions of public transport terminals. In addition, the PRMS establishes the requirement for transport and roadway system feasibility analyses for projects which generate a certain number of person trips (3,000/day) or vehicle trips (100/day) or for non-residential projects which require more than 50 parking spots (see, also, Section 4.7).

Finally, as a means to reduce the Metropolitan Area's functional dependence on the city center (and subsequent transport demands), the PRMS proposes 11 "subcenters for metropolitan infrastructure," with five located on the Vespucio Ring Road. The idea behind these subcenters is to concentrate urban services closer to residents. Nonetheless, it is unclear how the government will actually spur the creation of these subcenters; in some cases at the time of the Plan development, these subcenters already existed (i.e., the case of the mall at Vespucio in La Florida). Furthermore, in general transportation system performance terms, the PRMS was never subjected to a quantitative transportation system analysis; indeed, it was developed with no formal collaboration with transportation planning authorities.

Modifications and Comments. The principal modification to the PRMS occurred in December 1997, with the incorporation of the Province of Chacabuco (directly north of Greater Santiago) into the regulated area. This modification was a direct response to the widespread land speculation in this largely agricultural area and the subsequent suburbanization underway. Instead of ignoring these development pressures, the

government attempted to ensure that the growth occurring in Chacabuco would at least be guided by some concrete norms. In total, the Plan for Chacabuco adds nearly 19,000 urbanizable hectares to Greater Santiago (approximately 35% of the metro area's current urban area); some 190,000 hectares of Chacabuco Province are, at least for the time being, excluded from urban development in the modified PRMS. The principal innovations of the Chacabuco Plan are the creation of Urban Areas for Priority Development (AUDP), Zones for Conditioned Urban Development (ZDUC), and Exclusive Industrial Zones with Conditioned Development (ZIEDC), which are detailed further in Section 4.9.

The Chacabuco modification exemplifies the general challenges to and shortcomings of the PRMS. As with any land use regulatory plan, the PRMS is susceptible to intense financial and economic development pressures; the Chacabuco modification to the PRMS may set a precedent for other land owners and speculators and adds an additional level of uncertainty to the general land market – will further changes take place and when? Furthermore, there are considerable challenges to ensuring fulfillment of the zoning and development provisions in the PRMS, particularly those related to the ZODC/AUDP/ZIEDC (as will be discussed in Section 4.9), the development of the proposed "subcenters" for metropolitan infrastructure, and the preservation of open spaces and other ecologically protected areas (there are no provisions for purchasing land from private land owners). Also, there are few indications that the Plan will achieve its minimum gross density – almost arbitrarily arrived at by dividing a rough population projection across the estimated total urban area – particularly with the opening up of Chacabuco to some 600,000 to 800,000 residents by the year 2020.

The PRMS also exposes weaknesses deriving from the poor inter-sectoral coordination of its development, particularly with SECTRA's transport plan for Greater Santiago (also published in 1994), MOP's road concession plans, and CONAMA's air pollution control plan (published in 1998). Illustrations of this lack of coordination include the fact that several large infrastructure projects (such as MOP's 4th Ring Road, *Pie Andino*) are not included in the PRMS and that several areas identified as protected greenspaces in CONAMA's pollution control plan do not coincide with the PRMS. Beyond the poor inter-sectoral coordination, PRMS development involved virtually no coordination with Greater Santiago's Municipalities and no public participation.[84]

Finally, it is important to mention the process underway to develop an Intercomunal Plan (PRI) for the Provinces of Melipilla and Talagante and the comunas of Buin and Paine directly to the south/southwest of Greater Santiago. This area of the RM is already within the direct area of influence of the metropolitan area – particularly with the road and rail improvements completed and planned. The ultimate contents of this plan will have important implications for PRMS management as well as on the viability of some of the real estate projects planned for Chacabuco Province.

4.3.3 Plan Regulador Comunal

While the PRMS establishes the regional guidelines for urban growth in Santiago, it is the local-, municipal-level plan which is intended to operationalize these guidelines.

Called the *Plan Regulador Comunal* (PRC) (Comuna Regulatory Plan), these local level plans aim to regulate municipal growth through: zoning, establishing roadway hierarchies, and specifying the location of municipal facilities, parking requirements, densities, and growth limits.[85] While the Municipal Plans must comply with the PRMS' gross density minimums and maximums, within a municipality local densities can vary above or below these, as long as the weighted average gross density is in compliance.[86] Each Municipality must ensure that development implied by its Plan (expansion and densification) can be effectively supplied with the necessary sanitation, transportation, and energy infrastructure and services.[87] The PRCs also identify the relevant structural roadsystem and establish the roadway hierarchy. Rights of way defined in PRCs – once these are legally published – are automatically declared public goods, subject to expropriation. For comunas that are part of an Intercomunal or Metropolitan Plan (i.e., PRMS), the PRCs should also be accompanied by a strategic road capacity analysis (SEREMITT-RM, 1999).

The Regional Secretary of the Ministry of Planning (SERPLAC-RM) recently published a review of the current state of planning instruments within the RM (SERPLAC-RM, 1999a). According to that report, as of early 1999 only 13 comunas in Greater Santiago have PRCs in force. Of these, only four were approved after 1990 and only one (Las Condes) was approved after the PRMS. Some of these comunas are operating with PRCs that date to the 1950s and 1960s (though with modifications in the 1980s and 1990s), while others are using PRCs from other comunas (i.e., developed while the comuna formed part of another comuna). Across the rest of the RM, another five comunas have PRCs in force, although only two were formulated during the 1990s. Twenty eight comunas in the RM (22 within Greater Santiago) have PRCs in various stages of development, such as being under revision by SEREMI-MINVU, resolving issues raised through public participation or review by SEREMI-MINVU, or awaiting final approval. Of these, at least nine comunas face financing problems in completing their PRCs (SERPLAC-RM, 1999a).[88]

The latter two points highlight important challenges relating to PRC implementation: the increasing costs and time of development and the lengthy and somewhat bureaucratic process regarding approval. In terms of development, the costs have escalated due to requirements that each PRC be accompanied by an environmental impact study, a roadway impact study, and an urban impact study, as well as incorporate public participation. Approval entails an iterative process involving the comuna's Council, SEREMI-MINVU, and finally the Regional Government. The lengthy process and lack of Municipal resources means that the entire process can take up to six years, at which point the plan may already be obsolete and during which time development projects occur in a state of uncertainty.

Transportation. Similar to the case of the PRMS, PRCs have historically been developed with little or no technical transportation system analysis. To address this shortcoming, MINVU has recently issued a requirement that the development of all PRCs be accompanied by a Roadway Feasibility Study (*Estudio de Factibilidad Vial* or EFV), aimed at establishing the minimum road widths required for the principal structural

arteries to satisfy travel demand implicit in the PRC.[89] Although the recommendation and guidelines are new, they offer the promise of more adequately integrating transportation development into each stage of the PRC development process (see MINVU, 1997a). These EFVs are detailed in Section 4.7.

4.3.4 Sectional Plans

Beyond the PRC, the comuna has another relevant planning instrument, the Sectional Plan (*Plan Seccional*), which is generally more detailed than the PRC, precisely defininining street layouts and widths, zoning and construction types, and other urban characteristics. The Sectional Plan is used to define in more detail a specific area of the PRC, to guide development for those comunas without PRCs, or to approve major modifications to zones within an existing PRC. Sectional Plans must also be accompanied by a transport impact study.

Examples of uses of Sectional Plans include one developed for modifying approximately 12 hectares in the comuna of Las Condes, an area currently occupied by army housing. In this case the Sectional Plan zones the land; defines construction indexes, minimum lot sizes and road connectivity; and attempts to ensure that the planned development will fit "qualitatively" within the current surrounding built environment (COREMA, 1999b). In the case of a previously defined exclusive industrial zone in the comuna of Renca, a Sectional was developed to change the 3.6 hectare area to a mixed-use residential zone (COREMA, 1999d). Sectional Plans were also developed for the megaprojects at Cousiño Macul (in Peñalolén) and the Maestranza de San Bernardo, which are each discussed in more detail in Sections 5.3.2 and 5.3.3. Overall, the use of a Sectional Plan can help overcome the rigidities inherent in the PRCs (particularly since Sectional Plan development and approval is much less cumbersome than for a PRC); however, at the same time this flexibility makes them a tool of potential abuse or private interest pressure.

4.3.5 Institutional Issues

As mentioned, MINVU, through its SEREMIs is responsible for developing the PRDUs and the PRMs/PRIs, ostensibly in consultation with relevant Municipalities and other institutions and with authorization by the Region's Intendente. MINVU also produces the guidelines by which Municipalities should develop their PRCs, which must also pass a technical review by SEREMI-MINVU and be approved by the Regional Government. In short, MINVU (or its SEREMIs) has a significant level of influence in all levels of land use plans in the country. MINVU does not, however, exercise much authority in planning for other sectors (i.e., transport), so that inter-sectoral plan integration remains a major challenge.

4.4 Urban Growth Boundary

An urban growth boundary (UGB) – as defined within the relevant legislation – must be established for all comunas within their Land Use Regulatory Plans. In the case of the 1994 PRMS, a UGB (*límite de extensión urbana*) was established for the area of Greater

Santiago (this UGB should also be reflected in relevant comunas' plans; for fully urbanized comunas, the issue is irrelevant). This limit was subsequently modified with the addition of the Provincia of Chacabuco to the PRMS in 1997.

In Chile, the UGB does not prevent development, per se, rather it discourages urbanization by prohibiting the extension of public service trunk infrastructure to developments outside the UGB. Any developments beyond the limit are subjected to restrictions as specified in the Law of Agricultural Parcels (see Section 4.6), theoretically enforced by the Ministry of Agriculture (through the Agricultural and Cattle Service, SAG). The Municipal government is the primary enforcement authority of the UGB, through the issuance of building permits.

General theory suggests that an urban growth boundary can bring several potential benefits from a growth management perspective (NAIOP, 1999):

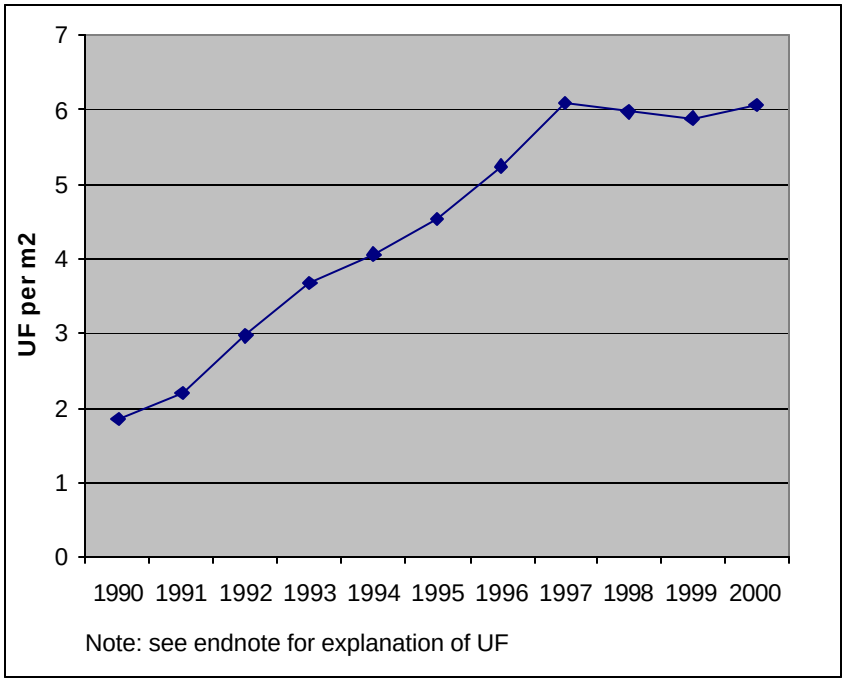
- reducing the costs of infrastructure provision (by eliminating growth on the urban outskirts) and within urban areas (densification and smaller lots reduce the costs of serving a given population);
- preserving high quality agricultural land, open space, and ecologically-sensitive land;
- facilitating the development process by increasing certainty of the prospects of developable land and potentially reducing development costs within the growth boundary;[90] and
- increasing inner-city property values, reducing poverty concentration and urban decline.

At the same time, a growth boundary carries several potential drawbacks (NAIOP, 1999):

- driving up land and housing prices within the UGB, increasing the burden and difficulty of home ownership, especially among lower income households;[91] and
- driving up land values for certain types of land (i.e., in areas with expensive homes) even if, in general, enough developable land is available to ensure competitive land prices.

In Greater Santiago, several different factors make it difficult to discern the effects of the UGB on the land market. First, the limit has only been in effect since 1994, so that potential impacts on land price variations within long-term market trends cannot be easily seen. Second, the UGB was only in place for three years before the Provincia of Chacabuco was added to the PRMS, which effectively expanded urban land supply in the metropolitan area. Third, the widescale subdivision of agricultural land and its effective "suburbanization" (as discussed further in Section 4.6) has not truly limited land supply in the region, at least for certain market segments (i.e., middle and upper-middle class families in the market for large housing lots). Fourth, the economic downturn since 1998 has generally dampened land prices in Greater Santiago. Finally, no reliable time-series data is available on land prices outside Greater Santiago (i.e., beyond the UGB), making it difficult to compare urban-rural land price evolution and gauge any possible peripheral land speculation.

FIGURE 4.1
AVERAGE LAND PRICES IN GREATER SANTIAGO (IN REAL PRICES)



Source: ACOP-CNSI, 2000.

With these limitations to land market price analysis in mind, an examination of average city-wide land prices over the past decade does not indicate any noticeable land value effect of the UGB. Indeed, across Greater Santiago, land prices increased more rapidly in the period 1990-1994 (20% annual growth rate, pre-UGB) than in the period 1994-1997 (13% annual growth rate, post-UGB, pre-Chacabuco). During these two periods, average annual economic growth rates were similar (approximately 8%).[92] After 1997, which coincides both with the expansion of the UGB (through the addition of Chacabuco) and the beginning of the economic slowdown, average city-wide land prices have virtually stagnated (see Figure 4.1).[93] While it is not possible to draw firm conclusions regarding the UGB's effect on the land market, during the brief period of the 1990s the UGB did not seem to exert inflationary pressure on city-wide land prices – a conclusion shared by others' analyses (see, for example, Sabatini, 2000), although conveniently ignored by those opposing the UGB.[94]

Beyond average city-wide land prices, it is possible that the UGB exercised some effects on different comunas within Greater Santiago, but again, the multiple influencing factors involved and the relatively short effective period of the UGB and limited available data make any analysis inconclusive. For the first half of the decade, land appreciated rapidly across a range of comunas, primarily in the first and second rings (Cerro Navia and Est. Central in the West; San Miguel, San Joaquin, La Cisterna, La Granja, and El Bosque in the South; Conchalí and Independencia in the North; and Providencia, Macul, Las

Condes and Vitacura in the East) as well as in the distant upscale suburb comuna of Lo Barnechea (see Table 4.3).[95]

Table 4.3
Comunas with Highest Average Annual Growth Rates in Land Prices - 1990s

1990 – 1994		1994 – 1997		1997 – 2000	
Comuna	AAGR	Comuna	AAGR	Comuna	AAGR
Cerro Navia	56.54%	La Florida	64.39%	Renca	31.24%
El Bosque	39.70%	San Bernardo	54.74%	Pudahuel	30.33%
Est. Central	31.88%	Lo Prado	47.72%	La Pintana	24.43%
La Granja	31.64%	Conchalí	43.53%	Cerro Navia	17.80%
Macul	31.37%	Puente Alto	40.30%	San Joaquín	15.98%
Independencia	26.47%	Maipú	40.22%	Puente Alto	14.33%
Conchalí	25.02%	Lo Espejo	37.80%	Quilicura	12.99%
San Miguel	24.37%	Huechuraba	36.96%	El Bosque	12.77%
Las Condes	24.28%	Cerrillos	36.88%	Cerrillos	11.63%
Lo Barnechea	23.25%	Quilicura	33.40%	Maipú	9.03%
La Cisterna	23.20%	Peñalolén	30.91%	La Florida	6.05%
Providencia	21.43%	Recoleta	29.12%	La Reina	3.23%
Vitacura	21.01%	San Joaquín	28.94%	Macul	2.80%

Note: Appreciation is based on inflation-adjusted UF/m^2 of advertised land prices.
Source: ACOP-CNSI, 2000.

From 1994 to 1997, much of the land appreciation seemed to focus on the periphery, including Huechuraba, Quilicura, Pudahuel, Maipú, San Bernardo, Puente Alto, La Florida and Peñalolén. These are principally urban edge comunas of middle and lower-middle classes, suggesting that the UGB may have influenced an upward trend in land prices for this growing market segment. Before coming to this conclusion, however, it is important to recognize at least two influencing factors. One is the completion of the upgrade of the north- and northwest portions of the ring road Vespucio. The upgraded section of the Vespucio Ring Road passes through six of the comunas with highest land appreciation (Conchalí, Maipú, Lo Espejo, Huechuraba, Cerrillos, Quilicura, and Recoleta) – where there are visible impacts on development, particularly industrial properties, which likely produced upwards pressure on land values. The other potentially influencing factor was the completion of the Metro Line 5 (in April, 1997), which passes through both San Joaquín and La Florida – from 1996 to 1997, average land values in La Florida, where Line 5 ends, tripled.

It is, thus, difficult to draw any conclusions regarding the ultimate short-term effects of the UGB on – at least – the land market in Greater Santiago. Nonetheless, the UGB has, in the short term, helped to some degree control the poor use of land and infrastructure beyond the city limits. Though a large degree of subdivision of agricultural parcels has occurred, widescale urbanization of this land has been prevented, to date. In essence, the UGB "bought time" so that other instruments (such as the ZDUC, see Section 4.9) might come into being. The influence of the UGB's future role will depend on its enforcement and whether it is virtually modified again with additional changes to the PRMS (or the

PRI being developed for the Talagante-Melipilla in the south, southwest, as discussed in the previous section).

4.5 Financial Interventions: Housing Subsidies

The principal direct fiscal intervention in the land market in the Santiago Metro Region is the use of housing subsidies, of which there are two general types: those targeted at aiding specific socio-economic groups (public housing subsidies and DFL2) and those targeted at promoting housing development in specific parts of the region (urban revitalization subsidies). MINVU oversees the program nationally, establishing the relevant requirements and providing funding via SERVIU.

4.5.1 "Public" Housing Subsidies

Ensuring some form of housing for its citizens has been and continues to be an important focus of Chilean government policy. The implications of this policy for urban growth trends are not trivial: providing, every year, a large number of affordable housing units (estimated annual national demand for low income housing is at least 70,000 units) means that the cost must be low. Low costs, in turn, require cheap land and low-cost construction, which essentially translates into land on the periphery and low-rise, space-consuming buildings.[96] As a result, government public housing (*vivienda social*) policy has been a major driving force behind urban expansion in the RM's low income comunas.

The government's public housing program works through a variety of subsidies. The most basic subsidy is for "progressive housing" (*vivienda progresiva*), designed to provide very basic shelter to the poorest household groups. The price of housing in this class is approximately US$4,000 (140 UF), of which the government subsidizes approximately 94%, with the applicant either: 1) supplying the remaining 6% through household savings or 2) owning the land. In the former case, the applicant purchases a minimal construction (bathroom and kitchen) directly from SERVIU (which contracts for the construction the units). In the latter case, the applicant uses the subsidy to construct their own housing.[97]

The next level of housing subsidy is for "basic housing" (*vivienda básica*). This program also has two variations. One is with the housing (38 to 42 m^2, either a one or two story attached single family home or an apartment in three-story buildings) provided via SERVIU. In this case, the housing costs an estimated US$6,700 (230 UF), with the government providing a maximum of 61% subsidy, the owner contributing a minimum of 4% in savings, and a maximum mortgage of 35%. In the other variation of "basic housing," the applicant can either buy a new or used home or construct a home. In this case, the maximum home value is $12,000 (400 UF), with the government providing a maximum subsidy of $4,000 (140 UF), the applicant contributing a minimum of $600 (20 UF), and a maximum mortgage of $3,000 (100 UF).[98]

4.5.2 Other Housing Subsidies

The unified subsidy (*subsidio unificado*) is geared towards middle and lower-middle income families, providing subsidies for housing purchases of up to US$44,000 (1,500 UF). These subsidies can be applied to new or used units, within three price ranges (see Table 4.4). The savings requirements can be completely or partially offset if the applicant owns the property. In addition, the applicant can take out a mortgage for up to US$30,000 (in no case greater than 75% of the unit cost).

Table 4.4
Financing Schemes for Unified Housing Subsidies

Unit Price Range	Subsidy	Applicant's Minimum Savings
< $14,600 (500 UF)	$3,200 - $3,800 (110 UF - 130 UF)	$1,460 (50 UF)
$14,600 - $29,200 (1000 UF)	$2,630 - $3,200 (90 UF - 110 UF)	$2,900 (100 UF)
$29,200 - $44,000 (1500 UF)	$2,045 - $2,630 (70 - 90 UF)	$4,400 (150 UF)

Note: Prices in US$ as of 1999, based on UF = CH$14,800 and US$ =CH$509.

There is an additional implicit subsidy for middle and lower-middle class homeowners, called the DFL 2. In place since 1959, DFL 2 provides tax relief to owners of housing of up to 140 m^2. Owners of such housing are exempt from paying income tax if the property is rented, do not pay inheritance tax, and are exempt from paying 50% of property taxes for 5 years (140 m^2), 10 years (100 m^2), or 15 years (70 m^2). The subsidy, aimed at alleviating the burden of home ownership for middle classes (similar to the U.S.' tax deductible mortgage interest payments), has been criticized because many homes originally built at 140 m^2 are subsequently expanded without proper Municipal approval (to avoid the loss of the tax shelter). In addition, similar to the criticism often leveled at the U.S. mortgage interest tax deduction (see, for example, Nivola [1999]), there is the possibility that DFL 2 contributes to urban expansion in Chile, by reducing the real cost of home ownership (thus urban area consumption) although the size limit of the residential area allowable to qualify for DFL2 and the limited time exemption that it allows likely dampens any such effect. Housing enjoys a similar tax benefit on the supply side, as construction companies have a virtual exemption from the value added tax (*IVA*) (Jorratt, 2000).[99] Assuming a competitive construction industry, then at least some of this tax benefit is passed on to buyers, translating into an additional effective subsidy to all types of housing, which might also translate into larger housing units than would otherwise be the case.

4.5.3 Urban Revitalization Subsidy

The urban revitalization subsidy was created by MINVU in 1990, with the aim of reversing the population losses being experienced by the city center of Santiago. Indeed, MINVU initiated the program at the urging of the Municipality of Santiago which was

particularly concerned about ongoing declines in its residential base. In response, MINVU designated urban revitalization zones in 38 cities across the country, including – in Greater Santiago – the comuna of Santiago and parts of Recoleta, Independencia, Renca, Quinta Normal, Estación Central, Pedro Aguirre Cerda, San Miguel, San Joaquín, and San Bernardo. The subsidy is structured similarly to the Unified Housing Subsidy, although the total subsidy amount is higher and constant across apartment price ranges (see Table 4.5). The subsidy can be applied to new or refurbished properties, with a maximum apartment price of approximately US$44,000. Similar to the other housing subsidies, SERVIU acts as the executing agency, accepting applications and awarding the subsidies.

Table 4.5
Structure of Urban Revitalization Subsidies

Apartment Price Range	Applicant's Minimum Savings	Subsidy	Mortgage Value	Applicant's Minimum Gross Monthly Income
< $24,840 (850 UF)	$3,507 (120 UF)	$5,845 (200 UF)	$15,489 (530 UF)	$587 (20.1 UF)
< $30,685 (1,050 UF)	$4,384 (150 UF)	$5,845 (200 UF)	$20,457 (700 UF)	$774 (26.5 UF)
< $36,530 (1,250 UF)	$5,553 (190 UF)	$5,845 (200 UF)	$25,717 (880 UF)	$956 (32.7 UF)
< $43,836 (1,500 UF)	$5,845 (200 UF)	$5,845 (200 UF)	$29,224 (1,000 UF)	$1,189 (40.7 UF)

Note: Prices in US$ as of 1999, based on UF = CH$14,800 and US$ =CH$509.
Source: Aravena, undated.

Although the program is available to eligible comunas nationwide, there has been a heavy focus on the comuna of Santiago. According to SUR (1999a), between 1990 and 1997, 6,615 urban renovation subsidies were granted nationally; of these, 92% were in the Metropolitan Region (RM), almost all of which were in the comuna of Santiago. The effects on housing permit requests (which do not necessarily translate into construction) have been noticeable: in 1991, the comuna of Santiago accounted for just 1% of annual housing building permits issued in Greater Santiago; by 1997, the comuna accounted for 12% of Greater Santiago's housing building permits (based on data from CCC, 1998). While the program has been successful in attracting a variety of residents, the majority are single, from the middle and lower middle classes, and in the 21 – 40 age group (Cordesan, 2000).[100] Furthermore, it is important to note that, at least during the period 1996 – 1999, the majority of subsidy applicants in Santiago came from center city comunas (43% from Santiago itself and an additional 15% from the central comunas of Independencia, Quinta Normal, Estación Central, and Recoleta) (Cordesan, 2000). Thus, the program apparently has played a more important role in retaining central city residents than it has in attracting new people to the city center (a conclusion supported by data on comuna population trends, see Section 3.2).

An important question to ask in regards to the urban revitalization subsidy is why has the comuna of Santiago been so successful in attracting applicants, while other eligible comunas in the country (and, for that matter, in Greater Santiago) have not? By most accounts, the main reason for the success of the program in Santiago is the political leadership exercised by the Municipality. When the program was first launched in 1990, the private sector doubted its success; it was believed that people were no longer interested in living in the city center. The Municipality, working through its Development Corporation (discussed further in Section 4.5.5), took two important steps: 1) conducting outreach to potential residents and organizing them into a demand exchange (*bolsa de demanda*), to demonstrate to the private sector that a potential market existed; and, 2) recruiting companies and facilitating the search for appropriate development sites. Although initially only one developer took interest in participating, the dynamic market soon attracted many others. Other factors contributing to the success of the program in the comuna of Santiago include Municipal efforts to generally improve the quality of life through improved police protection and public security, public spaces, cultural life, etc. (SUR, 1999a).

The subsidy program has been so successful in Santiago that the comuna is beginning to run low on affordable development sites. In some cases, the Development Corporation is now identifying potential sites in neighboring comunas, which means the success of Santiago's experiences may now be having spillover effects. In addition, the comuna is looking to try to replicate this success in the commercial/offices building market. The Development Corporation has already surveyed some 40 potential buildings for renovation and is now working on identifying incentives for stimulating improvements, such as: allowing the investment costs to be treated as operating expenses (and thus deductible from income taxes); providing an exemption from property taxes for a given amount of time (similar to the DFL 2 exemption for housing); or reducing the cost of the commercial operating permit (*patente*). The first two incentives would require special legislation.

4.5.4 Comments and Issues

The various housing subsidies in effect in the RM have had an important effect on the dynamics of the housing market and on urban growth trends. In terms of the two principal explicit subsidies – those for public housing and urban revitalization – they have essentially exerted countervailing forces. Under extreme pressure to provide housing for the poor, the government's public housing subsidies and related policies have continuously pushed development outwards in search for the cheapest land – all of the major lower and even middle class suburbs of today were born through public housing. The middle income housing subsidies (including the DFL2) and the implicit subsidies to home builders likely further fuel expansionary pressures. On the other hand, the urban revitalization subsidies have managed to at least halt the population decline in the comuna of Santiago. So, government housing subsidy policy has been both pulling the city outward and pushing it upward, with the net result being more expansion than central city densification.

Beyond these macro effects on urban growth, both of these subsidies have other important effects. Criticisms of the public housing subsidy program have focused primarily on its tendency to exacerbate the segregation of the poor. SUR Consultores (1999a), arguing that it is "more expensive to be poor," notes that marginal neighborhoods typically face: higher prices for a basic goods (poor communities cannot generate the purchasing power to bring prices down); higher transportation costs (in terms of time), due to isolation from concentrated centers of jobs, services, and education; poor quality public services and community spaces; and higher risks and costs due to surroundings (environment, crime, public health). The fact that public housing is exempt from land taxes only further exacerbates the situation, because the comunas with highest concentrations of public housing units are those already in the most precarious financial situation and the least able to deliver basic public services to those populations that most need public services. Ultimately, although the current system of subsidies may effectively minimize the initial costs of public housing provision, it generates high daily costs for the beneficiaries (and likely for the city in general, due to externalities). SUR (1999a) and others coincide in assessing the implications of this situation – public housing subsidies should be raised or other mechanisms found to ensure that more centralized, smaller swaths of land be found for public housing, thus better integrating the residents into the urban fabric.

While the urban revitalization subsidies have generated something of a residential renaissance in the city center, they have not come without their criticisms. Most have focused on the lack of urban aesthetic accompanying the program, arguing that the Municipality of Santiago emphasized attracting investors, without having in place the proper sectional plans to ensure the attraction of "good" projects (Prieto, undated). According to these criticisms, the result is large residential towers, not compatible with their immediate surroundings, without adequate urban amenities included such as greenspaces or sufficient parking. Prieto (undated) also faults the limited number of developers willing to work in the zone, which has produced something of a monopoly and a lack of innovation and diversity in architecture and urban design. SUR (1999a) suggests that the the success of the urban revitalization program in reinvigorating the city center's land market may be squeezing out lower income residents, forcing them to the urban periphery. On balance, however, at least measured by its objective of reducing the center city population loss, the program of urban revitalization subsidies has been a measurable success.

4.5.5 The Role of Santiago's Development Corporation

The Development Corporation of Santiago has played an important role in the management of the Municipality's use of the urban revitalization subsidies. While the Corporation originally depended almost entirely on subsidies provided by the Municipal government, it has in recent years increased the generation of its own operating revenues. Today, the great majority of revenues comes from operations related to the urban revitalization program. Through assisting developers in identifying development sites and potential buyers (through its demand exchange), the corporation receives a commission from developers. Currently, an estimated 40% of the residential buildings

geared towards the revitalization subsidy market operate under this commission agreement.

Today, however, other Municipalities do not have the benefit of creating Development Corporations similar to Santiago's, which was enabled by a law that was subsequently rescinded.[101] Current legislation allows for Municipalities to form corporations only for the promotion of art and culture (see Subdere, 2000c), not towards facilitating the type of relationship between Municipality and the private sector that Santiago's Development Corporation enjoys. While this may seem like a distinct disadvantage for other comunas, officials in the Santiago Corporation insist that such an institution is not required for a successful deployment of the subsidies. Instead, Municipalities need to display a sincere willingness and ability to work with the private sector as a partner in achieving development goals.

4.6 Law of Agricultural Land Parcels

Prior to 1980, legislation prohibited the subdivision of agricultural land – i.e., any land beyond established UGBs – in parcels less than 80,000 m^2 (8 hectares). In 1980, however, the government issued Law (*Decreto Ley* or DL) 3516, which reduced the minimize size restriction of agricultural parcels to 5000 m^2 (1/2 hectare). The DL 3516 originally intended to enable land ownership for small farmers, allowing them to have a small house and adjacent cultivated land. The law specifically requires that the land continue to be used for agricultural purposes and not converted to exlusive residential use; violation would result in surrender of land title plus a fine of up to 200% of the estimated value of the property. Nonetheless, the practical result of the Law has been the widespread sub-division of virtually all agricultural land in the country and the conversion (with impunity) of many of these lots near urban areas into primarily residential use (the so-called *Parcelas de Agrado*). In the Metropolitan Region, an estimated 300,000 hectares have been subdivided (Valdés, 1998).

The *Parcelas de Agrado* have been a primary initial force behind the suburbanization of, for example, the Province of Chacabuco. The lot size specified under the Law is the equivalent of 1.24 acres, not an uncommon size for upscale residential suburban/ex-urban neighborhoods in the United States. In fact, the densities implied by these regulations are equivalent to the average U.S. urban area density today (see Pickrell, 1999). According to one study (DII-UC, 2000), approximately 1,800 *Parcelas de Agrado* – with almost 11,000 residents – have already been developed in Chacabuco; the average house price on these plots is $180,000 to $200,000. In the comuna of Colina alone, an additional 5,300 remain as vacant lots.[102] In total, there are almost 20,000 hectares of parcels subdivided under DL 3516 in Chacabuco (DII-UC, 2000). As one example, at least one part of a major residential development (the nearly 400 hectare project "El Algarrobal") in the Province of Chacabuco, will occur on 60 hectares of land subdivided as *Parcelas de Agrado* (COREMA, 1998b). Ironically, *Parcelas de Agrado* used for residential purposes are still treated as agricultural land for property tax purposes, so these upscale suburban subdivisions remain exempt from property tax payments.

According to the Chamber of Construction, DL 3516 has had negative effects in at least three areas (Valdés, 1998): road infrastructure provision, other costs of urbanization, and agricultural productivity. In terms of roadways, for subdivided lots that have already been converted to residential use, most are connected via a maze of individual access roads, which will almost inevitably become the permanent roads of tomorrow's urbanization – most certainly with inadequate rights of way with corrective measures implying high expropriation costs. For other urban infrastructure and services such as water supply, the lack of capacity planning will produce similar problems with grave future implications. Finally, regarding agricultural production, the subdivision and partial sale of previously large pieces of agricultural lands has sometimes produced a patchwork of properties, for which large-scale agricultural production is no longer viable.

Recognizing the unintended consequences of DL 3516, MINVU intends to address the problem within the new General Law of Urbanization, by essentially extending the reach of PRCs to include sub-divided agricultural lots.[103] This would effectively extend the reach of the PRC from being urban planning tools to regional planning tools and give Municipalities more control over developments that occur in rural areas. This proposal would also likely eliminate the use of the UGB and strengthen the planning role of new instruments such as ZDUC (see Section 4.9).

4.7 Transport System and Roadway Impact Studies[104]

At least since the Pinochet regime, private developers have been required to provide the land for and build and pave the streets within their real estate projects. Responsibility for this infrastructure is then passed to the relevant municipal government (Kain & Liu, 1994). Despite this requirement, for many years such projects were undertaken with relatively little oversight by authorities and often resulted in an inconsistent road network, not necessarily matching up with adjacent developments and creating chaotic connections to, and additional traffic pressures on, the trunk road network. To correct this situation, authorities have been developing a more coherent policy to ensure that real estate projects contain the necessary transportation facilities and also mitigate the effects that they might have on the rest of the network. The principal tool in this respect is the impact study.

Various forms of impact studies (roadway impact studies, traffic studies, roadway evaluation studies) to determine the effects of urban development projects on the transportation system were originally called for in the General Ordinance for Urban Planning and Construction. According to this Ordinance, projects of a certain size or estimated influence require impact studies before the Municipality can approve the necessary building permit. Nonetheless, a formalized process for carrying out such studies was generally lacking until the 1994 PRMS established (in Article 7.1.5) – at least for the Metropolitan Region – the general guidelines for transport and roadway feasibility analyses for urban development projects, including:

- the minimum project size for which road feasibility studies should be conducted;
- the characterization of the project's "area of influence" (local, comuna, intercomunal, regional, national);
- the need for a transport demand study for the project; and

- a proposal of transportation project alternatives that can satisfy the estimated demand (maintaining level of service C as defined in the relevant roadway manual) and that can be feasibly financed by the project developers.

A main goal of the impact study is to determine the private sector interventions required to internalize the transport system costs that their projects imply. The general guidelines established, however, only set the basic outline for impact studies, leaving much operational and institutional ambiguity and weaknesses, such as (MIDEPLAN, 1998b):

- unclear specific procedures (i.e, a system for determining trip generation and attraction rates by type of activity and urban location);
- unclear institutional responsibility;
- failure to account for projects which constitute a change of existing land uses (i.e, from residential to commercial); and
- a general orientation towards facilitating the rapid approval of building permits, instead of the careful evaluation and amelioration of transport impacts.

In response to these weaknesses, the government has continued efforts to further formalize the transport impact analysis process, focusing on methodology and institutionality. In 1998, the planning ministry issued a document outlining a recommended methodology and framework for carrying out Urban Transport System Impact Studies (*Estudios de Impacto en el Sistema de Transporte Urbano* or EI/ST) (see MIDEPLAN, 1998b). Building on the concept of "one window" (*ventanilla única*) – whereby project developers would only have to deal with a single government entity – authorities hope to soon put in place a unified procedure for the EI/ST, which would effectively encompass all possible projects.

While not yet formalized, the EI/ST process will be built on essentially a two-tier hierarchy: the comuna level and the project level (see Table 4.6). As mentioned in Section 4.3.3, at the *comuna level*, a roadway feasibility study (EFV) must now accompany the development of the comuna land plan (PRC); the purpose of the EFV, which is the responsibility of the government (typically, but not always, the Municipality), is to define the basic structural transport system for the comuna. The resulting transport plan should be accompanied by a financing plan. At the individual *project level*, an EI/ST must be carried out by the project proponent; the purpose of this study is to both define the level of influence of the project (i.e., local, comuna, metropolitan) and define the relevant mitigation measures. Typically, the project proponent is responsible for the specific engineering design and financing of mitigation measures. In the case of a project with impacts beyond the local, additional mitigation measures may be required.

In terms of carrying out the EI/ST, the proposed process consists of the following primary task areas (MIDEPLAN, 1998b):

- Defining the unit of analysis - the type of project (i.e, office, residential) and specific characteristics or thresholds which would make a particular project subject to an EI/ST or not;

- Identifying the key variables - the area of influence of the project (local, comuna, or metropolitan), year of analysis, base situation, land and project development scenarios, and key design factors (i.e., parking);
- Specifying the modeling approach - the quantitative approaches to be used for analysis, depending on the project's area of influence as well as the available data and tools (i.e, whether a particular city has origin-destination data and a travel forecasting model);
- Evaluating the impacts – effects on the transportation system, relevant costs imposed on the system, and the mechanisms for mitigating them.

Table 4.6
Comuna-Project Hierarchy of Transport Impact Studies

Level of Analysis:	***Comuna***	***Project***
Purpose:	Define Strategic Transportation System	Define Project "Level of Influence" and Transportation System Mitigation Measures
Based on:	Roadway Feasibility Study (EFV) of Comunal Land Plan (PRC)	Transportation System Impact Study (EI/ST)
Responsibility of:	Municipal Government or Other Government Entity (i.e., MOP)	Project Proponent
Results in:	Transport Plan with proposed financing, including developer contributions (or mechanisms to determine developer contributions)	A list of Tactical Mitigation Measures for private sector financing. If project has impacts beyond the local (i.e., at comuna or metropolitan level), then additional mitigation measures may be required.

Institutionally, the SEREMITT is responsible for approval of PRC EFVs. In some special cases, the SEREMITT, MOP and other relevant authorities (i.e, SECTRA) may actually develop the equivalent of the PRC EFV (i.e., in the case of Chacabuco, discussed below). For project-related EI/STs, the process is designed to fit within the current process of building or subdivision permit issuance. The Municipality receives the proponent's request for a building or subdivision permit, at which point the determination is made (based on pre-defined characteristics) whether an EI/ST will be required. In this sense, the Municipality will serve as the principal authority (i.e., the *ventanilla única*) from the public's perspective. If an EI/ST is required, the Municipality then determines the area of influence (local or comuna). If the area of influence is local, then the EI/ST proceeds, with final mitigation measures proposed, and – once approved by the Municipality – the work permit is issued (as long as all other relevant requirements are met). If the Municipality deems the area of influence to be at the level of the comuna, however, then the proposal is passed to SEREMITT, which would solicit input from other relevant authorities (i.e., MOP, UOCT, etc.) and verify that indeed the level of influence is the comuna. In the case that it is, then the project proponent must carry out a comuna-level EI/ST. Final approval of the EI/ST and related mitigation measures for a

comuna-level EI/ST must come from SEREMITT before the Municipality can issue the building permit.

The recent case of the addition of the Province of Chacabuco to the PRMS serves as a useful case to illustrate the EFV and EI/ST process and inter-relations (see, also, Section 5.3.4). While the plan developed to add Chacabuco to the PRMS actually encompasses an area much larger than a comuna plan (PRC) (indeed, the Province is comprised of three comunas), the process undertaken is nonetheless analogous. In this case, MOP has undertaken a study to develop an investment plan for the structural (inter-comunal) road system and relevant upgrades in existing infrastructure necessary to support the proposed real estate development projects (of which, according to CIS [2000], there are 13).[105] This study will not only propose the infrastructure necessary to satisfy transportation demand due to the real estate developments, but also identify the mechanisms by which each developer will be charged its "fair share" for the costs of this infrastructure. This aggregate analysis, essentially an EFV, will not attempt to resolve local issues, such as local roadways, traffic signaling, etc.; these will be defined by, and incorporated into, the individual development projects via the EI/ST process. Each developer will, thus, have to make contributions to both the structural (regional) infrastructure as well as the local. For existing comunas, essentially the same process should occur.

4.7.1 Transport "Impact Fees" & Roadway Corporations

The case of Chacabuco, particularly the government's intentions to identify efficient and equitable charging mechanisms for transportation infrastructure development, highlights an important challenge to the actual deployment of such mechanisms – their legality. Current law apparently does not allow authorities to directly charge transportation impact fees; while they can require developers to make direct investments in transport system improvements (so-called "in kind" exactions, such as developing road infrastructure[106] or installing traffic signals), authorities cannot collect funds from project developers for the purpose of financing transportation infrastructure development. This poses a significant barrier to getting real estate developers to contribute to larger structural, comunal or inter-comunal transport infrastructure that their projects might require.

To get around this barrier, at least two Municipalities – Lo Barnechea and Peñalolén – have deployed an innovative instrument, the roadway corporation (*Corporación Vial*). Lo Barnechea – a comuna with historically limited roadway accesses to the rest of the RM – first came up with the idea of forming a roadway corporation in the early 1990s. At that time, the Municipality was in the process of developing a transport demand study for the comuna looking to the year 2005 and based on the numerous real estate projects planned. The goals of the study were to identify the necessary comuna-level road infrastructure and establish a mechanism through which real estate developers would contribute the financing to build this infrastructure (see MIDEPLAN, 1998). Due to its inability to directly charge impact fees, the Municipality designed a non-profit corporation, with a Board comprised of representatives from the Municipality and from the private sector and presided over by the Municipality's Director of Traffic. The corporation's purpose was to collect fees from developers (based on a pre-established per housing unit charge) and then to use the funds to finance the identified structural roadway

improvements.[107] These fees are in addition to any costs that developers might incur due to their local project impacts (i.e., neighborhood streets, intersection improvements, etc.). While the Municipality could not actually force developers to pay impact fees to the corporation, its approach was reportedly to leave developers with little option by otherwise requiring relatively costly mitigation measures. Most developers simply found compliance with the impact fee program easier and cheaper. Reportedly, Peñalolén's roadway corporation functions in a similar manner and has apparently contributed to nearly all of the comuna's road development in recent years.

Although providing the possibility to get around the challenges to collecting transport impact fees, roadway corporations have been criticized due to their lack of legal basis. In fact, the concept of the roadway corporation has been the subject of apparent legal questioning by the central government (through the *Controlaría de la Republica*) and the private sector. Nonetheless, absent a legislative initiative to legalize direct transport impact fees or government action that explicitly bans roadway corporations, these quasi-legal entities may be the only option for authorities trying to force real estate developers to, at least partially, finance large-scale comuna or inter-comunal transportation infrastructure.

In Chacabuco, authorities (MOP and SEREMITT) view a roadway corporation as a possibility for financing the identified infrastructure. However, in this case, an additional complicating factor has arisen – time. Real estate developers are anxious to get their projects moving forward, yet this cannot happen without transportation infrastructure in place. Forming a roadway corporation can take up to one year, perhaps longer in this case since five or more comunas would likely be involved.[108] As of September, 2000, authorities were still not clear on the mechanism that would be utilized.

4.7.2 Challenges and Comments

While the EFV and EI/ST processes seem to be becoming more formalized, certain risks and shortcomings remain. First, there is an apparent infrastructure-orientation to the entire process. When future transport demand is estimated due to a development project, the proposed response focuses nearly exclusively on the infrastructure necessary to satisfy that demand; alternative land development scenarios, initiatives to promote public transportation ridership, or other travel demand management measures are rarely considered. Even if such measures are considered, they most often fall on deaf ears. For example, in the case of the EFV done for Lo Barnechea, the consultants reportedly developed different land use scenarios for the comuna (using a detailed number of traffic analysis zones for modeling purposes) to show how different land use scenarios would change the transportation network performance (based on trip attractions). The Municipality, apparently, was unwilling to pursue alternative development plans. At the project level, even if a Municipality were interested in trying to convince a project proponent to alter its development project to reduce transportation demands, they have no formal authority to require such changes. Currently, a project's transportation effects would only alter developer plans if the transport impacts became so large as to require mitigation measures which would be costly enough to make the developer re-think its project.

In addition, there are some indications that the EI/ST process remains essentially a bureaucratic step in the approval process. For example, in the Sectional Plan developed for a mega-project in the comuna of Peñalolén (Cousiño Macul, see Section 5.3.2), the EI/ST laid out four different land development scenarios – varying the densities of development (CITRA, 1999).[109] Few illuminating conclusions can be drawn from the exercise, however. Instead, it seems that the mitigation measures were already determined: roadway improvements contained in the various official plans. While the study makes final mention of the need for a mass public transport intervention, due to overall congestion levels exhibited on two nearby principal roadways, no concrete steps in this regard are proposed and the EI/ST was approved by relevant authorities.[110]

Furthermore, there are possibilities that projects might slip through the process, either without being subjected to an EI/ST or not being appropriately characterized according to their area of influence. For example, since the Municipality serves as the principal contact with the project proponent, there is a chance that the Municipality – intentionally or not – might not properly identify the area of influence, running the risk that the EI/ST will not be reviewed by relevant regional authorities. Also, there is the possibility that a project proponent may present a project in parts, thereby keeping the project underneath the size threshold that would subject it to the EI/ST requirement.

In the case of levying direct transport impact fees, as discussed the principle challenge rests in defining a clear legal basis for their use. This requires legislation and could be incorporated into the new law for urban development and construction currently being developed (see Section 4.2.1). In addition, fundamental theoretical questions remain regarding what is actually being charged for through the impact fees resulting from the EFV and EI/ST process. The MIDEPLAN draft manual on the subject (MIDEPLAN, 1998) focuses on the need to internalize the external transport impacts of real estate projects, namely: their impacts on the scarce resources of time and land. Both resources are finite (i.e., cannot be produced), and a real estate project impacts them by generating travel demand that imposes congestion on the transport system (consuming individuals' time) and/or requiring infrastructure expansion (consuming land). In the case of projects that influence consolidated urban areas where road infrastructure expansion is infeasible, the transport impact fees should be based on the congestion effects the project will generate on an established system, not a trivial matter in terms of modeling nor in terms of quantifying the costs.[111] In the case of projects where capacity expansion does not face serious constraints (where land is not as scarce, as in the case of Chacabuco), the impact fees should be based on the costs of providing the infrastructure necessary to provide an acceptable level of service. In many cases, there may actually be a combination of these two factors – system expansion cannot fully meet generated demand at an acceptable level of service, so that measurable congestion effects remain. In such cases, the appropriate impact fee should be calculated based on the combination of infrastructure and congestion costs.

Of course, charging real estate projects for congestion that they might produce is a second best approach, at best. As congestion is a time- and place-specific phenomenom,

congestion pricing, which charges users the real marginal price of their travel decisions at the moment they make them, provides the most efficient mechanism to charge for it. If authorities ever have success in implementing a congestion pricing scheme in Greater Santiago (as has been in the works since the early 1990s), then the use of impact fees for recovering congestion effects would constitute double-counting and, thus, would no longer be necessary, at least for projects situated in areas of the city under the congestion-pricing regime. This actually raises the potentially important issue of what would happen if congestion-based impact fees were calculated and charged to projects in the urban area and then congestion pricing were later implemented.

For areas of large developments where little infrastructure actually exists (such as Chacabuco), then the calculation of a minimum network required to provide adequate levels of service and charging for that network is more straightforward, but questions still remain regarding: how future real estate developments might subsequently be charged; what to do about parts of the existing network that are connected and loaded onto (and cannot be easily expanded); and, how to ensure double-counting does not occur through other forms of transport user charges (fuel taxes, vehicle registration fees, real estate taxes, etc.). In short, it needs to be clarified exactly what is being charged for (capital costs, maintenance costs, long-run marginal costs, all external costs).

4.8 Environmental Impact Studies

According to national environmental legislation (Law 19.300, March 1994) all urban development projects of a certain size or in certain areas must enter into the Environmental Impact Evaluation System (*Sistema de Impacto Ambiental* or SEIA), as must relevant land use plans (PRCs, Sectional Plans, PRIs, PRMs). In areas like the Metropolitan Region that have been declared in violation of air quality norms, *all* development projects must enter the SEIA, where they are subjected either to an Environmental Impact Declaration (which requires minimum documentation so that authorities can ensure the project indeed has no adverse environmental impact) or an Environmental Impact Study (EIA) (which requires a more detailed environmental analysis and proposed mitigation measures). While specific details regarding the broad requirements of EIAs are beyond the scope of this work, there are particular aspects of the EIA system that have important influence on the land development-transportation system interaction.

In the most direct sense, a project submitted to the SEIA can simply be rejected based on violation of basic environmental principles. For example, in the case of the Sectional Plan developed for the real estate project "El Principal" (a residential development for some 20,000 people) proposed for the comuna of Pirque, the Plan was rejected because it was located on land restricted from development in the PRMS (COREMA, 1998a). Similarly, in the comuna of El Monte, a proposed residential development of over 50 hectares was rejected on grounds that it was to occupy land of important agricultural value (COREMA, 1999a).

4.8.1 "Compensaciones"[112]

A more subtle, complex and quasi-legal effect of the SEIA process on urban development is one directly related to transportation – the idea of environmental impact fees (or *compensaciones*). The use of *compensaciones* in the RM is legally founded both within the national environmental law and the RM Pollution Prevention and Control Plan (PPDA, see Section 4.10.2). According to this Plan, no new activity that locates in the RM can produce annual emissions levels over certain threshold limits (CONAMA, 1998).[113] If a project does exceed the limits, then it must more than offset its additional pollution, through reducing by 120% all emissions over the threshold. The goal is to ensure a neutral effect on overall regional pollution levels. Among the many different types of activities for which this mechanism applies include those that produce emissions due to the generation of new trips.

Regional environmental authorities have applied this environmental impact fee to estimated transportation impacts of certain real estate projects, particularly those in the Province of Chacabuco, under the premise that these projects generate longer trips than those which would occur if the real estate projects were to locate within the existing urban area. Although authorities stand, admittedly, on shaky legal – and methodological – ground in this approach, they have to date applied the compensation requirement to three projects, one of which had been formally approved by August 2000. According to the agreement between project proponents and the government, the project, Pan de Azúcar, must implement two compensation measures (COREMA, 1999e):

- to offset carbon monoxide (CO) emissions – retire from circulation, within a period of 36 months, 93 basic taxis without catalytic converters and either destroy them or export them from the country; and
- to offset particulate matter (PM) emissions – plant and maintain, within a period of 10 years, 100 hectares of greenspace with vegetation capable of retaining PM.

Both of these measures were justified based on the project's generation of private automobile trips (for work and school). The *compensación* aims at offsetting the additional trip lengths that the project implies, due to its distance from the urban area. In other words, authorities are only requiring the project to compensate for the incremental increase in kilometers per trip and the resulting emissions based on the distance between the project and the existing urban edge.

Although the use of these environmental impact fees is authorized in Law and the PPDA, in reality their application edges into a legal "gray area." For the Pan de Azúcar project, while the negotiations between the government and the private sector were difficult, the project proponent eventually accepted the *compensación* proposal, in part to avoid a more drawn out project approval process and in part because of the relatively minor cost of the ultimate compensation level required (for example, the estimated investment in Pan de Azúcar is US$500 million, while the cost of retiring 93 used taxis is an estimated $250,000). It is not clear what the cost will be of providing the required greenspaces as specified in the negotiation agreement.[114] For the other two projects in Chacabuco that are currently in the process of identifying environmental *compensaciones*, the negotation

process has reportedly gone more smoothly, as project proponents now seem more willing to accept the concept.

Despite these steps forward, the risk remains that future project developers might more rigourously question the legality of the application of *compensaciones* – at least in their current formulation – to real estate projects. To reduce this risk, authorities need to strengthen the theoretical underpinnings and methodological approach behind these impact fees. Theoretically, the use of transport-related *compensaciones* to account for the additional emissions due solely to a project's distance from the existing urban edge lacks sound justification. The idea rests on the theory that a project outside the current urban area will produce more transport emissions than if the project located within the current urban area, due to the extra distance that residents must travel to access the urban activity system (primarily jobs and school). In reality this may or may not be the case. The answer depends on how residents of the new projects actually interact with the rest of the urban system (number of trips, their destinations, mode choice, time of day, etc.), the actual driving conditions in built-up versus new areas, and how these factors evolve in time (particularly as the new and existing urban areas change in time). Modeling this activity-transport-emissions system interaction is no small task, so it is understandable why authorities have to date taken their somewhat blunt approach.

The current approach, however, highlights that the real estate market does not seem to be the most appropriate market through which to recoup the air pollution externalities produced by transport system users. Similar to the case of transportation externalities, pollution externalities are most efficiently (and equitably) charged for according to actual system use. However, even if a congestion pricing scheme (that was also capable of levying accurate pollution charges according to driving conditions and vehicle emissions) is not possible, it is not entirely clear that incorporating these pollution effects into the real estate market even constitutes a "second best" measure. Other, more appropriate second-best charging mechanisms would likely be increased fuel taxes, pollution fees charged during inspections, or, simply, more stringent vehicle emission standards (which normally translate into proxy charges by increasing vehicle ownerhip and operating costs) (see, for example, Howitt and Altshuler, 1999). Of course, these charging mechanisms are not easy to implement either (due to political and/or technical infeasibility), so perhaps attempting to recuperate transportation pollution externalities through the real estate market makes sense – it is easier to target a single large developer, rather than thousands of daily transportation system users.

But, even if these *compensaciones* via the real estate market provide a "third-best" option for charging for transportation's pollution externalities, the current very low charges (i.e., US$200,000 for the $500 million Pan de Azúcar project) suggest that either the charges are very poorly estimated or/and the incremental air pollution effects of these new developments are actually quite low. The reality may be a combination of these two factors, but poor estimation is certainly a concern.[115] Poor estimation, in turn, directly relates to the ambiguity regarding exactly what is being charged for via the *compensaciones*. In this regard, authorities should clarify: why they impose *compensaciones* only for the additional travel distance associated with a project's

distance from the existing urban area; what the time period is over which a project's emissions are being estimated (i.e., one year, 10 year, 25 year); and why only the emissions over certain established thresholds should be compensated. Furthermore, CONAMA should allow for a broader range of *compensación* measures (beyond the purchase of used taxis); developers should be allowed to offset emissions through acceptable measures of their own choice, including through improvements to their own developments. Indeed, the potential for incorporating *compensaciones* into a tradeable permit scheme should be investigated.

By addressing these issues then authorities would move towards more accurate and just impact fees for charging real estate developers for their effects on transportation pollution. CONAMA (1998) itself recognizes that the definition of an accurate methodology to estimate travel-related emissions due to real estate project locations should be a priority area for future study. In the end, these impact fees should, likely, be targeted at all developments in the RM, be based on a comparison to alternative location options, account for the locational and urban design impacts on each phase in the trip-making process (generation/attraction, distribution, mode choice), and, possibly, be fully integrated into the EI/ST process (to minimize duplication of effort and reduce possibilities of double counting in fees). The modeling requirements behind such a mechanism are difficult but achievable (see, for example, Pushkar, et. al, 2000). The end result would not only be a more efficient and equitable mechanism, but also one that might indeed effect locational patterns and allow developers (and, eventually, consumers) to offset their real impact on emissions via demand management measures and alternative forms of growth.

4.9 Urban Impact Studies & ZDUCs, AUDPs, ZIEDCs

The requirement for urban impact studies arose directly from the 1997 modification to the PRMS which incorporated the Province of Chacabuco (see Section 4.3.2). This modification contained three different mechanisms to help guide mega-project development in the Region: residential and non-residential Zones for Conditional Urban Development (*Zonas Urbanizables con Desarrollo Condicionado* or ZDUC), Exclusive Industrial Zones for Conditional Development (*Zonas Industriales Exclusivas con Desarrollo Condicionado* or ZIEDC) and Areas of Priority Urban Development (*Areas Urbanizables de Desarrollo Prioritario* or AUPD). In each of these cases, if they are proposed in areas not yet covered by a PRC, an Urban Impact Study (*Estudio de Impacto Urbano* or EIU) must be completed and approved by SEREMI-MINVU. The guidelines for conducting these EIUs were subsequently issued by SEREMI-MINVU (1998).

The fundamental principle behind the EIU is to address what had been a vacuum in issues of urban development in Chile – the lack of any government norms to guide the development of completely new urban areas. Previously, the available instruments (i.e., PRC, PRM, PRI) aimed at regulating existing urban areas (via expansion or densification), but no tools effectively addressed the issue of areas physically separated from the existing urban space. The EIU aims to correct this shortcoming, identifying a proposed development's "area of influence," determining its impacts on surrounding areas, and proposing specific mitigation measures. According to the guidelines, the EIU

is intended to be complementary to the EIA process (see Section 4.8). In all cases, the EIU must develop programs to address: natural risks, transport and roadways, potable water, sewage and water treatment, and drainage. Furthermore, AUDPs and residential ZUDCs must contain zoning provisions to ensure fulfillment of required land uses and densities as well as a program to ensure adequate delivery of urban infrastructure and services (parks, buildings for police and fire services, a local services center, and sports, health care and educational facilities).[116] For the transport and roadways assessement the EIU guidelines essentially defer to the EI/ST and EFV process detailed in Section 4.7.

For Chacabuco Province, the modified PRMS identifies 10 areas for ZDUCs, a total of 4,107 hectares. A ZDUC has essentially two development options. In the first case, these areas are prohibited from having lots smaller than 4,000 m^2 and densities greater than 10 people per hectare – essentially continuing the situation created by the Law of Agricultural Parcels (see Section 4.6) and allowing low density suburban subdivisions.

The second development option under the ZDUC regulations, aims specifically at slowing the *Parcela de Agrado* phenomenon, by allowing for intensified development densities. If a developer controls a minimum area of 300 contiguous hectares, a project can be developed at an average residential density of 85 persons per hectare. The rationale underlying this provision is that allowing more intensified development enables the developer to increase its profit potential (more units on the same amount of space); consumers, on the other hand, will be attracted to these developments because of the enhanced amenities (trunk infrastructure connections, etc.) offered. In exchange for these higher density permissions, developers must target at least 5% of the land needs at low income "social housing" (i.e., "inclusionary zoning") at density levels of 300 to 500 persons per hectare[117] with the goal of creating mixed-income areas and also potentially reducing travel demands for lower income domestic workers that might be able to live and work within the same community. In addition, at least 5% of land in a ZDUC must be dedicated to "productive" activities (services, industry, commercial, etc.), an attempt to create a mix of uses, thereby potentially reducing travel demand for some shopping, work and other types of trips. These ZDUCs must also, of course, comply with the other requirements laid out in the EIU process, regarding provision of educational and other urban service facilities.

For ZIEDCs, the PRMS identifies 2 areas with a total of 1,350 hectares. Similar to the case of ZDUCs, these can only be developed at low densities - a minimum lot size of 40,000 m^2 – unless comprising contiguous areas of at least 40 hectares, in which case the land can be subdivided into lots of 4,000 m^2, pending approval of an EIU. Finally, some 12 areas in Chacabuco are identified for AUPDs, most immediately adjacent to existing urban areas within the Province. These are to be developed at an average density of 85 persons per hectare, with parcels of no greater than 5 hectares dedicated to social housing at maximum densitities of 300 persons per hectare.

4.9.1 Challenges and Comments

Currently, of the three mechanisms designed to guide megaproject development in Chacabuco, the ZDUCs have been the focus of most private sector activity. Indeed, at

least some private sector representatives claim that the regulations formalizing the ZDUC development guidelines are actually built around development concepts that the private sector proposed to the government for some of the first "mega"-projects slated for the region (see Section 5.3.1). While the ZDUC regulations and private sector interest do indicate interesting steps in the move to create semi-autonomous, mixed-use and mixed-income "new" cities, there is no guaranteee that these developments will come to fruition as currently planned. The draft transport system impact study (EI/ST) conducted for the entire Province (DII-UC, 2000) estimates that approximately one-half of the areas identified as ZDUCs will be developed at the intensity of 85 persons per hectare, while the other half will be developed essentially as *Parcelas de Agrado*, at 10 persons per hectare.

A major challenge rests in the fact that Municipalities or other levels of government have no clear mechanisms or incentives in place to ensure that ZDUCs fulfill their plans. The long-term nature of most of the projects proposed (typically 30 year time-frames) only exacerbates this problem and makes it unclear at what point the different required accompanying services and infrastructure will be viable. Furthermore, for the publicly run services (such as police, education, hospitals), though the projects are required to provide the facilities, there is no guarantee that the public sector will have, at least in the short-term, the funds to operate these services. Finally, at least one case (the ZDUC proposed for Lampa) has exposed an unanticipated problem: what happens when a project is geared nearly exclusively towards low income groups, in which case the 5% set aside for social housing is irrelevant, and the possibility of creating mixed income and mixed use urban areas is greatly compromised?

While the private sector embraces the ZDUC for projects in Chacabuco, its enthusiasm for AUDP appears less clear.[118] At the same time, there are no clear signals within any of the planning guidelines for how the government might put in place incentives for the private sector to pursue the AUDPs and thus promote the development and revitalization of existing urban areas in the Province. Finally, there is the possibility that the ZDUCs might develop in part as low-density suburban subdivisions, essentially continuing the current *Parcelas de Agrado* phenomenom.

4.10 Sectoral Plans

There are various sectoral plans with relevance to the transportation and urban development system. Some of these plans, such as water provision or similar infrastructure and service plans, while certainly impacting urban growth, fall out of the scope of this paper. Here, we focus on two sectors of most direct relevance: the several metropolitan-level transportation plans and the 1998 air pollution and control plan.

4.10.1 Transport Plans

In 1994, SECTRA unveiled a transportation plan for Greater Santiago, a plan elaborated and evaluated with support of the Santiago strategic urban transport planning model ESTRAUS (SECTRA, 1994).[119] The SECTRA plan identified strategies and investments for the period 1995 – 2010, including: road infrastructure expansion, bus priority

measures, road pricing, urban subcenter development, Metro and suburban rail development, and an investigation into bicycle infrastructure development.[120] According to the SECTRA analysis, plan implementation carried a net present value of US$900 million, with an estimated internal rate of return of 26 percent. The plan contains a schedule of investments and interventions over the 15 year period, however, implementation of the SECTRA plan depends completely on the commitment and financing of other relevant authorities (MOP, SERVIU, MINTRATEL, GoRe, Municipalities), since SECTRA itself is not an executing agency. In essence, the plan serves as a guidance document; projects contained in the plan are essentially "approved" by MIDEPLAN for financing, although specific financial resources are not specified.

A main criticism of the SECTRA transport plan is its lack of integration with the contents of other relevant plans and unclear articulation with them. For example, although the SECTRA plan does overlap with MINVU's land use regulatory plan (PRMS) for Greater Santiago (i.e., they share much of the same infrastructure as well as concepts such as the proposed urban sub-centers), these plans were developed in isolation. In other words, the SECTRA plan does not ensure the feasibility of the land use-transport plan as proposed in the PRMS. Furthermore, since the SECTRA plan was developed with no public participation, many of its final results have met with stiff opposition – represented, for example, by community opposition to a major busway proposed for Gran Avenida running to the southern suburbs.

In addition, a lack of coordination exists between the SECTRA plan and those various plans put forward by MOP – both MOP's infrastructure concession program and its other roadway projects. SECTRA's history has shown that its planning activities have often been overridden by the desires of the more powerful Ministries, both MOP and MINVU.[121] If fact, recent history indicates at least some level of competition in planning activities between MOP and MINVU. While SECTRA was undertaking the planning and modeling activities leading to its 1994 Transport Plan, MOP led a similar activity – one aimed at planning infrastructure for the entire central "macro zone" (the so-called *macro zona central*, comprising the RM and the adjacent Regions V and VI). This initiative focused primarily on urban and inter-urban transportation infrastructure[122] (including port and airport development), utilizing an integrated modeling package combining regional economic input-output modeling with transport and land use forecasting models (the MEPLAN package; see, for example, Hunt & Echenique[1993]). Despite its inter-regional scope, the resulting plan placed important emphasis on the Metropolitan Region, proposing for the RM (in US$1992): $2 billion in roads and highways, including an approximately 175 km-long second ring road (the "orbital"), at a radius of 15 to 20 km from the center of Santiago; $1.5 billion in Metro (including Line 5) and suburban rail investments; and $200 million, for 200 kms of busways. While both MINVU and SECTRA were involved as counterparts in the "macro zone" project, the extent of coordination and integration is unclear. For example, only portions of the right of way for the proposed "orbital" highway are demarcated in the PRMS; furthermore the macro zone plan identifies 20 urban "sub-centers," only a few of which coincide with those in the PRMS.[123] This 1993 plan also identified significant swaths of urbanization in the

Province of Chacabuco, although the 1994 PRMS would (before the 1997 modification) prohibit urban development there.

Building on this planning initiative, MOP had, by the mid-1990s, identified 16 road projects to be developed by 2005, at an estimated cost at the time of US$750 million (MOP, 1996). Some of these projects have either since been completed (i.e., the new airport access), while others have recently been successfully concessioned out (i.e., the North-South system, including the urban portion of the Panamerican Highway Route 5 and the upgrade of a parallel avenue to highway capacity). Two of the planned facilities comprise the eastern portion of the "orbital," one (*Pie Andino Norte*) running north from the upper income suburb of Lo Barnechea to Route 5 (Panamerican Highway) North and another (*Pie Andino Sur*) running south from Lo Barnechea along the eastern foothills to Route 5 South. Both of these projects were to be developed via concession, but doubts remain over their feasibility; a scaled-down version of the *Pie Andino Norte* will reportedly be built by a real estate developer in Chacabuco (see Section 5.3.4). Another highway concession also has its genesis in Lo Barnechea, the proposed *Costanera Norte*, which would run directly through the city center and west to the airport. The *Costanera Norte* – which will slice off the southern edge of the Metropolitan Park and tunnel through another part of the park and center city neighborhoods – met with strong public opposition, but the concession contract has been recently signed and it now seems that the project will proceed.

As MOP manages a substantial budget (according to MOP [2000], its roadway investments in the RM averaged $40 million per year during the 1990s) and runs the increasingly powerful concessions program, it arguably has more ability to ensure that its planning initiatives ultimately come to fruition. In the case of concessions, there are some indications that this program has taken on a life of its own. Several concessions proposed for tender in the period 2000-2001 – including the upgrade of the southern segment of the Vespucio Ring Road (a portion of which will include an exclusive busway) and a north-south suburban rail line running on existing rights of way from Til-Til in Chacabuco through the city center to Melipilla[124] – are contained in either MOP and/or SECTRA plans.

However, at least one concession project, the proposed 21 km North East Santiago Access (*Acceso Nor-Oriente*) finds it origins completely outside the public sector planning process. The North East Access was proposed by ECSA, a real estate company developing the $600 million ZDUC project, Chamicero, in Chacabuco (see, also, Section 5.3.4). The company, along with other developers in the area, deems the highway, which connects its project to Route 5 North and to the upscale eastern neighborhoods of consolidated Santiago, as crucial to the success of its project and proposed it as a concession to MOP. MOP's concession program actually contains incentives for such private sector proposals – companies that propose new concession projects to MOP are rewarded bonus points in any eventual tendering, which greatly strengthens the likelihood that the proponent will be awarded the concession.

Regarding additional public transport infrastructure concessions, MOP has preliminarily identified ten corridors (97 total kms), for which it hopes to identify some form of private sector participation, either for the corridors themselves and/or the stations (including Metro transfer stations) (GdC, 2000). In addition, suburban rail line concessions are being explored, both south to Melipilla and north to Til-Til (in Chacabuco).

The realization of these concessions, particularly the public transport concessions, remains in serious doubt. Some of the inter-urban roadway concessions have recently entered into problems with contract fulfillment and underestimated demand – problems which throw the urban concession proposals into an uncertain light as well.

The new government which came to power in early 2000 has placed emphasis on improving urban transport conditions, including those in Greater Santiago. Towards that end, authorities have launched a new transport planning initiative involving SECTRA, MOP, MINVU, CONAMA, MINTRATEL and others. In many ways, the new planning process aims at more effectively integrating transportation infrastructure with system management and, perhaps more importantly, reining in and coordinating the various independent initiatives of different government agencies. According to authorities, the plan will:[125]

- attempt to integrate infrastructure and system management;
- emphasize the modernization and optimization of public transport;
- recognize the links between transportation and urban planning, focusing on issues of activity locations (schools, land use plans, etc.);
- stress the role of nonmotorized transportation;
- more explicitly incorporate public participation; and
- attempt to resolve the institutional vacuum through the creation of a metropolitan transportation authority.

4.10.2 The Air Pollution Prevention and Control Plan

The Metropolitan Region's Air Pollution Prevention and Control Plan (*Plan de Prevención y Descontaminación Atmosférica de la Región Metropolitana* or PPDA) is a normative/indicative instrument aimed at improving the air pollution conditions afflicting the RM (CONAMA, 1998). The Plan was developed under CONAMA's coordination, with COREMA as the responsible authority, and a wide range of governmental authorities participating in several sectoral subcommittees (such as the transport systems subcommittee and the regional planning subcommittee). In addition, a public participation process – involving representatives from government, civil society, the private sector, universities, interest groups, and others – paralleled and fed into the PPDA development process.

The PPDA provides a potentially powerful tool for urban management because, theoretically, any project in the RM that enters into the environmental impact assessment system (SEIA; see Section 4.8) must meet the conditions established in the PPDA. Beyond establishing norms (such as vehicle emission standards and emissions thresholds that new activities cannot exceed), the PPDA also dictates various indicative guidelines

and calls for many measures closely related to the urban development and mobility system, including:

- the creation of a Metropolitan Transportation Technical Unit within the Regional Government, with the objective of coordinating transport plans and pollution reduction plans;
- the development of a master plan for pedestrian and bicycle transportation;
- studies of alternative mass public transport technologies and other system improvements such as integrated fare schemes;
- strengthening the CROT (see Section 2.1.1) and locating it within MINVU;
- completing the PRDU (see Section 4.3.1) and updating all PRCs (see Section 4.3.3);
- the development, by MINVU and CONAMA, of a methodology to quantify the negative externalities of real estate projects (including transportation effects, pollution, and other urban costs) and mechanisms for internalizing these (see Section 4.8.1);
- a reduction in the total number of housing subsidies issued in the RM, to reduce incentives for continued migration to the RM from other parts of the country;
- a doubling of the number of urban renovation subsidies (especially to promote urban subcenters' development), to help influence housing decisions of those that do locate in or relocate within the RM (see Section 4.5.3);
- a combined effort between MOP and MINVU to establish a program of "anchor buildings" in the urban subcenters identified in the PRMS (see Section 4.3.2);
- the strengthening of education facilities and services in the south and southeast, to reduce school trips from these parts of the city to the rest; and,
- the use of *compensaciones*, including for real estate project trip generation (see Section 4.8.1).

Despite this broad range of proposals, the PPDA carries little weight for ensuring implementation. The recently completed external audit of PPDA progress (CONAMA, 2000a), while recognizing important advances made in terms of establishing technical norms (such as for vehicle emissions and fuel quality), underlines this problem. The audit finds that over 20 different government institutions are involved in measure implementation,[126] complicating issues of accountability, coordination, and ultimate responsibility. Furthermore, the audit criticizes the lack of prioritization among the measures and the lack of financial resources behind any of the measures. Similar to the situation of SECTRA, CONAMA is a coordinating and consultative body, dependent on other government bodies to actually dedicate their resources to implement the plan's measures. Without clear signals from above, these authorities will continue measuring their success based on their specific organizational functions, not on fulfilling the objectives of the PPDA (an example is MINVU/SERVIU's objective of providing the greatest possible number of social housing units per year, with no metric in place to consider implications for urban growth patterns and impacts). In the end, CONAMA's principle tool for management of environmental issues is its power to reject, or call for the modification of, specific projects through the environmental impact process (SEIA).[127]

Despite its weaknesses, the PPDA may evolve into a more powerful tool for urban management. Indeed, the CONAMA audit sees a strengthened PPDA as the key to achieving medium- and long-term air pollution reductions. Towards this end, the audit recommends the reduction of transportation demand through more effective regional planning (including the control of urban expansion). It also calls for a strengthening of the *compensaciones* system and the establishment of a emissions trading scheme. It cautions, however, that without more budgetary resources and strengthened autonomy and flexibility, the effectiveness of the PPDA will remain greatly compromised.

5. Recent Trends in Real Estate Development

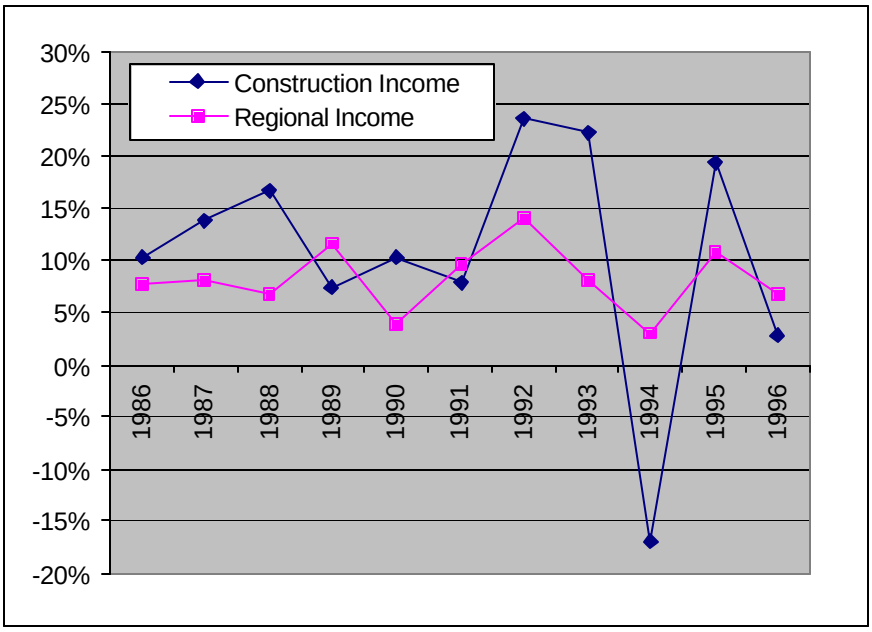
The combination of economic and demographic trends, transportation system operations and infrastructure, and the various direct and indirect government interventions in the land market plays an major role in the real estate market. Real estate market trends and development, in turn, can play an influencing role in many of the above factors. This section provides a general overview of the real estate market in the Santiago Metropolitan Region, looking at the emergence of major market players, the evolution in land values, the dynamics of different building sub-sectors, and also highlighting specific real estate projects within many of these sub-sectors. This background is crucial to understanding the true potentials for urban growth management for mobility in the RM.

5.1 Market Background & Major Players

The construction industry comprises less than 6% of the region's economic activity (see Section 3.1) and construction activity generally follows economic growth, although typically with higher peaks and valleys (see Figure 5.1). The real estate market, specifically, weighs heavily among private sector activity in the RM; over the period 1994 to 1998, real estate investments equaled 50% of all private sector investments in the RM, reaching approximately 75% by 1998 (see Figure 5.2).[128] In relatively recent history (up until the early 1970s), the public sector played an important role in many real estate projects – via Urban Improvement Corporations or CORMU – purchasing and developing large tracts of land for real estate projects. Indeed, in the two adminstrations leading up to the start of the military regime in 1973, government programs accounted for 65% of all housing construction in the city (Sabatini, 2000). Today, however, public sector direct participation in the market is limited to SERVIU's role in some public housing (*vivienda social*) construction (accounting for approximately 15% of the total housing market in recent years [Gemines, 1998]).

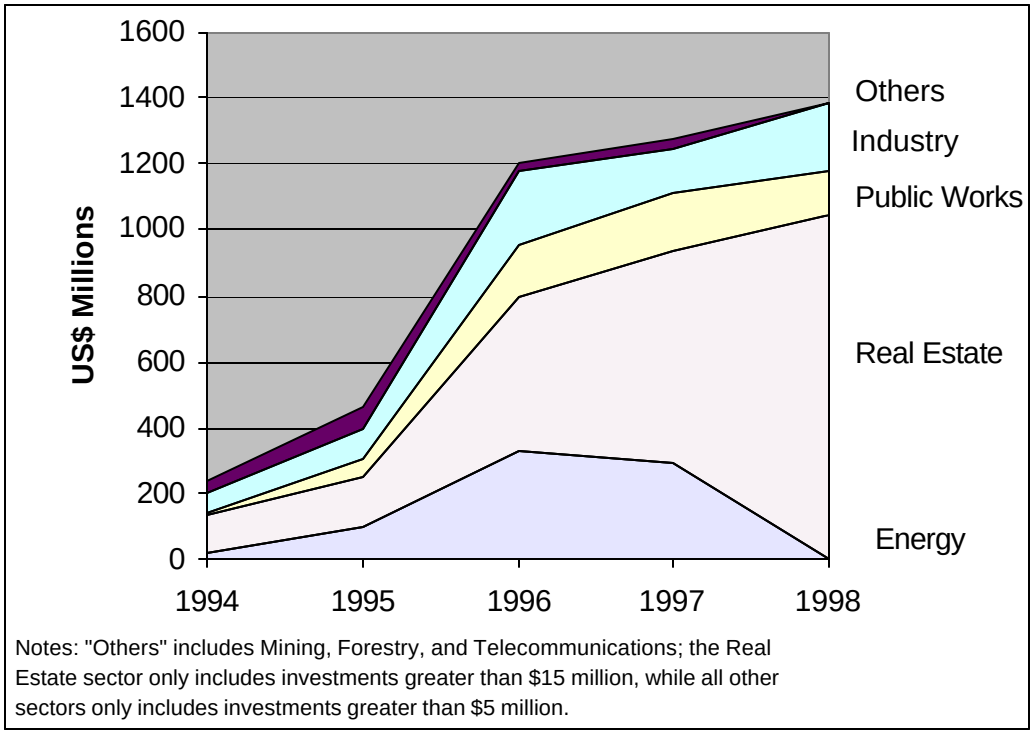
According to Sabatini (2000), today's real estate market owes itself to specific actions undertaken by the military regime, including: the liberalization of the land market, the sale of large tracts of government owned land, the elimination of low income squatter settlements in high income comunas, and the legalization of squatter settlements in other parts of the city. These market actions helped contribute to the growth in the importance of the real estate market to the regional economy which has, in turn, been matched by the emergence of a growing number of major market players. These market players, in turn, are linked to the "megaproject" phenomena, which has increasingly characterized real estate developments in the RM (and other parts of the country as well).

FIGURE 5.1
GROWTH RATES IN CONSTRUCTION & THE REGION'S GROSS PRODUCT



Source: Banco Central, 1999.

FIGURE 5.2
PRIVATE SECTOR INVESTMENT IN THE METROPOLITAN REGION



Notes: "Others" includes Mining, Forestry, and Telecommunications; the Real Estate sector only includes investments greater than $15 million, while all other sectors only includes investments greater than $5 million.

Source: SERPLAC-RM, 1999b.

While innumerable developers exist, there are an estimated 25 major players in the real estate business.[129] Many of these companies arose from the construction industry, although many have also arisen from other industries and/or from some of Chile's most prominent wealthy families. Several factors have contributed to the emergence of the "megaplayers" and their "megaprojects":

- the accumulation of large sums of capital, a by-product of Chile's decade long economic growth and financial sector modernization, linked to large investment funds (such as CB Capitales and Fondo Las Américas) and pension (via the privatization of the Chilean pension system) and insurance funds;
- a growth in consumer purchasing power, leading to demand for larger lot and home sizes and the amenities associated with "suburban" living;
- road infrastruture development and motorization, opening up large tracts of land to potential development and the subsequent decline in this land's alternative (typically agricultural) value; and
- dynamic real estate consumer financing opportunities and favorable tax benefits for housing construction.[130]

Although many of these emerging firms are young – some under a decade old – they have already left an indelible mark on the urban landscape. Inmobiliaria Manquehue might be characterized as a "megaproject" pioneer, launching the upscale 180 hectare Santa Maria de Manquehue in 1979, on the northern edge of the comuna of Vitacura (see Section 5.3.1). Linked to a holding company involved in winemaking and telecommunications, Inmobiliaria Manquehue has since gone on to develop at least 5 other megaprojects in Lo Barnechea, Huechuraba, Quilicura, and Colina (see Table 5.1).

Table 5.1
Inmobiliaria Manquehue's Residential Megaprojects

Name	Comuna	No. of Units	Size/Unit (m^2)	Price/Unit (US$1999)	Investment (US$ 1999)	Total Has.	Begun
Sta Maria de Manquehue	Vitacura	1,200 lots	4,000 – 6,000	$420,000 (remaining lots)	$180 million	180	1979
El Golf de Manquehue Stages 9-12	Lo Barnechea	1,500 lots	900-3000 800-900 800-1000	$156,000 $171,000 $189,000	$170 million	250	1992
Polo de Manquehue	Colina	512 lots	n.a.	n.a.	$40 million	250	1994
El Carmen de Huechuraba	Huechuraba	2,000 homes	n.a.	n.a.	$300 million	140	1996
Santa Marta de Huechuraba	Huechuraba	350 homes	n.a.	$73,000 - $97,000	$30 million	12	1997
Valle Lo Campino	Quilicura	4,000 homes	n.a.	$60,000	$250 million	105	1998
Chicureo	Colina	12,500 homes	n.a.	n.a.	$1,800 million	1,000 (urban)	In approval

Note: Chicureo is being developed in conjunction with Hispano Chileno, Sipsa-Guzman, Bouchón.
Sources: *Estrategia*, 2000; personal communication with company, company website.

Some of the other prominent companies involved in the sector are shown in Table 5.2. One is Manso de Velasco, originally formed in 1988 as a subsidiary of a Chilean electric company (Chilectra), to adminster real estate assets as well as to work in electrical engineering. In the beginning of the 1990s, the company moved into building construction and recognized the lack of major players in this field in Chile. The company soon embarked on massive projects, looking to take competitive advantage of its access – through its holding company – to large sums of low cost capital. In 1991, Manso de Velasco launched its first major residential project, on 300 hectares in Lo Barnechea (described further in Section 5.3.1). Today, the company – a fully owned subsidiary of the large Spanish energy holding company, Endesa – is spearheading the 1,000 hectare Enea Busines Park near Santiago's principal airport and has future plans for a large residential project (Tapihue) in Til-Til (Chacabuco Province).

Other firms, such as Besalco, have a relatively long history in civil works and engineering. Besalco served as a major contractor on the construction of Metro's Lines 1 & 2, has built many large government buildings, constructed mining and hydroelectric facilities, and recently participated in a highway concession project. In the mid-1990s Besalco built almost 1,200 homes in a large project in Maipú and most recently has begun work on a major project in San Bernardo, the *Maestranza* de San Bernardo (see Section 5.3.3). The *Maestranza* project marks one of the first initiatives with large international equity contribution, as the project's prinicipal partner is a large Malaysian firm.

This internationalization of the real estate industry in Chile is a growing trend and goes both ways. Belasco, for example, is pursuing a large residential project south of Buenos Aires in conjunction with a U.S. firm and also has projects in Peru. Another important and longstanding Chilean real estate firm, Fuenzalida Propiedades also has projects in Argentina and Peru, as does Sipsa. The latter, together with Hispano-Chileno, is developing a 565 hectare project 50 kms outside Buenos Aires and a Sipsa associate recently developed a large industrial park in Peru (Zegers, 2000). There are some indications that the increased presence of foreign capital in the Chilean real estate market is creating additional pressures on the urban planning and plan modification process, while also introducing additional points of conflict among different government agencies.[131]

In terms of downstream services, in some cases companies have formed mortgage associations to facilitate consumer credit for purchases. While developers will often assume direct responsibility for selling their own units, there is a large and vibrant real estate brokerage industry. Fuenzalida Propiedades, for example, has two businesses, a real estate development arm and a brokerage.

Table 5.2
Some of the Major Real Estate Players & Their Projects in the RM

Company	Major Projects (Comuna)	Other Businesses
Inmobiliaria Manquehue	Santa Maria de Manquehue (Vitacura), Chicureo[1] (Colina), El Golf de Manquehue (Lo Barnechea), many others	Winemaking, telecommunications
Crillon Inmobiliarios	Pedro de Valdivia Norte[2] (Providencia) Parque Cousiño Macul (Peñalolén)	Cousiño Macul Vineyard
Harseim	Pan de Azúcar (Colina)	Software, hotels, explosives
ECSA	Chamicero (Colina)	Banking, agro-industry
Hispano-Chileno	Ciudad Empresarial (Huechuraba), Chicureo[1] (Colina)	Manufacturing, vending machines
Manso de Velasco	Santuario el Valle (Lo Barnechea), Enea Business Park (Pudahuel), Tapihue (Til-Til)	Engineering, affiliate of Endesa (Spain)
Sipsa[3]	Ciudad Empresarial (Huechuraba), Chicureo[1] (Colina)	Restaurants, fishing, shipping, industry
Besalco	Maestranza de San Bernardo (San Bernardo), Parque San Francisco (Maipú)	Civil engineering, highway concessions
Sencorp	Several office buildings in "Sanhattan" (Las Condes)	Construction, architecture, equipment leasing

Notes: 1. Chicureo ownership shares: Manquehue 47%, Hispano-Chileno 28%, Sipsa-Gúzman 14%. 2. Pedro de Valdivia Norte was developed by the Cousiño family in the early-/mid-1900s; the family only recently created Crillon specifically for the development of Parque Cousiño Macul. 3. Sipsa's share in Chicureo and its work on Ciudad Empresarial are shared with businessman Patricio Guzmán. Most of the projects listed in this table are detailed further in Sections 5.3 & 5.4.
Sources: *Estrategia*, 2000; personal communications with several companies and company websites.

5.2 Land & Its Development

It is often claimed that the true profits from real estate actitivities in Santiago derive largely from land speculation and appreciation. The rapid rates of growth in land values in many of Greater Santiago's comunas seem to support this claim. According to advertised sales prices during the past decade, the average city wide growth rate in real property values was 12%. Over half of the comunas posted real annual growth rates of 15% or higher (ACOP-CNSI, 2000), with six comunas over 20%. Interestingly, none of these high growth rates were posted in comunas from the "cone of wealth;" instead they were widely dispersed across Greater Santiago, in the:

- southeast - Puente Alto, La Florida, Peñalolén, Macul;
- north/northwest – Quilicura, Renca, Huechuraba, Conchali, Independencia, Recoleta;
- west- Maipú, Cerrillos, Pudahuel, Estación Central, Cerro Navia; and

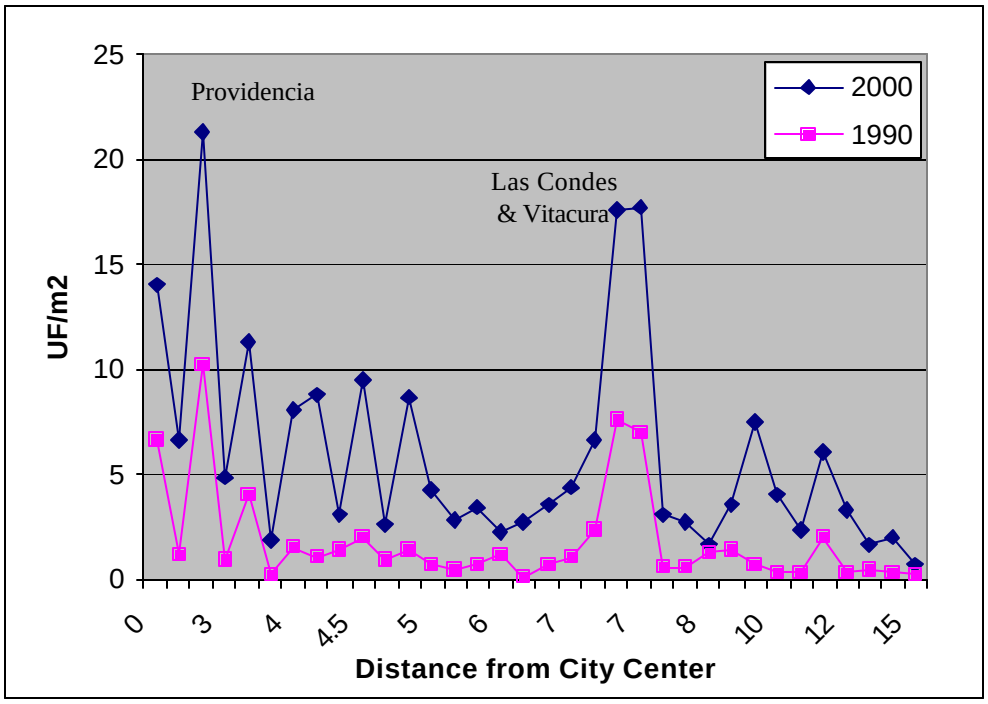
- south - San Miguel, San Joaquin, La Granja, El Bosque.

While more detailed analysis of factors underlying land market dynamics is beyond the scope of this work, these observable trends suggest – not surprisingly – that a combination of relatively low initial prices and strategic locations might be a cause of the price growth dynamic. The majority of the above-listed comunas had well below average land prices in 1990[132] and many of these also underwent rapid development during the decade. Although land price appreciation is not closely linked to any particular development pressures, per se, the southeast continued to be a focus of residential development and the north and northwest, together with El Bosque in the south and Cerrillos (in the southwest), experienced industrial concentration (as mentioned in Section 4.4, this industrial concentration is linked to the Vespucio Ring Road upgrade).[133] Comuna distance from city center had no effect on land price growth rates. A number of these high growth comunas might be characterized as "inner city" (i.e., Estación Central, San Miguel, San Joaquin, Independencia), while others are fringe (i.e., Pudahuel, Puente Alto, Maipú) and others are somewhere in between.

Very little office develelopment occurred in any comunas with high land value appreciation, focusing instead on the consolidated, high land price comunas of Las Condes, Providencia and Santiago.[134] In this case, office tower construction economizes – to some degree – on the costs of land, with the high costs also offset by the economies of office agglomeration, not to mention the cachet associated with addresses in these comunas. There are, however, indications that office development is already beginning to actively seek out cheaper, yet still accessible lands, with a new business park already open in Huechurba and a large one underway in Pudahuel (see Sections 5.4.4, 5.4.6). As households further suburbanize, these trends of office decentralization may well accelerate.

Although over the past decade, land price changes do not follow any distinct geographic pattern, price levels do roughly portray a land price gradient, with average comuna land price (per m^2) declining with distance from the city center. There are, however, many peaks and valleys in the gradient – most notably associated with comunas from the "cone of wealth" (see Figure 5.3). Despite the continued variation in land price across comuna, this variation has declined somewhat over the past decade.[135] Regarding land outside urbanized Greater Santiago, no hard numbers on land prices exist, particularly since historical sales prices are generally not available. But, where speculation and development pressures exist (such as in Chacabuco), significant appreciation in value has almost certainly occurred in recent years. CIS-INECON (1997), for example, reports that land prices in Colina have increased from $6 (0.2UF) to $24 (0.8UF) per m^2 in recent years. These are expected to reach up to $120 (4UF) per m^2 by the early- to mid-2000s, still below the average for Greater Santiago and well below prices in those middle and upper middle comunas considered in direct competition for developments in Chacabuco.[136]

FIGURE 5.3
AVERAGE COMUNA LAND PRICES VERSUS DISTANCE FROM CITY CENTER (1990-2000)



Source: ACOP-CNSI, 2000.

As the price of land offered in Greater Santiago has increased over the last decade the overall size of lots has been in decline since 1996 (Trivell, 2000). This might be due to the relative slowing in land price growth brought on by the economic downturn since 1997 (perhaps keeping some large chunks of land off the market until price increases pick up), further accentuated by the ongoing consolidation of the urban area (and subsequent decline in large tracts of still undeveloped land). With land prices growing more rapidly than income and the size of available parcels within Greater Santiago declining, land as an input then becomes relatively more important to the real estate development equation.[137] This phenomena may be what has led some observers, such as SUR (1999a) and Sabatini (2000), to suggest that the land market operates as a quasi-monopoly. These higher land prices also continue to squeeze out public housing construction, which then continues being forced outward in search of cheaper land.[138]

Higher land prices have also made historically large land owners into important equity partners in major developments:

- Manso de Velasco's partner in the Enea business park (Section 5.4.6) is the family owner of the 1,000 hectares,
- the Cousiño family is spearheading the 250 hectare project on its vineyard in Peñalolén (Section 5.3.2),
- Fuenzalida Propiedades has a 25 hectare residential project in Huechuraba with the agricultural landowner as an equity partner, and

- the state railway company, EFE, entered as a partner in Belasco's residential project on the former railyards (*Maestranza*) in San Bernardo (Section 5.3.3).

While by no means proof of a trend, these few examples of land owners becoming direct equity participants in development projects, as opposed to simply selling their land to developers, throw some doubt on the claim by many that land speculation is the true source of profit in development. These land-as-equity partners clearly see more profit to be made by the value added from accompanying urbanization than by just cashing in on the land. Recent work by Sabatini (2000) supports this hypothesis; although he recognizes the role that land speculation (itself spawned by market liberalization) has played in the land price increases, he argues that this speculation has been capitalized by real estate developers who count on this as part of their improved bottom line.

In the end, the availability of land in the RM and its price are the ultimate determinants of the type and form of development undertaken in the city. Within Greater Santiago, there are 16 comunas that still have undeveloped land for residential development – a total of roughly 12,000 hectares. Roughly 17% of this land is considered apt for upper class housing, 27% for upper-middle class, 29% for middle class, 24% for lower middle class, and just 2% for lower classes (DII-UC, 2000). Based on historical trends of land consumption, available land in Greater Santiago will be exhausted within 10 to 14 years. On the other hand, in Chacabuco Province, there are a minimum of 11,000 hectares currently considered apt for development, with a target market income distribution similar to that of Greater Santiago, although slightly more skewed towards the upper classes (DII-UC, 2000). As mentioned, prices in Chacabuco are currently well below those in Greater Santiago. Further deflationary pressures may arise with the plan development in southern Santiago (Melipilla, etc.), also bringing into question the feasibility of realizing the PRMS density objectives.

5.3 Residential

Housing represents approximately 43% of construction product in the region and is dominated by the private sector, which accounts for 81% of housing investment (Gemines, 1998). In 1992, 91% of housing built in the RM was in Greater Santiago, proportional to the amount of the RM's population residing in Greater Santiago (see Section 3.2). From 1970 to 1992, the rate of home ownerhip in the RM increased from 57% to 71% (Urbe, 1995). In comparison to national housing stock growth, the RM's housing stock grew by 34% during the period 1982 to 1992, while the nation's increased by 27% (Urbe, 1995). These differences in housing growth between the nation and the region closely matched the differences in population growth rates during the same period (see Section 3.2).

As overall housing stock growth trends somewhat match national and regional demographic patterns, the same holds true – but to a lesser degree – within the RM. For example, from 1982-1992 the southern section of Greater Santiago accounted for 26% of RM's stock built in that period (Urbe, 1995). This same area of Greater Santiago actually concentrated an even higher share of population growth during the period (roughly 40%), reflecting partly the larger relative household size in these comunas as well as, perhaps,

some degree of unit overcrowding. From 1992 to 1997, housing starts – measured in number of building permits issued for individual housing units (from CCC, 1992-1998) – were highly concentrated: 8 comunas accounted for 75% of all permits issued (see Table 5.3). Although most of these comunas also registered high population growth rates during the period, two notably did not. Both Santiago and Providencia have continued to experience population losses since 1992 (at annual rates of -0.2% and -0.5%, respectively), but each had an important share of new housing starts. This suggests that the growth in residential space in these comunas is more than offset by other residential uses being replaced by office and commercial space (certainly a factor in both Providencia and Santiago). Furthermore, this may represent, particularly in Providencia, a shifting in the comuna's demographic profile, with less families and more seniors, single persons, and childless couples. Finally, there is the possibility that these comunas may currently have high apartment vacancy rates.

Table 5.3
Comunas Concentrating New Residential Building Permits (1992-1997)

Comuna	SE	% of All Units	Cumulative %	Comuna	SE	% of All M^2	Cumulative %
Puente Alto	M-L	19.4%	19.4%	Las Condes	H	17%	16.9%
Maipú	M	19.2%	38.5%	Maipú	M	13%	29.9%
Las Condes	H	7.9%	46.4%	Puente Alto	M-L	13%	42.7%
La Florida	M	6.5%	53.0%	La Florida	M	7%	49.7%
Pudahuel	M-L	5.9%	58.9%	Providencia	H	7%	56.4%
Santiago	M	5.8%	64.7%	Santiago	M	6%	62.3%
San Bernardo	M	4.8%	69.5%	Vitacura	H	5%	67.8%
Providencia	H	4.7%	74.3%	Pudahuel	M-L	5%	72.3%
Quilicura	M	4.5%	78.7%	Peñalolén	M-L	4%	76.2%

Note: SE – Socioeconomic characteristics of comuna. L-Low, M-Medium, H-High
Source: CCC, 1992-1998.

As can be seen in Table 5.3, a high share of housing units does not necessarily correspond to an equally high share of total floor space. This, of course, stems from the difference in average housing unit size across comunas. The wealthy comunas of Las Condes and Vitacura, for example, account for a much higher share of square meters in housing permits issued than in housing units. Indeed over the period 1992-1997, Vitacura, Lo Barnechea, Las Condes, La Reina, and Providencia had average housing unit sizes 45% to 184% bigger than the Greater Santiago-wide average of 73 m^2. On the other end of the spectrum, comunas like La Pintana, Puente Alto, and Cerro Navia had much smaller average housing unit sizes – 55% to 65% the city-wide average.[139] Some comunas, particularly Peñalolén, La Florida, and Huechuraba, have shown tendencies towards significantly increasing average unit size in recent years – for permits issued in 1997, these comunas had average unit sizes close to those of La Reina (139 m^2).

Of the comunas showing the most dynamic growth in housing construction (as measured by number of units in Table 5.3), five (La Florida, Maipú, Puente Alto, Pudahuel, Quilicura) are growing primarily, but not exclusively, through expansion, two (Providencia and Santiago) are growing entirely through densification, while Las Condes

is clearly growing both up and out. Interestingly, the comunas growing primarly through expansion have been adding, on average, smaller unit sizes than those densifying. Thus, the higher income residents living in Providencia, Santiago and Las Condes, even when opting for apartment living, still generally enjoy more living space than those lower income residents living in houses being put up on the periphery.

The tendency toward apartment living in higher income, densifying comunas helps explain why, at the end of 1994, on average across Greater Santiago, new apartments cost nearly double that of houses. At that time, no apartments were available city-wide below US$25,000. On the other hand, 70% of homes were less than US$35,000 and 90% were less than US$58,000. Furthermore, in all price ranges greater than $36,000 apartment sales greatly exceed home sales (Urbe, 1995).[140] The familiar "cone of wealth," which accounted for less than 50% of total housing sales, accounted for 71% of all apartment sales. Urbe (1995) interprets this phenomenon as an indication of a strong market segmentation – houses apparently are geared towards lower income groups.

Higher income groups, according to this interpretation, prefer apartment living due to certain consumer desires (such as the security apartment buildings offer[141]). While consumer preferences for building type might offer some explanation, a much more likely cause is social stratification and residents' desire to live in the "best possible" neighborhood. Upper classes – and their aspirants - gravitate towards the most expensive parts of the city, where home construction is difficult due to already high land prices. Apparently, the upper classes would rather live in apartments in expensive neighborhoods than houses in cheaper neighborhoods. On the other end of the market, government policy for low income housing has increasingly favored houses instead of apartments, which naturally brings down the average house price in Greater Santiago. While, as Urbe (1995) suggests, certain consumer desires might partly explain the higher relative prices of apartments, social stratification and the status and amenities associated with living in higher income neighborhoods may have more to do with the higher average cost of apartments in Greater Santiago.

That apartment prices – at least in recent history – have been relatively higher than home prices seems supported by recent data on apartment and home supply and demand. In 1996, based on the total number of new apartments on the market and the apartment sales rate, it would have taken approximately 13 months to sell the entire available stock (CCC, 2000). At the same time, a veritable apartment boom was under way, fueled by economic growth and high apartment sales prices. From January 1996 to January 1999, as these apartments in the pipeline came into market, the supply of new apartments steadily increased from 6,000 to 10,000. This supply coincided precisely with an economic downturn, producing an apartment glut – at the peak of this glut, in January 1999, the estimated time to sell the entire available apartment stock reached three years. A decline in new apartment supply and slight acceleration of apartment sales has reduced the glut – the time to liquidate the entire stock was 24 months in March, 2000 – although the oversupply in specific high priced markets remains significant (CCC, 2000).[142]

In the market for houses, total sales of new units was quite comparable to that for apartments – primarily in the 300 to 600 units per month range – over the period 1996 to 2000. Within the

house market, however, supply is much more equilibrated with demand: in January, 1996 it would have taken approximately 10 months to liquidate the entire available stock. Although this value also peaked in January 1999 at 22 months, the peak was much briefer than that for apartments and as of March 2000 the figure was 8 months, one-third the time for apartments (CCC, 2000). An important factor driving this house market equilibrium relative to apartments is the fact that homes can be built incrementally, allowing developers to adjust more rapidly to prevailing market conditions.

Table 5.4
New House and Apartment Prices in Comunas of Greater Santiago

Average Price (in US$/m^2) New House			Average Price (in US$/m^2) for Apartment		
Comuna	**Range (1994-2000)**	**Price May 2000**	**Comuna**	**Range (1994-2000)**	**Price May 2000**
Las Condes	1,200 - 1,500	1,500	Las Condes	1,200 - 1,950	1200 - 1950
La Reina	1,050 - 1,350	1,140	La Reina	900 - 1,050	990
Peñalolén	750 - 9000	900	Santiago	840 - 900	900
Quilicura	450 - 900	600	San Miguel	840 - 990	900
Maipú	450 - 600	540	Maipú	600 - 750	750
Huechuraba	840 - 990	900	Vitacura	1,500 - 1,650	1,590
Puente Alto	450 - 510	510	Ñuñoa	990 - 1,050	1,050
La Florida	540 - 600	600	La Florida	600 - 750	750

Notes: House data for Huechuraba, La Florida, and Puente Alto only available from 1998 onward; apartment data for La Florida and Maipú only available from 1996 onward; after 1997, apartments in Las Condes were disaggregrated into three sectors of the comuna. Prices originally stated in UF, an inflation-adjusted financial unit used in Chile; a UF in US$ ranged from $26 to $33 during 1994-2000 and was $29.44 as of August, 2000. Source: CCC, 2000.

Unfortunately, more detailed recent comparable data on new home versus apartment prices is not available. However, the current market dynamic suggests that apartment prices have deflated relative to homes. In the few comunas for which both new apartment and home sales prices were available, (see Table 5.4), new homes seem to fetch higher prices (per m^2) than apartments in higher income comunas (Las Condes,[143] La Reina), while the opposite holds true in the middle income comunas (La Florida, Maipú). No more detailed location-specific influences on these price differentials was available.

The current overall market conditions suggest that the market for houses is healthier than that for apartments. This market health is substantiated by anecdotal accounts of a continuing shift in consumer preferences linked, as mentioned previously, to ongoing motorization. As auto ownership spreads across income classes, access to peripheral lands – where land is cheaper and homes thus more viable – is increased. At the same time, houses become more attractive because they typically have more space for vehicle storage. Home purchasers also apparently take comfort in the belief that houses have a higher re-sale value than apartments.[144] While we were unable to gain access to market studies on housing preferences, DII-UC (2000) mentions opinion surveys indicating that 90% of consumers would prefer houses over apartments. From the developers perspective, recent market conditions also make home-building more attractive due to the ability to more appropriately adjust the number of units through incremental home building in constrast to fixed-unit apartment building construction.

In the future, whether apartments or homes satisfy the brunt of residential building demand will play a key role in the future form of the metropolitan area – after all, housing comprises 75% of current land uses across the entire built area of Greater Santiago. In its early market study of the development potential for Chacabuco, Urbe (1995) estimated that Greater Santiago would require an additional 910,000 new housing units between 1996 and the year 2020, roughly 37,000 units per year.[145] This figure significantly exceeds annual apartment and home sales reported by realtors – averaging between 12,000 and 20,000 per year from 1996 to 2000 (ACOP-CNSI, 2000) – but is below the average annual new housing starts implied by building permits issued annually – averaging 45,000 per year from 1992-1997 (CCC, 2000). The true number of units which will be built acros the entire RM will likely be in the 30,000 to 40,000 range for the foreseeable future.[146] We now turn to a closer look at a recent development trend – the "megaprojects" – which will play an important role in what that future will look like.

5.3.1 Early "Megaprojects"

Perhaps the first residential "megaproject" in modern Santiago was Santa Maria de Manquehue, situated in the foothills of the Manquehue Mountain, at the time of its development close to the end of Avenida Santa Maria running along the Northern shore of the Mapocho River in what is today Vitacura (at the time Vitacura was still part of Las Condes). This project, initiated by Inmobiliaria Manquehue in 1979 (see Table 5.1), entailed the urbanization of 1,200 lots on 180 hectares and was considered a great financial success. Today, the few remaining lots are advertised at remarkably high prices, equivalent to \$70 - \$105 per m^2 (\$290,000 to \$425,000 per acre) (see Table 5.1).

Santa Maria de Manquehue was the immediate predecessor to the development that would soon be launched in the upscale La Dehesa neighborhood of Lo Barnechea. In the mid-1980s real estate developers reportedly convinced the Municipality of Las Condes to extend Avenida Santa Maria, winding it up through the hills into the undeveloped foothill region of Lo Barnechea (Zegers, 2000). Inmobiliaria Manquehue and Manso de Velasco then spearheaded the consolidation of what is today La Dehesa, purchasing 250 and 300 hectare (respectively) tracts of land from its previous landowners (Trappist Monks). Today, these neighborhoods are among the most exclusive of exclusive La Dehesa: the remaining fully urbanized lots in Inmobiliaria Manquehue's El Golf de Manquehue are advertised at \$156,000 – \$189,000. Being able to sell social exlusion and "exclusivity" – such as that associated with La Dehesa – has been a major source of prestige and enhanced income for megaproject developers (Sabatini, 2000).

The more recent residential megaprojects – most still in the planning or very early development stages – mark a shift from the almost exclusive residential character of earlier projects. For one, most are considerably larger in scale than their predecessors. Second, they are, in most cases, geared towards the creation of, essentially, new cities. Indeed, as mentioned in Section 4.9.1, these development plans motivated – some claim actually inspired – the government's development of the ZDUC regulations. In reality, however, the true precedent for the RM's modern "megaprojects" may lie outside the RM. In the early 1990s, CB Inmobiliaria – a subsidiary of the financial holding company

CB Capitales – initiated the 3,800 hectare project Curauma, located just 15 minutes from the coastal metropolitan area of Valparaiso-Viña del Mar. The first residents began arriving to Curauma in 1996 and today there are 500 households living there; reportedly 30% commute to Santiago. Eventually, Curauma will have a large industrial park and various commercial sectors (Pérez, 1998; Suárez & Rubilar, 2000).

5.3.2 Parque Cousiño Macul[147]

One of the only residential "mega-projects" currently within the existing urban area, Parque Cousiño Macul is being developed on a 250 hectare piece of land in the rapidly growing comuna of Peñalolén. The land belongs to one of Chile's most prestigious old wealth families, the Cousiños and has operated as a vineyard since the late 1500s. The vineyard continues to produce, but no longer competitively, due to high production costs from pollution and other effects of the surrounding urbanized area, such as theft of product. Avenida Tobalaba, running south from Providencia to La Florida cuts the parcel in half. To convert the vineyard from agricultural use to mixed residential/commerical land use required a Sectional Plan (see Section 4.3.4), with an accompanying transport impact plan (EI/ST, see Section 4.7). The current plans call for the development over 20 years of 185 hectares, with 15 hectares to be left as an operating vineyard and 50 staying as a private park of the Cousiños.

Instead of simply subdividing the land for individual lot sale, the owners formed a real estate company, Crillon Inmobiliarios, partnered with an experienced real estate development and brokerage – Fuenzalida Propiedades – and engaged a team of U.S. and Chilean urban design firms to design the initial Master Plan. Crillon is pursuing staged development of the entire parcel, which when complete will contain 8,000 housing units for up to 40,000 residents (one-fifth of Peñalolén's current population). The gross density for the entire project will be in the 100 to 160 persons per hectare range, depending on household size. Approximately 80% of the units will be DFL2 (see Section 4.5.2), thus under 140 m^2. The lots range in size from 380 m^2 to 700 m^2 and the home prices range from $130,000 to $220,000 (4,300 UF to 7,300 UF), implying a minimum annual income of approximately $38,000 – clearly aimed at upper middle income households. All homes will be internally regulated (for colors, modifications, etc.) via deed restrictions.

The first stage of the project, on 40 hectares in the northeast corner of the parcel, consists of 325 homes. Of these, 95 will be ready within the first quarter of 2001; as of August 2000, 85% of the 95 were sold. By March of 2001 a private school (pre-school through ninth grade) will be in operations in this northeast portion of the project; project proponents sold the land to the school, an affiliate of a private university, which will develop and operate it. The school's sports facilities will be open to residents for a club fee. Negotiations are also underway to bring a supermarket to the lot next to the school (on the corner of Avenida Tobalaba), aimed to serve not only the development, but also the surrounding neighborhoods. By the end of 2006, the plans call for the development of the entire 100 hectares east of Avenida Tobalaba, with 1,000 homes and 700 apartments.[148]

In addition, on the southwest corner of the land – across Avenida Tobalaba and on the Vespucio Ring Road – a French-owned supermarket chain is currently developing a large store. Occupying a total of 41,600 m^2 - 16,000 m^2 of floor space, 22,000 m^2 for 816 parking spaces and 3,600 for greenspaces – this supermarket will be geared to the comuna and inter-comuna market (it is several kilometers from Cousiño Macul's residential development on the eastern part of the land). Crillon hopes for this store to serve as the anchor for an eventual commercial center, planned to take the form of a "main street."

In terms of urban design, transportation impacts and infrastructure provision, the Master Plan calls for each sub-neighborhood in the development (the first stage consists of three sub-neighborhoods) to have one guarded entrance, although there are plans for local streets connecting each neighborhood. There are no commercial uses within the residential neighborhoods – access to the supermarket planned adjacent to stage one will only be possible via the principal arteries (Tobalaba and the future Los Presidentes) external to the project. Bus stops are planned for the one main route running through stage one; at least one existing bus line will apparently serve this stage. The Master Plan orients all the eventual neighborhoods around a lineal park/parkway running through the middle of the entire 185 hectares and a network of bicycle and pedestrian facilities. As future stages progress, Crillon plans to add additional schools and various public services to the project.

For structural transport infrastructure, Crillon must add a road (Consistorial) on the project's east border, one (Quilin Norte) through the east-west center of the entire 185 hectares, and one (Sanchez Fuenzalida) parallel to Tobalaba. Finally, Crillon must split – with a firm developing a project directly to Cousiño Macul's north – the land provision and construction costs to build a road (Los Presidentes) on the project's northern border. There have been several projects proposed by the private sector and various Municipalities to build a mass public transport corridor (such as light rail) on Avenida Tobalaba, extending all the way to Providencia. While Crillon views such proposals as beneficial to Cousiño Macul, they maintain little optimism regarding their future and have no serious interest in initiating such a project themselves. Although bus stop infrastructure is included in the development, Crillon expects this service to be used primarily for service workers; similar to the attitude expressed by other developers in the region, the proponents of Cousiño Macul view bus-based public transport service to be inadequate to the needs and service quality expectations of those with automobiles. This perspective is also technically reflected in the transport impact study (EI/ST) (see CADE-IDEPE, 2000).

Regarding project negotiations, these reportedly took over three years, with the most difficult aspects being those related to the roadway impact study. There were also certain socio-economic challenges surrounding the project, since Peñalolén has historically been primarily a low-income comuna. Given the targeted income group of the project and the socio-economic segregation so prevalent in Greater Santiago, the developer was somewhat concerned about the willingness of middle and upper-middle income classes to insert themselves in a traditionally low income neighborhood. The Municipality viewed

the project favorably and worked to facilitate it, seeing it as a chance to improve the image of the comuna, increase Municipal income and increase local employment both through construction and eventual services employment.

5.3.3 *Maestranza* de San Bernardo[149]

The city of San Bernardo was founded in 1821 as a site for widows of the Chilean War for Independence (Matas & Balbontin, 1987). In 1857, a 16 kilometer steam railroad connected San Bernardo with Santiago (*Estación Central*) (Morrison, 1992), initiating San Bernardo's future role in the rail industry. By 1908, an electric tram was extended from downtown Santiago via La Cisterna to San Bernardo (Morrison, 1992). With the installation in 1921 of a major railyard (the *Maestranza*), San Bernardo became the focus of intense urbanization and by 1960 the growing Santiago metropolitan area physically absorbed San Bernardo (Matas & Balbontin, 1987).

The development currently underway on the site of the old *Maestranza* finds its origins in a Chilean government initiative aimed at attracting Asian capital to Chile and promoting Asian-Chilean joint ventures. From this initiative, the Chilean construction, engineering & real estate firm Besalco (see Table 5.2) linked with a Malaysian firm (the IJM Corporation Berhad and its investment holding subsidiary Masscorp) to pursue a residential real estate project. The government assisted in identifying the *Maestranza* as a potential site, since the state-owned railway company EFE still owned it. Eventually, instead of selling the *Maestranza* land to the project proponents, EFE opted to enter into the project as a land equity partner. The contributions of the three partners to the joint venture are: 35% EFE, primarily in the form of land (some 50 hectares[150]); 32.5% IJM/Masscorp and 32.5% Besalco (*Estrategia*, 1999).

The project proponents originally proposed a development with homes of 50 m^2, essentially aiming for basic level public housing (*vivienda social*). MINVU, however, rejected this proposal, as they envisioned the site being an important urban sub-center, to which they wanted to attract higher income groups. The Municipality, furthermore, reportedly did not want additional public housing pressures in the comuna. The project, in its final incarnation, will consist of approximately 4300 housing units (mostly homes, although some apartments are possible), to be developed in 11 stages and finished by the middle of this decade. Construction began in 1998 and as of August, 2000 approximately 800 units had been sold. Four different home types are offered, ranging in size from 54 m^2 to 75 m^2 and ranging in price from $28,000 (940 UF) to $50,000 (1670 UF). The majority of the homes are in the price range which qualifies for the urban revitalization subsidy (San Bernarndo is a designated revitalization area; see Section 4.5.3). Project plans also call for a commercial center and a technical high school (*liceo técnico*). Since the the *Maestranza* is considered a national heritage site (*Patrimonio Nacional*), three or four of the original buildings (approximately 6 – 7 total hectares) will be preserved, likely serving as the planned commercial center and a museum. An estimated total of $100 million will be invested in the project (*Estrategia*, 1999).

While smaller in total land size than most of the other megaprojects described in this section, the *Maestranza* merits focus for two main reasons: 1) it is the only

"megaproject" designed as an urban renewal project and 2) it includes innovative integration of transportation infrastructure and services. In terms of transportation infrastructure, project proponents were required to build a new central avenue running the length of the development and incorporating a park in the median. The government had originally also planned to require the developers to build two road underpasses crossing underneath the rail line, which otherwise separates the *Maestranza* from much of the rest of the comuna of San Bernardo. Reportedly, SERVIU ultimately financed these underpasses.

The true innovation in the project's transportation infrastructure, however, comes from its incorporation of a suburban rail service. The *Maestranza* site flanks the suburban MetroTren line to Rancagua and the project developers took advantage of this by building a new rail station as part of the development; in addition, the project reportedly contributed US$ 1 million towards financing additional rolling stock for the MetroTren service. Building on its rail-oriented past, the *Maestranza* has become Santiago's first modern public transport-oriented megaproject (what Bernick and Cervero [1997] would call a "transit village"), less than 20 minutes by rail from downtown Santiago. Whether intentional or not, the *Maestranza* project is being built at a scale well above what many estimate as the minimum necessary to support rail-based public transport. For example, for the U.S., Bernick and Cervero (1997) suggest a minimum of approximately 30 residential units per hectare (12 per acre), to support rail-based public transport; the *Maestranza* project will have roughly 61 to 86 units per hectare (24-34 units per acre). As of yet, no data on current residents' travel characteristics (such as use of MetroTren service) is available. While the *Maestranza* project certainly does not constitute a "trend" in real estate development in the RM (after all, it was largely due to fortuitous circumstances), the fact that the project has been developed and is showing to be viable in the marketplace[151] suggests that similar projects might be pursued in the future.

5.3.4 Chacabuco Province

As mentioned throughout this paper, Chacabuco Province has been the focus of intense development pressures since at least the latter half of the 1990s. Chacabuco – made up of the comunas of Colina, Lampa and Til Til – is, in many respects, a natural extension of the residential migration east/northeast, initiated by the earlier megaprojects in Vitacura and La Dehesa (see Section 5.3.1). As these upper-middle and upper class suburban enclaves exhausted their remaining land, Chacabuco became a logical area for expansion. Land was relatively cheap – lots in the early 1990s reportedly sold in the US$6 to $12 per m^2 range (CIS-INECON, 1997), while the average land price in Greater Santiago in the early 1990s was ten times higher (ACOP-CNSI, 2000).[152] Relative to the suburbanizing south, the Province offered high levels of accessibility via the Panamerican Highway (Route 5) and the International Highway (Route G-15, also referred to as R-57) to Argentina, especially since the north and northwest of Greater Santiago was undergoing industrial development and job creation along the Vespucio Ring Road and the Panamerican Highway. Finally, the Province – still primarily agricultural in 1992 – offered the promise of rustic quasi-country living.

Large investors and real estate companies, not blind to the trends and potentials, began making investments in lands here and planning some megaprojects. Chacabuco became the latest target of the developer strategy that Sabatini (2000) calls "social modification" – whereby developers are able to purchase land at "workers" (in this case agricultural) prices and repackage and market it to the middle class. The government, both under pressure by the private sector to open up the land for development and keen to try to address the problem of the *Parcelas de Agrado* (see Section 4.6), responded in 1997 by adding the Province to the PRMS and creating the ZDUC, AUDP and ZIEDC planning instruments (see Section 4.9). It is in the context of these market pressures and government tools that Chacabuco's "megaprojects" became formalized.

Today, there are at least 24 projects in some stage of development as ZDUCs, AUDPs or large subdivisions of *Parcelas de Agrado* in tracts of over 100 hectares (see Table 5.5). These projects comprise a total of 10,000 to 18,000 hectares. An additional 9,000 hectares have smaller scale subdivisions planned or underway as *Parcelas de Agrado* (DII-UC, 2000). Depending on the pace of development and the success of these projects, they could add between 160,000 and 350,000 new residents to Chacabuco by the year 2010 (CIS, 2000; MINVU, 1997d), up to three times the current population of the Province. From 2010 to 2020, another 300,000 residents may well call Chacabuco home. Not only would this population growth signify major demographic changes to the Province (not to mention the rest of the RM), but also an important socioeconomic shift. Currently, the comunas of Chacabuco are among the poorest in the RM. In 1994, 37% of the Province lived in poverty, compared to 21% in the RM; in Lampa nearly 50% of the population lived below the poverty line (CIS-INECON, 1997). As the majority of the megaprojects in the Province are geared towards the middle and upper-middle classes (see Table 5.5), these projects will introduce important changes in the socioeconomic profile of the Province, with concomitant increases in demands for public services.

Table 5.5
Principal Megaprojects in the Province of Chacabuco

Project	Type	Comuna	has[1]	Income[2]	Company
Sta. Maria de Chicureo[3]	ZDUC	Colina	800	H	Manquehue
Chamicero	ZDUC	Colina	512-600	H	ECSA
Chicureo	ZDUC	Colina	450-1350	H	Hispano-Chilena/Manquehue
Pan de Azucar	ZDUC	Colina	418-471	M-H, H	Harseim
Santa Elena	ZDUC	Colina	540-1900	M-H, H	Salamanca/Santa Elena
Wopke	ZDUC	Colina	200	L-M, M	Familia Leon
El Algarrobal[4]	Parcelas/ ZDUC	Colina	400	M-H, H	ECSA
Las Brisas de Chicureo	Parcelas	Colina	400-533	H	Grupo FFV-Las Brisas
Los Algarrobos	Parcelas	Colina	151	H	Los Algarrobos
Pampa Blanca	Parcelas	Colina	300	n.a.	Pampa Blanca
Quilaco	Parcelas	Colina	367	n.a.	Quilaco
Santa Cecilia	Parcelas	Colina	100	H	n.a.
Santa Sara	Parcelas	Colina	540-4250	M-H, H	La Isla
Aires de Colina	AUDP	Colina	174	L-M, M	Grupo FFV-Las Brisas
El Alfalfal	ZDUC	Lampa	430-640	L-M, M	COPEVA
Valle Grande	ZDUC	Lampa	344	n.a.	Grupo De Castro
El Algarrobal de Batuco	Parcelas	Lampa	100	M	n.a.
La Largatija	Parcelas	Lampa	663	n.a.	Batuco
Los Maitenes de Lipangue	Parcelas	Lampa	270	M-H	n.a.
Santa Rosa de Lampa	Parcelas	Lampa	120	M	n.a.
Gran Batuco	AUDP	Lampa	95-183	L-M, M	Inm. Quintay/ ENTEL
Larapinta	AUDP	Lampa	395-1000	L-M, M	SOCOVESA
Tapihue	ZDUC/AUDP	Til Til	850-1500	M	Manso de Velasco
Huertos Familiares	ZDUC	Til Til	283-2000	M	Hispano-Chilena

Notes: (1) Ranges based on different estimates from different sources; in the case of parcelas, area is calculated based on the number of reported lots and minimum size *Parcela de Agrado* (5000 m^2) (2) L-M, lower-middle; M, middle; M-H, upper middle; H-High. (3) Likely combined w/Chicureo and split into Polo Manquehue. (4) CIS reports as ZDUC, DII-UC and CIS-INECON as *Parcelas de Agrado*. This table only includes *Parcelas de Agrado* planned on contiguous tracts of 100 has. or more.
Sources: CIS (2000), CIS-INECON (1997), DII-UC (2000).

Among the many projects underway, the first ZDUC to receive development approval was Pan de Azúcar, a project planning for some 8,000 homes on 470 urbanizable hectares. The project is being developed by the company Harseim, on the properties of its old explosives manufacturing site, with an investment estimated at US$500 million (*Estrategia*, 2000). Densities will range from 20 persons per hectare to 240 persons per hectare, with an average gross density of approximately 60 persons per hectare (CIS-

INECON, 1997). Approximately 6% of the project's land space will be devoted to roadway infrastructure, 5% to greenspaces, 2.4% to recreational facilities, 1.5% to commercial areas, and 0.3% to educational facilities (CIS-INECON, 1997). This project was the first required by environmental authorities to pay *compensaciones* for estimated transportation air pollutant emissions (see Section 4.8.1). In addition, the project must make several contributions to transport infrastructure beyond those directly contained within the development, including: providing land for the section of Av. del Valle (a new intra-comunal road) bordering the development and connecting with the ZDUCs Chamicero and Chicureo; and helping to finance the link of Av. del Valle with Route G-15 (COREMA, 1999e). This project, along with most of the others under development currently in the region will also most likely have to contribute to Metropolitan-level transport infrastructure to be identified by the government (as discussed further below; also see Section 4.7).

Further north on Av. del Valle is one of the largest ZDUC's under development, Chicureo City (*Ciudad Chicureo*), approximately 20 kilometers from downtown Santiago.[153] According to plans, Chicureo will entail an investment of US$1.8 billion (*Estrategia*, 2000) over the next 20 years, producing a veritable city of 12,500 to 15,000 housing units, plus educational and health facilities, offices, sports facilities, and commercial and civic centers. A projected 60,000 to 80,000 people may eventually live on Chicureo's 1000 hectares of urbanizable land, implying a gross density of 60 to 80 persons per hectare. The project is a collaboration of some of the more prominent real estate firms of recent years – Inmobiliaria Manquehue, Hispano-Chilena and Sipsa-Guzmán (see Table 5.2).

Designed by a U.S. design firm (RTKL), the project's Master Plan aims to create an independent, self-sufficient city, and hinges on the concepts of the village and city center – scaled concentrations of civic, office, and commercial activities that, if ultimately realized, might serve as an important source of internal employment. A private religious school (middle and high school) already operates in Chicureo, another one will begin operations later this year and an affiliate of another private school (the *Colegio Aleman*) owns land in Chicureo with plans to begin operations within five years. The Master Plan also call for a technical institute and a private university to be located within the development. While the plans call for the majority of commercial activities to be located either in the village center or the city center, they also incorporate space for local neighborhood commercial activities; to create incentives for commercial development, the developers plan to offer an initial period (perhaps three to four years) of implicit subsidies, via reduced rents. Approximately 13% of the entire development will be devoted to greenspaces in the form of plazas and public parks. The developers plan to construct some of the homes in the project, but they also plan to sell lots and tracts of lots to third parties for development. It is likely that Chicureo city will charge residents the equivalent of condominium fees (*gastos comunes*), to pay for operating costs such as maintenance, private security and garbage collection. Developers view these fees as necessary, since it is expected that, at least in the near-term, the relatively poor Municipality of Colina will be unable to provide service levels that will meet residents' demands.

The project plan to integrate housing, shops, workplaces, parks and civic facilities embraces the fundamental precepts of the urban design movement in the U.S. which has come to be known as the "New Urbanism" (see, for example, Katz, 1994). Perhaps the main exceptions are the lack of apartments, since the great majority of housing will be single family homes, as well as the uncertainty over ultimate inclusion of low income ("affordable") housing. Also, there are indications of an over-scaling of the internal transportation infrastructure, resulting – according to developers – from MINVU's minimum roadway requirements. Chicureo's developers believe that MINVU's road design manuals contain excessive specifications for right of way widths and that the same capacity could be provided with less space dedicated. As a result some 28% of land area will be devoted to road infrastructure, thereby reducing developable area and greenspaces. Road rights of way were apparently a major point of disagreement and extended debate between developers and MINVU. Despite these problems, the Plan's road system and activities layout are designed to minimize travel distances. At the local-level, the aim is to locate minimum basic commercial activities within a 500 meter radius from homes. To keep high speed traffic off neighborhood streets, the plan has local (low speed) roads interconnecting neighborhoods, but limiting complete interconnectedness to keep from turning these into alternative routes for the major structural (high speed) throughfares. The plan also incorporates concepts of traffic calming (such as curb bump outs, raised and textured intersections and pedestrian crossings). Finally, although recognizing that bicycle use is not common to Santiago, the project proponents claim to want to promote bicycling within Chicureo and have included in the Master Plan segregated bicycle facilities and a network of greenways.

Discussions regarding public transport service infrastructure issues are still ongoing with MINTRATEL, revolving around issues of differentiated bus stops and improving the quality of vehicles and services. The project will be required to incorporate a public transport terminal. Finally, in terms of road infrastructure provision beyond the project, similar to the case of Pan de Azúcar, the developers will likely have to contribute land for the right of way for Av. de Valle and also pay for this road's link to Route G-15. Further contributions to Metropolitan-level transportation infrastructure are still being determined through the EI/ST process for the Province (see below and Section 4.7). Also, Chicureo's developers plan to invest an estimated US$10 million to build a 10 kilometer road across the steep foothills southeast to La Dehesa (in Lo Barnechea). This connection is on the right of way identified for the future Pie Andino segment of the proposed second Ring Road – the "orbital" (see Section 4.10.1). Chicureo proponents do not see the complete Pie Andino as important to the viability of their project. DII-UC (2000) speculates that the totality of the Chacabuco Province developments will only further increase the pressures for the completion of the entire Pie Andino and the eventual construction of the "orbital".

Similar to the case of the Cousiño Macul project, Chicureo's developers say that the Municipality has been supportive in facilitating the development process. The developers believe that the Municipality views their project favorably, as a means to improve Colina's regional importance and image, not to mention its financial resources.

Negotiations with central government authorities have, however, reportedly been more difficult. The developers attribute the difficulty to: a lack of a clear institutional authority (the need to deal with several different government entities); the fact that some of the tools (such as the EI/ST) are being developed, essentially, on the fly; and a rigidity and lack of reality in the norms. For example, while the developer views the ZDUC as a well-intentioned mechanism – looking to create self-sufficiency in urban developments – it also considers as misplaced the ZDUC's reliance on strict standards for provision of particular land uses such as public housing (*vivienda social*) and productive activities. Particularly in the case of public housing, the developer considers the requirement to be infeasible in the market, claiming that a single community should not assume the responsibility of the city and furthermore claiming that the minimum standards for public housing (lot and home size) are "unlivable" and will only bring down the quality of the entire development. Whether the project ultimately implements the ZDUC's affordable housing provision will be an important test of the viability of the provision and the government's willingness and ability to ensure its fulfillment.

As in the case of Pan de Azúcar, Chicureo will have to pay environmental *compensaciones* related to the project's transportation environmental effects. While the negotiations were not complete by August, 2000, the *compensación* required for the project would likely be 140 taxis. Again, while the project proponents agreed that Chicureo would have an environmental impact, they viewed the *compensación* mechanism as too rigid.[154]

As mentioned in Section 4.7, the scale of the planned developments across Chacabuco Province carry major implications for transport infrastructure not only in the Province but across a large portion of the Metropolitan Region. Chicureo's developers, for example, estimate that current levels of accessibility to their project allow for a maximum of 2,000 to 3,000 homes. As discussed in Section 4.10.1, ECSA, the developer behind the third ZDUC in Colina – Chamicero, directly east of Pan de Azúcar – has proposed the concession highway, the North East Access (*Acceso Nor-Oriente*). This proposed toll road will run from Route 5 North, intersecting with G-15 and then Av. del Valle before heading further east to connect with the proposed concession highway *Costanera Norte* in Vitacura. All of Colina's ZDUC developers view this highway as crucial to the viability of their real estate projects.

Under pressure from developers to ensure the accessibility necessary to move their projects forward, the Ministry of Public Works has been leading a multi-governmental process (an EI/ST or EFV) to identify the structural transport necessary to satisfy the Province's projected megaprojects. This process aims to identify necessary improvements beyond the several major intra-Provincial roadways already planned – to inter-connect many of the ZDUCs and also link the ZDUCs and AUDPs to the prinicipal trunk highways (Panamerican and International). These will apparently be financed "in large part" by the real estate developers (DII-UC, 2000). The draft EI/ST (DII-UC, 2000), predicts high congestion effects by 2005 on the large inter/intra-urban facilities, including: the northern section of the Vespucio Ring Road, an important portion of the concessioned Panamerican Highway (Route 5), and on the yet-to-be-developed (and still

polemic) concession highway *Costanera Norte*, proposed to run on the Northern bank of the Mapocho River from Lo Barnechea through the city center and out to the airport. Furthermore, important impacts will be produced on the several urban arteries which currently run North from the city center towads Chacabuco as well as others more distant from the Province (such as Avenida Vitacura).

To mitigate these effects, the draft EI/ST proposes a series of mitigation measures (not including projects already in current plans), with costs roughly estimated at $200 million. The measures include projects such as a tunnel under San Cristobal Hill (the Metropolitan Park) and a route parallel to (slightly south of) the Northern segment of Vespucio (consisting of significant upgrades of local roads) (see DII-UC, 2000). Not only are these first order estimates of costs, but these mitigation measures are only preliminary, to ultimately be decided through iteration and negotiation among the public sector authorities (SEREMITT, for example, is pushing for the consideration of additional mass transport services such as a Metro or light rail extension to Colina) and the developers (who will be asked to foot the bill). The developer behind Chicureo claims to support the idea of having the private sector pay for this infrastructure, although they want a fair and equitable charging mechanism and are concerned about how future projects will also be charged. Finally, although public input remains virtually absent from the transport planning process in Chile, organized public interest and community groups have grown increasingly powerful in shaping transport decisions (the concession of the *Costanera Norte* has, for example, been held up in large part due to concerted public opposition; see, for example, Sagaris & Araya, 1997).

5.3.5 Future Growth

The ultimate viability of the projects in Chacabuco depends not only on the timely provision of transportation infrastructure, but on many other factors as well. One of the greatest uncertainties relates to the availability of drinking water. Groundwater supplies in Chacabuco are already at risk of depletion (CONAMA, 2000b) and no obvious and easily tapped alternative sources exist. Some observers also raise questions about whether residents are ready to embrace *en masse* the suburban lifestyle that Chacabuco implies, pointing to concerns about security and the still high relative costs (such as travel costs) and lifestyle implications (such as the U.S. pop social phenomena – the "soccer moms").

In the end, however, the greatest doubts cast on Chacabuco may come in the form of competition from other sectors of the city and the Metropolitan Region. In the Lo Aguirre section of the comuna of Pudahuel, for example, CB Inmobiliarias (the developer behind Curauma, see Section 5.3.1) owns 4,000 hectares and plans to build a large scale project there, but first requires a modification in Pudahuel's PRC. Maybe more important, however, will be what occurs in the south of the RM. The government is in the early stages of developing an Intercomunal Plan (PRI) for this part of the region,[155] which may well open it up to development akin to that currently underway in Chacabuco.

There are suggestions that the southeastern spur of the railway to the comuna of Melipilla may be the next MetroTren line developed, under concession, instead of the northern spur

to the comuna of Til Til. Signs already exist of heightened land development in the comuna of Melipilla, halfway between Santiago and the coast, just off the concessioned highway (*Autopista del Sol*) to San Antonio Port. Melipilla, already the most highly populated comuna outside Greater Santiago with 92,000 residents in 1998, is seen by some as a natural "bedroom community" of Greater Santiago, particularly if the rail line comes through. The largely agricultural comuna, comprised of a total of 130,000 hectares, is under 60 kms from downtown Santiago and has considerable amounts of undeveloped land. Melipilla currently has only 250 developable hectares within its existing defined urban area. However, much of its agricultural land has also been subdivided as *Parcelas de Agrado* and many owners are reportedly interested in developing and will likely be a force in the development of the new PRI. Already 52 hectares are planned for development with 2,320 homes in the $18,000 to $45,000 price range. The current price for undeveloped land ranges from $9 to $14 per m^2. In Melipilla as well, however, there are reportedly questions regarding adequate water supply to support additional development in the area (see Vildosola, 2000).

Other signs of development in the south include the project of Angostura,[156] being developed on 470 hectares of land, 61 kms south of Santiago on the Panamerican Highway. The condominum-style, closed access development includes a country club (golf and equestrian). The current owner purchased the land five years ago, originally operating a vineyard there, which proved to be unprofitable, and then petitioning the government for a change in land use. The land is within the area of urban extension for the town of San Francisco de Mostazal. The project is comprised of 400 *Parcelas de Agrado* lots (5000 m^2), 138 of which are sold; buyers build their own homes, but according to deeded construction/design specifications. Currently, there are 15 homes finished – in the range of 300 to 400 $m.^2$ Beyond being near the Panamerican Highway, the project is on the MetroTren line to Rancagua, offering travel times of 57 minutes to Santiago and 17 to Rancagua. The owner anticipates that eventually the residents will be a mixture of commuters to Santiago and Rancagua, as well as people using the place as a second, country home. There are, reportedly, at least two other similar developments in the immediate vicinity.

5.4 Other Sectors: Offices, Industrial, Commercial

This Section overviewing the real estate market has focused heavily on residential real estate and its current trends. In part, this focus is due to the facts that residential land uses comprise an important portion of total land uses in Greater Santiago, are the main generator of passenger trips, and in many ways tend to lead the subsequent development of other land uses (such as commercial and office). In addition, residential projects tend to best exemplify the megaproject phenomenon. Finally, much more data on the residential real estate market was readily available. Nonetheless, other land uses obviously play an important role in the mobility system (attracting and generating trips, including freight trips) and also certainly influencing, in the medium term, residential location decisions. Here we focus briefly on the real estate market underlying these other uses, focusing specifically on the office, industrial and commercial sectors and highlighting three "megaproject" examples.

5.4.1 Industry

From 1985 to 1997, every one percent increase in national income led to an estimated 0.34% increase in demand for industrial space. For the next decade, this income elasticity is projected to increase to 0.43, signifying that demand for industrial space as a function of economic growth will increase more intensively than in the past (CIS, 2000).[157] If recent trends are any indication, most, if not all, of this industrial growth will occur in the outlying comunas, due to planning regulations, land prices, road infrastructure, and the increasing road transport intensity of industrial activities. From 1992 to 1997, seven comunas accounted for 80% of the industrial building permits (in terms of m^2) issued for Greater Santiago (see Table 5.6). All but one of these comunas are linked to important transport infrastructure, including: the Vespucio Ring Road (Quilicura, Pudahuel, Renca, Huechuraba, Maipú, and San Bernardo), the Panamerican Highway (Renca, Quilicura and San Bernardo), Route 68 to the port of Valpairaiso (Pudahuel), and Route 78 to the port of San Antonio (Maipú). Perhaps surprisingly, the comuna of Santiago accounted for 6% of industrial permits issued. No information was available on the number, type, or size of installations implied by these permits.

While road infrastructure access surely influences the location of these industrial facilities, another major underlying factor in industrial site development are the regulations in the PRMS (1994) which prohibit the establishment of most major industries (*industria molesta*) within the Vespucio Ring Road (see Section 4.3.2).[158] Not only has this provision pushed industrial locations to Greater Santiago's peripheral comunas, but also further out to other comunas in the RM. Chacabuco, again, has been an important development focus. In 1997, the Province already had an estimated 203 industries in operation (CIS-INECON, 1997). A major problem here has been the legality of these operations; in the comunas of Colina and Lampa, for example, only an estimated 38% and 11% (respectively) of industries have official operating permits (CIS-INECON, 1997).

Table 5.6
Comunas Concentrating New Industrial Building Activity (1992-1997)

Comuna	% of Greater Santiago's Building Permits
Quilicura	25%
Pudahuel	13%
San Bernardo	11%
Renca	10%
Maipú	8%
Huechuraba	7%
Santiago	6%
Total	**80%**

Note: The percentage is measured as percentage of the comunas' building permits issued (in m^2) relative to Greater Santiago's total.
Source: CCC, 1992-1998

Regarding future industrial facilities, one developer estimates that at least 32 major industrial zone projects are under development in the RM.[159] Some comunas that have recently been a focus of industrial development, such as Pudahuel, will continue in the future (particularly with the Enea megaproject discussed below). Others will decline in the face of competition from competing land uses within and cheaper industrial sites without. This seems likely to be the case of the comuna of Santiago and, perhaps, Quilicura. For the latter comuna, DII-UC (2000) estimates a decline in the growth rate of industrial land, since many of the "prime" sites (fronting on major highways) are gone and land prices are now cheaper in competitive comunas. Many of the competitive sites are in Chacabuco, where industrial parks are springing up along, for example, the Panamerican Highway and where future industrial growth will also occur in the modified PRMS' exclusive industrial zones (ZIEDC).

5.4.2 Commercial and Office Development

Relative to industrial land demand, demand for commercial land from 1985 to 1997 was estimated to be less responsive to income growth, while that for offices and services space was higher (income elasticities of 0.26 and 0.43, respectively) (CIS, 2000). For the next decade, CIS (2000) estimates that the responsiveness of commercial land to income growth will stay constant, while that for office space will decline (elasticity of 0.34).

As the rate of future office space growth may be lower relative to income growth than in the recent past, there may also be a growing shift in the geographic focus of office development. As seen in Section 3.4.2, office land uses are heavily concentrated in three comunas: Santiago (43%), Providencia (18%) and Las Condes (10%). During the period from 1992 to 1997, these comunas also focused a heavy share of new office development (see Table 5.7). However, Las Condes has clearly become the comuna of choice for new office development, Vitacura seems to be emerging as an important focus, and Huechuraba has also moved onto the scene, albeit still at a small relative share. The emergence of Huechuraba (and to a lesser extent Quilicura) and Vitacura, the strengthening of Las Condes, and plans for at least one future "megaproject" in Pudahuel (Enea, detailed below) suggest that office development has begun something of an outward migration. Greater Santiago and its environs may well be fully entering into an "edge city" (see, for example, Garreau, 1991) development phase, with office development following residential development out into the suburbs.

The office market in the RM has suffered during the recent economic downturn, a situation – similar to the case of the residential market – exacerbated by the building boom during most of the 1990s. Overall city-wide office vacancy rates (as of June, 2000) stood at approximately 13%, although these vary from an estimated 6% in Huechuraba's new office center (*Ciudad Empresarial*, see below), to 15% in the comuna of Santiago. These vacancy rates have translated into deflated prices: in Las Condes, current office rental prices are approximately $15 (0.5 UF) per m^2, down 30% from peak prices of two years ago. According to advertisements for new office space in downtown Santiago, rental prices start at $12 (0.4 UF) per m^2 and purchase prices at approximately $1,200 (39 UF) per m^2. Trends suggest that the rental of office space, as opposed to purchase, will become increasingly important. In addition, as advanced technologies become more

critical to modern office operations, there may be an accelerated out-migration of companies from the older offices in the downtown. The Santiago Development Corporation's plans to renovate and modernize downtown office space (see Section 4.5.3) aims to address this problem as do private initiatives to build flagship office towers (such as the proposed complex, StgoDowntown, comprising 12 buildings with offices, entertainment, commercial and other uses).

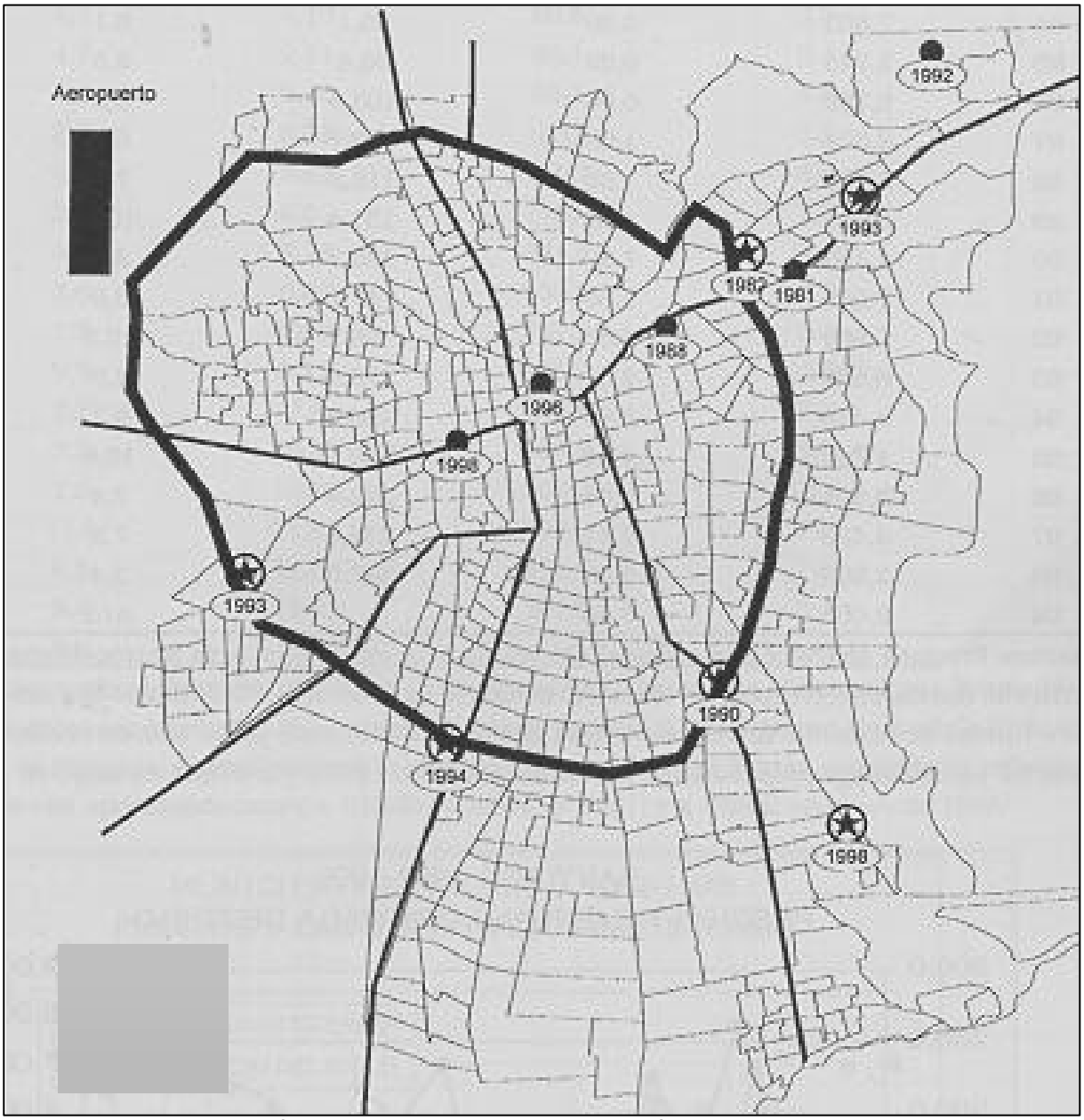
Table 5.7
Comunas Concentrating New Commercial & Office Building Activity (1992-1997)

Comuna	% of Greater Santiago's Commercial Permits	Comuna	% of Greater Santiago's Office Permits
Santiago	14%	Las Condes	41%
Quilicura	14%	Providencia	24%
Las Condes	7%	Santiago	18%
Maipú	6%	Vitacura	10%
San Bernardo	6%	Huechuraba	4%
Providencia	5%	Quilicura	1.4%
Huechuraba	5%		
La Florida	4%		
Total	**61%**	**Total**	**97%**

Notes: Total may not match due to rounding. The percentage is measured as percentage of the comunas' building permits issued (in m^2) relative to Greater Santiago's total.
Source: CCC, 1992-1998

Commercial land uses also have shown a historically heavy focus in the city center, although with less total concentration than office uses and with commercial uses more widely dispersed across a range of comunas (see Section 3.4.2). Santiago has historically been almost renowned for its commercial "corridors" – long avenues of specialized commercial activities, such as Calle San Diego, 10 de Julio, and Av. Providencia. The first large "shopping centers" appeared as natural extensions of the commercial corridor, springing up first on Providencia Avenue and then following the upscale population migration eastward along Apoquindo into Las Condes (*Omnium* and *Apumanque*). The first large, stand-alone malls did not appear on the scene until the early 1980s, with Parque Arauco, near the intersection of the Vespucio Ring Road and Av. Kennedy in Las Condes. Built on the site of a former squatter settlement, Parque Arauco would be followed later by Alto Las Condes which consolidated around a large supermarket 3 kilometers east from Parque Arauco along Av. Kennedy. After the upscale market proved their viability, shopping malls would soon spring up in other parts of the city, including Maipú, La Florida (Mall Plaza Vespucio, at the terminal station of Metro's Line 5), and even in the city center (see Figure 5.4). A new mall, Mall Florida, is under development in La Florida, on approximately 18 hectares of land, 73% of which will be dedicated to buildings.

FIGURE 5.4
LOCATION OF MAJOR COMMERCIAL SHOPPING CENTERS IN GREATER SANTIAGO



Note: Star denotes center of regional impact, circle denotes center of local impact. Source: Sabatini, 2000.

5.4.3 Ciudad Empresarial

The Ciudad Empresarial (Business City) represents the first greenfield office park "megaproject" of Greater Santiago. The project, on 72 hectares just off of the Vespucio Ring Road on the eastern edge of the comuna of Huechuraba, was initiated in 1993 when a partnership including Hispano-Chilena and Sipsa (both also involved in Chicureo City) purchased the marginal farmland at a price of US$9 (0.3 UF) per m^2 (Zegers, 2000). The project proponents urbanized and landscaped the land, arranging building lots along wide circular avenues and ample parking and building an underpass connection to the

Vespucio Ring Road. Although the plan was to sell the urbanized lots, the developers initiated Ciudad Empresarial with the construction of three buildings, as a way of demonstrating project viability to potential buyers. Developers have invested an estimated $100 to $250 million in the project to date;[160] lot prices currently stand at $330 (11 UF) per m^2.

There are approximately 22 buildings complete or close to complete in the site, with more than 170 different companies including Shell, Xerox, and Telefónica Manquehue. Eventually, developers expect more than 20,000 people to work in Ciudad Empresarial, which will also eventually include a five star hotel, a convention center, and other services. In terms of transportation considerations, with its wide avenues and ample parking, the project clearly expects its executive clientele to arrive to work by car. A shuttle bus service does, however, operate a 5.5 kilometer route between the eastern terminal station (*Escuela Militar*) of Metro's Line 1. In addition, at least one traditional bus line enters the development. Although the project is directly adjacent to growing residential development just to the North, the Ciudad Empresarial's road infrastructure abruptly ends before connecting to this neighborhood, and the two developments are physically separated by a wide tract of vacant land and a fence.

5.4.4 "Sanhattan"

"Sanhattan" is a name often applied to the skyscraper neighborhood springing up at the convergence of Av. Andres Bello (on the southern shore of the Mapocho River), Av. Vitacura, Av. El Golf, and Av. I. Goynechea, on the northwestern edge of Las Condes. The area has always been upscale; indeed it was home to one of the early upmarket high rise apartment buildings from the 1960s (La Portada de Vitacura). In the late 1980s and early 1990s, the neighborhood and its immediate surroundings underwent a transformation, with many large homes being replaced by office and apartment high rises. The upscale commercial and restaurant scene thrived and the area was further consolidated by the U.S. and British embassies relocating here in the mid-1990s. Some of the most important buildings in the neighborhood (including the Radisson Hotel) were built on the previously vacant terrain formerly owned by the Chilean brewing company, CCU. The CCU terrain on the Providencia side of Sanhattan remains vacant – likely some of the most valuable undeveloped land in the RM.

Today, Sanhattan is valued for its relatively good access (adjacent to main avenues running from downtown and uptown and within a kilometer from Line 1's Tobalaba Metro station) and the nearby restaurants and services geared towards the executive. The ongoing migration of offices to the sector has been spurred by the fact that an increasing relative number of business clients also live and work nearby. The area has also been identified as one of the hot spots for Chile's nascent dot-com entrepreneurs (Allendes & Meza, 2000). For some businesses, however, the choice of locating here has not come without some concerns for lower income employees, due to the lack of affordable nearby restaurants and the relative transportation inconvenience compared to the city center (see Goynechea, 2000), which is still the convergence point for the city's bus lines and three Metro lines.

While not a "megaproject" in the sense that we have used the term in this paper – a large tract of land developed by one team of developers – Sanhattan still has a flagship developer, Sencorp. Sencorp is a holding company, with a real estate firm, construction firm, architecture firm, and a construction equipment leasing firm. The company has built six buildings in the Sanhattan neighborhood since the mid-1990s, with a total floor space of approximately 250,000 m^2, equal to 25% of all office space issued in building permits for Las Condes during the period 1992-1997.[161] For its most recent project, Sencorp reportedly paid $2,100 (70 UF) to $3,000 (100 UF) per m^2 for land acquisition (Díaz, 1998), almost 7 to 10 times higher than the current costs of urbanized lots in the Ciudad Empresarial.

Sanhattan has certainly transformed its neighborhood and Sencorp has brought new elements of building technologies and prestige to its projects. The area has its detractors, however, particularly those involved in urban design and architecture, who criticize the new neighborhood for its "privatization" of space, since most of the area between adjacent buildings is fenced off and dedicated to parking accesses thus preventing pedestrian movements. Other critics lament the poor urban integration – with each building standing as an individual structure, disconnected from its environs. Less subjective than these aesthetic criticisms, however, are those that can be leveled at the area's influence on the surrounding transport system. Sanhattan's location along important east-west arteries (Vitacura and Andres Bello) has added pressure to an already saturated system. Today, in the evening peak, traffic backs up deep into the buildings' underground parking garages. The problem, which will only worsen as additional buildings come on-line, has its origins in the fact that the first wave of buildings were approved individually, with each of the impact studies analyzed completely independently (MIDEPLAN, 1998b). Although the relevant authorities (i.e., SEREMITT, and others) recognized this problem as it was occurring, they were left without adequate mitigation mechanisms. Ultimately, authorities were only left with the option of negotiating with the various private sector developers – appealing to their financial interests by claiming that the congestion conditions will hurt the market attractiveness of the projects – an approach limited by the fact that many of the developers have already sold most of the office space (MIDEPLAN, 1998b). No obvious short-term roadway solutions exist, and the possibilities for a rail-based public transport option should not be rejected.[162]

5.4.5 Enea Business Park[163]

Certainly one of the most ambitious real estate developments in the RM and the country (if not Latin America) is Enea Business Park in the comuna of Pudahuel. A massive project, currently three years in the making, Enea is located on what those involved in the project call "the best corner in Chile" – adjacent to the Vespucio Ring Road and Route 68 to the coast, between Av. Bernardo O'Higgins and the proposed alignment of the Costanera Norte Highway, across from Santiago's International Airport, and not far from the *Autopista del Sol* (Highway to the Port of San Antonio). Enea is the initiative of Endesa España (via Manso de Velasco; see Table 5.2), contributing 55% of the investment funds and the Guzman family, which is contributing the remaining equity in

the form of over 1,000 hectares of land straddling both sides of the Vespucio Ring Road. The estimated investment amount of the entire project is US$1.9 billion.

According to its Master Plan – reportedly developed by a team of 120 specialists at a cost of US$ 3 million – Enea will proceed in three phases over a 25-year time horizon. Although market dynamics will dictate the actual process of development, the first phase will move forward over the next four years with office, service and industrial development on some 90 hectares. Enea is ensuring the provision of all relevant infrastructure (roads, landscaping, water, streetlighting, electricity and telecom trunk lines) to each lot. The lots will be sold for individual building construction, subjected to standards contained in deed restrictions. The lot size averages over 3,000 m^2, although the range is from 2,000 m^2 to nearly 40,000 m^2. Similar to the case of *Ciudad Chicureo* building owners will have to pay common fees (similar to condominium fees) to cover services such as garbage collection, security and maintenance. Again, while the Municipality ostensibly should provide these services, the perspective of Enea, at least in the near-term, is that the Municipality will not be able to. Currently, the planned second phase will be a residential area, to be built by a third party developer, on approximately 20 total hectares. The Master Plan envisions the entire Enea project to eventually contain, commercial, services, industrial, office, and residential uses.

The project developers are constructing all the internal roadways and also contributed the land for and built a $10 million access junction to the Vespucio Ring road (directly in front of the new airport access road). Unlike the *Ciudad Empresarial*, Enea's road infrastructure will be directly connected to adjacent existing neighborhoods in Pudahuel. The project has reportedly completed an EI/ST, which identified transport mitigation measures; each additional project phase will also require an EI/ST. The developers clearly see transportation accessibility as critical to the project's success – thus the phrase "best corner in Chile." They claim, however, that the viability of the project does not depend upon the completion of the Costanera Norte Highway. Bus connections are currently planned for the nearby western terminal station (*Pajaritos*) of Metro's Line 1 – only a few kilometers to the project's east. Developers speak of a possible eventual extension of the Metro (perhaps via light rail) through the project.

Regarding the negotiation process with authorities, according to the project proponent these have gone relatively smoothly, although certain levels of bureaucracy have introduced significant delay in plan approvals (especially the sanitary plan). There are basically two "official" perspectives on the project: at the national government level, the project is seen as important to national and international competitiveness, due to the project's high locational profile; at the regional and local level, of course, comes the challenge of compatibilizing the project with local needs and technical norms. At the comuna level, since Pudahuel is currently in the process of developing its PRC, this project actually stands to influence that plan's development.

6. Principal Findings and Recommendations

The Santiago Metropolitan Area is a rapidly growing economy in a rapidly growing and expanding urban area. While the city has a history of growth management instruments,

the urban area's expansion and underlying forces have often extended well beyond the reach and power of these instruments. Transportation planning and responses have often also fallen prey to the same phenomenon. While the city has enjoyed strong economic growth for much of the last two decades, it continues to suffer from a high degree of socio-economic spatial segregation, manifest in a variety of ways including disparities in: provision of amenities, quality of life indicators, and travel times and accessibility.

In the last two decades, urban expansion has consistently outpaced population growth, hampering growth management aims and possibilities. Two forces have been driving this expansion. On one side, expansion has been driven by the needs to provide housing for a still significant share of poor residents. Cheap peripheral lands have been critical to ensuring low cost housing provision. But the search for cheap lands has only accelerated urban expansion, while further exacerbating the concentration of poor in comunas already taxed with high levels of needy populations and insufficient public resources to provide services. On the other hand, economic growth has brought ongoing motorization and consumer desires for larger lots and homes, which combined with infrastructure expansion, has also fueled urban outgrowth. Expansion has not, however, been the only form of urban growth, as urban transformation through densification has characterized an important share of development, particularly in parts of middle and upper middle income comunas.

This paper has explored the existing institutions and tools that are available for managing urban growth in Santiago, with a particular focus on managing growth to enhance urban mobility and accessibility. In this sense, it is important to recognize that, while urban growth and transformation certainly affects mobility patterns, it is not the only – and perhaps is not even the most important – influencing factor. Other factors such as income growth, motorization, changing trip behavior, and changing demographics (such as women in the work force) may well play a much more important factor in overall transportation system evolution.

6.1 Land Use and Transportation System Major Characteristics

The principal characteristics of the Metropolitan Region's transportation and land use system are summarized below.

<u>Relevant Institutional and Policy Framework</u>

- Lack of a clear, coherent, and integrated urban development and transportation policy at any relevant level of government.
- Lack of clear transportation planning hierarchy, authority, responsibility and accountability, signs of increasing institutional competition in this realm.
- Indicative of the above points, poor coordination in land use and transportation planning, both within relevant authorities and in resulting plans.
- Strong technical capacity within centralized authorities (and universities) for transportation planning and evaluation.
- Some degree of institutional flux, due to ongoing process of decentralization and deconcentration of political, administrative, and financial authority.

Principal Characteristics of the Land Use System

- Rate of urban expansion significantly exceeding population growth in recent decades.
- Estimated demand for new housing of 30,000 to 40,000 units over the next 20 years.
- Suburbanization underway, in part ignored and (perhaps inadvertently) subsidized (*parcelas de agrado*) by the government.
- The evolution of the RM from center city-oriented to metropolitan in scale, and now increasingly moving towards a macro-zone scale, in an "edge city" pattern of population and activity centers connected by growing and expanding infrastructure links.
- A progressive lowering in densities of developments, although still high by U.S. standards.
- Increasing, and in many cases severe, environmental and natural resource constraints to further urban growth.

Principal Land Planning Instruments

- Lack of flexibility in planning instruments, long and laborious approval process, lack of financial reality.
- A failure to effectively link density guidelines in regional and municipal land plans with broader goals, such as the densification of transport nodes and corridors (i.e., attempting to replicate the Curitiba experience).
- Lack of effective integration of land plans with transportation plans.
- Housing subsidies showing to be an effective instrument for achieving some form of public policy goals – such as building public housing and encouraging urban revitalization.
- Indications of various fiscal stimuli to urban expansion, particularly the current housing subsidy structure – low income housing; subsidies to builders, and subsidies to most buyers (unified subsidy and the DFL 2).
- No apparent ability to ensure open space preservation or fulfillment of other plan goals and objectives (such as "sub-center" development).
- An increase in the use of financial growth management instruments (in-kind exactions and impact fees)

Market Players

- Strong private sector pressures for plan alterations, modifications and development as well as transportation infrastructure expansion;
- At the same time private sector criticism of bureaucratic burdens of project and plan approvals.
- The emergence of real estate market "megaplayers" and "megaprojects" involving large tracts (in some cases over 1,000 hectares) of land and the creation of virtually "new" cities, mostly on the urban fringe.
- Unclear mechanisms to ensure fulfillment of conditions contained in the new planning instruments directed at these megaprojects.

- Signs of important urban design "innovations" contained within some megaproject proposals.

Principal Characteristics of the Transportation System

- High growth rates in motorization, individual trip making, and trip distances.
- Majority share of all trips still satisfied by public transport, both the bus and Metro, but a growing share of private motorized trips.
- Large differences in travel times and conditions across income groups.
- Large share of air pollution problems produced by transportation, along with other problems such as noise pollution and traffic safety.

Transportation Planning

- Lack of attention paid to growth management and land use as a tool to enhance mobility and accessibility – despite some rhetorical and planning support (such as sub-center development and educational facilities relocation plans).
- Strong demand and system management focus, including a vehicle restriction in place for much of the year, a computerized traffic signalization program, and a program of reversible one-way commute streets.
- Important improvements in the privately owned and operated bus system, notably uniform service characteristics, newer and cleaner buses, stable fares.
- Despite the latter, a widely prevailing perception among the general public that the system is still woefully inadequate (particularly as an alternative to the auto).
- Few examples of bus priority measures in place, despite public sector rhetoric over the last decade calling for such priorities.
- While Metro ridership has been on the rise, evidence of significant capacity underutilization on two of the three lines, indicating important potentials to increase urban development and activities along these corridors.
- Important advances in pedestrian facilities, but virtually no attention given to bicycle facilities.
- Discrete points of major infrastructure expansion, including Metro development, new and expanded roadways (particularly to the east and southeast upper and middle class neighborhoods), and completion of the ring road.
- The latter fueling and being fueled by residential development pressures and the formation of new industrial corridors and office/commercial park development.
- Growing pressure for infrastructure development (primarily highways) on the part of real estate developers, particularly in the northern province of Chacabuco.

Transportation Finance

- A failure to explicitly link transportation plans with realistic financing plans and an unclear transportation financing system.
- Despite the latter lack of clarity, road system user costs apparently more than cover road system investments, with an implicit cross-subsidy to Metro capital costs.
- However, still significant external costs (and inefficiencies) implied by transportation's air and noise pollution, accidents, and congestion.

- Metro operating revenues more than covering operating costs and depreciation.
- Growing influence and power of the transportation infrastructure concessions program, particularly emphasizing highway building and linked to private sector real estate development interests.

6.2 Institutional Issues

Metropolitan transportation and land use planning in any large, sprawling city invariably involves many public and private actors, each of which often has its own competing interests and responsibilities. These institutional challenges are often highlighted as a principal barrier to implementing coherent urban transport and land use strategies (see, for example, Anderson et al., 1993; Gakenheimer, 1993). In Chile and, specifically, in the Santiago metropolitan area, the calls for stronger metropolitan planning institutions are certainly not new, having been echoed from the political, transportation, land planning, and environmental perspectives for decades (for recent examples see Figueroa, 1993; CED, et al., 1994; CONAMA, 1998; IG-PUC, 1999; Subdere, 2000b).

The lack of a clear authority in the land planning and transportation arenas in the RM has led to well-recognized institutional competition, lack of integration of different sectoral plans, poor lines of accountability, and institutional finger-pointing. Much more difficult than recognizing the problem, however, is proposing a politically and functionally feasible mechanism for integration. This is not a problem unique to Santiago, or Chile, but one that it is confronted by most other large and rapidly growing metropolises around the world.

Of course, no "solution" to regional governance and management exists; the situation can only be improved with incremental steps set within the context of a dynamic and constantly evolving urban area comprised of a growing population with changing demands and expectations. We do not endeavor here to propose a "governance" structure for the RM; that is well beyond the scope of this paper. We do, however, suggest general guidelines for thinking about appropriate metropolitan governance structure and then attempt to situate the current political realities of Chile within these guidelines.

The main challenges to metropolitan-wide land use and transportation planning and management rest in finding the right balance between planning, provision and enforcement which should occur at the regional level, versus what is best undertaken at the national and the local levels and, then, overcoming the local and national political opposition that real metropolitan government formation will likely confront. The metropolitan model must ensure that some degree of constituent preferences can be served within various jurisdictions in a metro area (so-called "Tiebout" sorting); at the same time, such a model must aim to prevent inefficient competition across municipalities in a metro region and control for "spillovers" (such as traffic). In rough terms, the "ideal" metro government would entail the following functions: master planning, trunk sewers and main drainage, arterial highways, garbage, traffic management, water supply, public transport, police, utilities, recreation areas, cultural institutions, fire, housing, and environmental protection (Sharpe, 1995).

Most metropolitan governments function at the "second tier" in a metro region (Sharpe, 1995), either through voluntary coordination among municipalities (the typical approach in the United States' Metropolitan Planning Organization [MPO] system) or through a political and institutional restructuring, with metropolitan political authority empowered through direct elections (i.e., Toronto, Ontario). Lefevre (1998) considers the most effective metropolitan-level governments to be characterized by: strong political legitimacy (through direct elections); "meaningful autonomy from both 'senior governments' and basic local authorities" (financial and human resources); "wide-ranging jurisdictions;" and "relevant territorial cover." In a recent assessment of highway investments at the metropolitan region level in the U.S., Boarnet & Haughwout (2000) recommend "an increased role for representative regional decision-making bodies…so as to maximize the regional, rather than local, advantages that transportation policies offer." Sources of financing, in such a context, becomes a crucial and controversial issue, particularly as other levels of government view their available revenue sources with understandable protectiveness. Lefevre (1998) stresses that truly feasible new institutional structures in metropolitan governance will only arise from partnerships and negotiations among: territorial authorities, the private sector, associations, interest groups, and the population at large. Although, the process implicit in forming such partnerships will inevitably be lengthy, it will likely result in a structure with more ultimate strength and legitimacy.

6.2.1 The Chilean Reality: Decentralization and Deconcentration

Similar to many other countries around the world, Chile has been grappling with political and administrative decentralization in recent decades. Already, political autonomy and some degree of fiscal autonomy (see Section 4.1) have been passed on to Municipal governments. The country has done a commendable job in managing the decentralization of power and financing to local authorities, attempting to balance redistribution goals, transfers, and accountability. The wide disparities in financial capacity and income levels across Municipal governments have made central government requisition of a large share of locally-generated resources (property taxes, vehicle registration fees, business licenses) and subsequent redistribution necessary. It can be argued that locally-generated revenues are better left to local use, with the central government using other taxing mechanisms to achieve redistribution goals. Public finance theory supports this argument. However, the central government's heavy reliance on sales taxes (which tend to be regressive) in place of national income taxes, limits its mechanisms available to achieve distribution goals.

At the same time, the central government provides very little leeway to Municipal governments in actually setting the rates for these revenue sources. The central government's stance in this regard – while open to criticism on the grounds of reducing the welfare benefits associated with allowing people and firms to choose their taxation levels – is justified on the grounds that the Municipal governments are still young and unproven (first elected in 1992), in many cases with low levels of technical capacity. A perhaps unanticipated side effect of this system, beneficial from the perspective of urban governance and management, has likely been lower levels of inter-Municipal competition

for land uses, which in the U.S. has often been criticized for producing "bidding" wars for certain land uses that exacerbate coordinated planning efforts.

While progress has been made in decentralizing political and administrative powers to the Municipalities, the challenge of developing legitimacy in and allocating powers to the Regional Government remains. As mentioned in the previous section, some semblance of regional authority is critical to achieving metropolitan coordination of transportation and land use planning, as well as ensuring improved integration of other various sectoral plans (i.e., water, sanitation). The Regional Government (GoRe), comprised of the Intendente (Governor) and the Regional Council, has been looked to as a logical point for effectively integrating regional development (CED, et al., 1994; Subdere, 2000b). The GoRe already has a role in approving comuna and metropolitan land use plans and allocating regional budgets, however most of its proactive powers are limited to discrete actions (such as declaring environmental emergencies). The main progress in regional decentralization undertaken to date has been administrative, not political. Although regions have gained some degree of independence, they are still wholly dependent on the central government for revenues. The GoRe has little planning or implementation capacity of its own.

Past efforts to address these shortcomings include calls from above for the formation of inter-sectoral planning committees (i.e., CROTs) and special sectoral committees (i.e., Executive Committee for Urban Transport), which have had limited real impacts because of little, if any, legal or institutional support. No real political power exists on the regional level and distribution of authority remains unclear (in other words, there is no accountability[164]). The problem persists at two levels. In relations between the central government and the GoRe, central government Ministries still seem to dominate decision-making. On the Regional-Municipal government plane, instruments for coordination are virtually non-existent (the Intendente can intervene in inter-municipal affairs when asked by Mayors to do so). Paradoxically, the process of decentralizing local government (i.e., splitting and creating more Municipalities) may in fact be exacerbating the problem, both by making metropolitan-level coordination more difficult across an increasing number of jurisdictions and by watering down the pool of available local government technical expertise.

The principal barriers to strengthening the role of the regional governments (and to decentralization in general) are political and institutional. Boisier (2000) attributes Chile's strong central government to a series of historical and cultural realities[165] and notes that the problem in decentralizing power to the regional governments rests in the fact that the regional governments were essentially created by the military regime in the 1970s as a direct tool of central government control.[166] In a recent assessment of decentralization in the country, Subdere (2000b) highlights many continuing barriers, including: a national political system characterized by a strong executive power and unitary state; no regional political system (i.e., regional political party subsystem) and subsequent lack of full citizen participation; other legal, historical, and cultural barriers; globalization, which has contributed to a perceived (perhaps real) need for a "unified"

national economy; and macroeconomic stability concerns (fear of allowing lower levels of governments to undertake activities which might undermine national economic goals).

Effective empowering of regional government cannot occur without some level of fiscal independence and responsibility; this, however, cannot fairly occur without a more democratically elected regional government. An additional problem arises from the fact that local and regional government are clearly less prestigious than national service – strengthening local control is a way to make it more prestigious. This poses something of a chicken and egg problem. Nonetheless, there are indications that good local governance (perhaps easier in a wealthy comuna) carries prestige and rewards on the national stage. For example, the previous Mayor of Las Condes ran a very successful candidacy for President, barely losing in a run-off in the 2000 election.

Despite these shortcomings and barriers, there are indications of continued movement towards a structure of regional governance. The establishment of some form of directly elected metropolitan government might be the ultimate ideal, but legal and political complexities will inevitably make such a process slow. In the meantime, the Metropolitan Region seems to be moving towards a U.S.-style MPO structure; already the Regional Council is comprised of members appointed by Municipal Councils – indirectly elected in a form of Electoral College. The Regional Secretaries of the Ministries (SEREMIs) are already effectively managing regional interests (i.e., EI/STs) beyond the local concerns and have enabled ongoing formalization, coordination, and enforcement of regional planning activities and concerns.[167] The key here rests in further strengthening regional governance by truly subordinating the SEREMIs (i.e., SEREMITT, etc.) to the Regional Government and duly integrating their planning and implementation activities.[168] This process would overcome a principal criticism of the current GoRe – lack of technical capacity. It could also potentially improve the bureaucratic functioning (building on the concept of the *ventanilla única*) – such as plan and impact analysis approvals – which is often a criticism levied by the private sector. Passing these agencies into the hands of the regional government, however, will require more budgeting power in the GoRe for sectoral activities – subordinating financial authority of the SEREMIs and similar organizations to the Intendente instead of their respective Ministries. Here, however, the problem leads back to the non-elected nature of the Intendente and questions of fairness (should taxation powers be allowed without direct political accountability?).

6.2.2 Other Institutional Issues

Other institutional issues that require resolution to improve management of the metropolitan transportation and land use system include the lack of clearly stated national, regional, or metropolitan urban and transportation policies. Much rhetoric is contained in documents from different sectors (i.e., environment, transport), but no clear consensus-based policy exists. This issue, linked to the lack of clear lines of authority/accountability and the isolated process of sectoral plan development, manifests itself perversely in competition and contradiction in plans and programs. For example, MINVU's plans ostensibly seek to densify the metropolitan area and control urban outgrowth – efforts to some degree supported by SECTRA's historical transport demand

management focus. MOP's highway development plans (such as the second ring road) and road concession program, however, clearly encourage urban expansion. Competing schools of thought among different public institutions cannot be eliminated; nonetheless, a unified *policy*, built through participation with the many stakeholder groups both public and private can help build a framework for coherently pursuing plans and projects.

Policy formulation needs to be linked with more useful indicators of goals achievement, aiming to integrate the qualitative with the quantitative. Again taking the example of MINVU, perhaps its most important indicator of success is the provision of housing units for low income households. While a crucial goal, ensuring the most basic human need of shelter, everyone acknowledges that the blind pursuit of this measurable objective may be perhaps the single largest force undermining MINVU's objective of controlling urban expansion.

Finally, the need for further training of professionals in the related areas has often been identified as crucial in Chile (see, CED, et al., 1994; Daher & Mingo, 1993). The country has highly qualified professionals in the relevant fields, however they are still in short supply relative to the need, particularly as power and responsibility are decentralized to the Regional and Municipal levels. Programs to further stimulate student interest in this field and ongoing training of professionals will be critical to continuing improvements.[169]

6.3 Public Finance

In the United States, the debate over 'sprawl' has emphasized the role of fiscal burdens and competition among jurisdictions in metropolitan areas. Rising tax burdens and decreasing public service quality (i.e., education) lead to 'urban flight' – as middle income residents flee to the suburbs. In the Santiago metropolitan area, such forces do not seem to play as important of a role – central government control essentially limits Municipalities to using similar tax structures (although public service delivery levels clearly differ). If anything, middle class residents leaving to, for example, Chacabuco, will likely be paying higher relative costs – through neighborhood common fees beyond normal taxes and user fees as well as roadway impact fees capitalized into housing prices. The several explicit or implicit subsidies to home ownership (including DFL2 and the income tax subsidy to housing construction firms), however, may well be exacerbating expansion by lowering the relative cost of space. This subject requires additional study. Furthermore, the problem of the *parcelas de agrado*, and their continued property tax exemption despite their conversion to suburban residential use, must be addressed, an issue well-recognized in Chile but caught in an apparent political stalemate.

The lack of property tax re-appraisals poses one of the greatest public finance problems related to urban growth management. Chilean law calls for property reassessments to be conducted every ten years, however most indications are that non-agricultural properties have not been reappraised since 1977. This causes several problems. Beyond depriving the government the full value of an important revenue source, the lack of timely property value re-appraisals reinforces its own political opposition. Property taxpayers get used to the declines in their real tax burden and thus more opposed to eventual re-appraisals – the opposition only grows with the length of time between reassessments. Other issues

worthy of further study in Chile include the implementation of differential taxation on buildings versus land to promote the intensification of development in urban areas and the explicit linking of the recently enacted tax surcharge on undeveloped land with specific land use plans and objectives.

6.3.1 Transportation Finance

In regards to transportation finance, without reassessments of property values, the government loses a great potential source for capturing the value from transportation infrastructure improvements – a possibility considered in Chile at least as far back as 1928. In that year, the Austrian urban planner contracted by the government to develop the guidelines for a Santiago land use plan proposed a series of diagonal streets, with the construction to be financed through the tax revenues which the increased land values would generate (Matas & Balbontin, 1987). Today, property value appreciation could serve as a means of pursuing infrastructure improvements – such as Metro expansion. While no detailed studies have been carried out on the effects of the Metro on land values, the evidence suggests significant valuation at least on parts of the new Line 5. Similarly, land development and price trends along the upgraded portions of the Vespucio Ring Road suggest that the government is losing out on an important source of revenues from land value appreciation there as well. Some form of mechanism for revaluation of land values due to investments in public infrastructure is needed, although this is hampered by the fact that some 70% of properties are actually exempt from the property tax.[170] Such a mechanism could also facilitate the possibilities for debt financing of infrastructure and the use of tools such as tax increment financing (TIF) districts.

In broader terms, the transportation system does, apparently "pay for itself" through the various user fees in place. Cross subsidies essentially exist, particularly road users effectively financing Metro capital investments. However, the failure to effectively and explicitly charge for transportation's broad "external" costs, such as air pollution and congestion, introduces severe inefficiencies in system performance and likely distorts investment decisions. Furthermore, no methodical assessment of the transportation finance system exists – in broad terms the revenue-expenditure process is not clear to users and transportation plans are not clearly linked to financing plans (discussed further in the following section). The U.S. approach of explicitly linking capital improvement and financing plans, as codified in the 1991 Federal transportation legislation (ISTEA), offers a model worth exploring in the Chilean context, starting, perhaps, with the comuna land plans and requisite Roadway Feasibility Studies (EFVs).

Chile's experiences over the past decade with transport infrastructure financing through concessions shows the power that specifically linking projects to available financing can have in influencing projects' actually moving forward (the fact that some of these projects have been effectively held up by public opposition also exposes the weaknesses of transportation planning without citizen participation). Importantly, under the concessions law, Regional Governments have the authority to formulate projects for possible concession, although the government of the RM has yet to take advantage of this

opportunity. Regarding transportation impact fees, their implications for the transportation finance system are discussed further below.

6.4 Plans

Land use planning requirements have been codified at the regional, metropolitan, and local level through national legislation. The principal problems with the planning processes and resulting plans include:

- some degree of arbitrariness in specific requirements/objectives (such as density goals);
- a lengthy and bureaucratic process of plan approval by higher levels of governments (Municipal governments report that the overall plan development and approval process can take up to six years);
- subsequently, many Municipal governments functioning without any relevant local land use plan in effect;
- lack of integration of land plans with fiscal realities, general economic development goals, and other sectoral plans (i.e., transport, environment);
- strong private sector pressures to change plans, without necessarily due consideration of the broader public good;
- failure to explicitly recognize and adequately address suburbanization pressures; and,
- in some cases, unclear mechanisms for plan enforcement.

6.4.1 Plan Densities

Regarding relative arbitrariness, the most glaring example is the metropolitan-wide density goal of 150 persons per hectare, and its more detailed density manifestations at the local level. The 150 persons per hectare target was arrived at by allocating projected population across the urban growth area identified in the 1994 metropolitan plan (PRMS). That the metropolitan area did not approach this gross density level during the 20th Century (see Figure 3.7) throws the achievement of the goal into serious doubt, as does the planned and anticipated future population growth shifts to Chacabuco Province as well as to Provinces in the RM's south (i.e., Melipilla). Fulfillment of this relatively arbitrary goal does not pose the real problem, however. The larger problem derives from the lack of justification underlying more specific zonal level development densities. The capability of current infrastructure (i.e., transport infrastructure) to adequately support these densities is highly uncertain. No attempt to link density with specific infrastructure corridors – particularly high capacity public transport corridors, such as has been achieved in the well-known case of Curitiba, Brazil – has been made; such corridor development could be coordinated with the current housing subsidy programs.

6.4.2 Transportation Considerations

On a related note, a move to better incorporate transportation into land planning instruments is already underway with the various forms of transport impact studies now required (EFVs, EI/STs). While still nascent, these requirements seem to be moving towards a formalized methodological and institutional structure, which should have

important impacts, particularly in terms of integrating transportation and land planning. They will also play an important role in formalization in the use of transportation impact fees. However, there has been a genuine failure to consider land use as a mobility enhancement tool and incorporate mobility objectives into land plans. Broad empirical evidence from other countries shows that density (controlling for household income, household size, and urban area size) does effect travel behavior (such as vehicle distances traveled and automobile mode share), particularly at density levels still common to developments in the Santiago metropolitan area (see Pickrell, 1999). Internationally, the debate on urban form, density, etc. and subsequent effects on transportation user behavior is still rigorous and inconclusive (for differing perspectives see, for example, Crane, 1999; Newman & Kenworthy, 1989). Surprisingly, however, this debate has been virtually non-existent at policy-level circles in Chile. Without such a debate and empirical analysis, it will be difficult for developers (particularly megaproject developers) and comuna land use plans to propose alternative design patterns and urban forms as means to alleviate travel demand. Instead, current transport impact studies (EI/STs and EFVs) propose mitigation measures that are almost always focused on infrastructure expansion.

6.4.3 Plan "Flexibility"

The issue of private sector influence on land plan (both comuna PRCs and the PRMS) development and modification is a challenging one. Private sector land speculation and development pressures have been the principal force behind modifications to land plans. The 1997 modification to the PRMS incorporating Chacabuco Province, for example, grew directly from large private land owners' influence. Much of the land actually under development in Chacabuco was already owned by current developers before the plan modification was even underway, suggesting that the private sector knew that they would be able to effectively pressure the government to change development plans when the time was ripe. This sets a possibly dangerous precedent, even for the developers in Chacabuco, since other areas of the RM (such as Melipilla) are subject to similar development pressures. The owner of a 4,000 hectare parcel in Pudahuel is reportedly awaiting the right opportunity for a plan modification to allow development in this area. Similarly, the University of Chile has a planned new campus and technical park – on government provided land – for a site currently zoned as ecologically sensitive in the PRMS. The pressure from this project will likely eventually result in a re-zoning of this land. In some cases, the private sector does not even await plan modifications. For example, CIS-INECON (1997) identifies 21 large residential projects in development for Chacabuco, seven of which were on lands identified in the PRMS as exclusive agricultural use or for ecological preservation.

Flexibility in plans is not, inherently, a bad thing. However, if a land use plan represents the public good (such as protection of ecologically-sensitive land uses) and this public good can be so easily "consumed" by private interests, then some form of compensation is required. Further, in many cases the government should have more power to stop projects from moving forward for violation of land uses – indeed this has occurred in several cases (see Section 4.8), though many others are caught in political struggles, suggesting that the issue of "takings" might grow as a future legal challenge in Chile.

Improved mechanisms, such as public financing of lands zoned for "preservation" (via development impact fees) or transferable development rights, will almost certainly be needed to strengthen the ability to truly achieve land plan goals.

6.4.4 Financial Realities

The lack of mechanisms to ensure implementation of land plan objectives is closely linked to the lack of financial foundations underlying these plans. As discussed above, transportation plans face a similar challenge, as does the air pollution control plan. Explicitly incorporating financial and economic development realities into land plans will help ensure the true viability of plan goals and objectives – such as preservation of open space or the development of proposed urban "sub-centers" – and move towards the identification of mechanisms that can actually help achieve these goals. The sub-centers concept, for example, has not effectively translated into reality – the few that actually exist were developed by the private sector before ever "officially" being identified in the PRMS. Again, if the government truly considers the subcenters concept as in the "public interest," then identifying financing for these (via subsidies, a fund from impact fees or other mechanisms) should be a real priority.

6.4.5 The Urban Growth Boundary, Suburbanization, and "New Cities"

Many planners, authorities and private sector representatives have criticized the urban growth boundary (UGB) in the Santiago metropolitan area for being blunt, distortionary, and inflationary. Similar criticisms of UGB-type growth controls can be found in other parts of the world. In reality, however, the UGB has been in effect for a short period of time in Santiago, plus it was partially undermined by the "legalization" of small agricultural plots many of which were effectively suburbanized (the so-called *parcelas de agrado*; see Section 4.6). Thus, any discernible effects of the UGB on the land market cannot be readily identified (see Section 4.4). If the UGB has had any positive effect during its short modern lifespan in the city, it has been in somewhat slowing uncontrolled urban outgrowth while other more flexible instruments could be devised. In terms of negative effects, on the other hand, perhaps the UGB's most damaging has been to allow policymakers to essentially "sweep" the suburbanization and *parcelas de agrado* problem "under the carpet." With the UGB in place, urban expansion technically could not exist and policymakers could ignore the phenomenon – a stance which only worsens the problems that unplanned expansion brings.

More recently, the modification of the PRMS to include Chacabuco Province and the concomitant creation of the planning instruments to regulate growth in the Province (ZDUC, AUDP, ZIEDC) have virtually eliminated the UGB's presence in the north of the metropolitan area. Through calls for comprehensive land planning, complete infrastructure provision and "inclusionary zoning" (for low income housing and commercial and employment activities) Chacabuco's new planning instruments formalize in-kind exactions as a way of regulating the creation of "new cities." Other researchers note that such requirements likely create less perverse incentives and have less inflationary effects than strict growth limitations like a UGB (Altshuler & Gómez-Ibáñez, 1993).

Although in principle the ZDUCs and related instruments offer a more flexible and "market-oriented" tool for managing the new megaproject growth on the urban edge, the instruments do not come without their own problems. One problem is that the regulations contain no clearly specified means for enforcement of plan implementation nor provisions for penalties if plans are not fulfilled. As such, no guarantees exist that a ZDUC's planned areas for low income housing or commercial development will be fulfilled. Developers themselves have raised doubts about the "commercial viability" of some of these requirements.

Perhaps a greater problem, however, is that the ZDUC provisions apparently leave open a large hole through which low-density, unplanned suburban development can continue its advance. According to the regulations, landowners can opt for the ZDUC – intensifying land development at higher densities on large tracts of contiguous lots in exchange for meeting requirements for low income housing and commercial land uses. Otherwise, they are "limited" to developing land at no greater than the equivalent of 1 household per acre (2 to 3 households per hectare) – densities that have been proven completely viable (indeed the norm) for urban growth in, for example, the United States. Researchers and policymakers in Chile doubt the viability of mass "low density" suburbanization on such a scale in Greater Santiago, particularly in the face of the ZDUCs, which will offer autonomous, amenity-complete developments. Nonetheless, the risk remains that the ZDUC – similar to the UGB – may create a virtual distraction for policymakers and the public, apparently keeping unplanned suburbanization off the public policy radar screen until it has produced infrastructure impacts that can no longer be ignored. Perhaps, the markets will prove the ZDUCs to be the most competitive, with the *parcelas de agrado* no longer an attractive consumer option – effectively removing the *parcelas* from the market. However, the risk remains that some ZDUCs will be developed at much lower densities, non-ZDUC *parcelas de agrado* will continue their development advance and the entire Province will grow into a mix of planned and unplanned developments with severe impacts on infrastructure and public services.

6.5 Financial Instruments

The government's growth management toolbox contains two forms of direct financial instruments – housing subsidies and, more recently, impact fees. In addition, the use of private sector infrastructure concessions – granting the private sector the right to build, operate and charge for the use of "public" infrastructure – offers another form of financial instrument available to the government for potential growth management. Each of these tools carries its own set of challenges and possibilities, as discussed below.

6.5.1 Subsidies

Arguably the two most influential housing subsidies in the RM, low income housing subsidies and the urban revitalization subsidies, have exerted countervailing forces on urban growth. Low income housing subsidies – and the low income housing program in general – have perpetuated urban expansion due to the never-ending search for low cost, inevitably peripheral, land that low income housing implies. These expansionist

tendencies may be further fueled by subsidies to middle income homebuyers (including a property tax exemption) and an effective subsidy to homebuilders (see Section 4.5.2). On the other hand, in recent years, the program of urban revitalization subsidies has produced an important re-focus of residential development in existing urban areas (particularly downtown Santiago). The net result has certainly been expansion winning over densification, since a greater number of low income housing subsidies are effectively granted each year and because the low income program has been in effect for a longer period of time.

While policymakers and others in Chile unanimously recognize the negative effects of the public housing program on urban expansion (not to mention segregation and a worsening of the financial situation of already poor low income Municipalities), solutions are difficult due to the pressing short-term need of providing families shelter. If the government truly wants to address this problem it must either raise the value of public housing subsidies (to reduce the pressures to search for the cheapest peripheral lands), find smaller tracts of already urban land (possibly subsidized by the government) and/or develop another mechanism to finance higher cost land acquisition (the ZDUC requirements for "inclusionary zoning" offer a precedent). Otherwise, will the government be willing to assume the costs (such as increased transportation costs) that urban expansion imposes on low income residents?

Regarding the urban revitalization subsidies, while their implementation is a measured success, there is considerable room for improvement in their deployment. For example, these subsidies could be more explicitly tied to land plans and, particularly transportation plans and goals. Vial (1995) reports that SECTRA convinced MINVU to authorize housing subsidies in Renca and Quilicura, to reduce transport effects being created by the rapid industrialization underway there. The results, reportedly, were "disastrous," producing unregulated developments, without proper accompanying infrastructure. This case only highlights the need to link existing and future transportation infrastructure with the housing subsidy program. For example, the revitalization program should target areas around under-utilized Metro stations for development. This would further increase the value of the program by potentially increasing Metro ridership, taking full advantage of what are "sunk" government infrastructure costs. The *Maestranza* project – around the MetroTren station in San Bernardo – offers a precedent. Why should it not be possible to link low-income housing subsidy programs to Metro station development or to bus-based public transport-oriented development and dedicated travel corridors?

6.5.2 Exactions and Impact Fees

In Chile, the use of "in-kind" exactions – requiring developers to provide certain "public" infrastructure such as local roads and street lighting – dates to at least the Pinochet regime. More recently, "in-kind" exaction requirements have been formalized and expanded (through, for example, the Urban Impact Study requirements and ZDUC-type development regulations). At the same time, explicit financial exactions, or impact fees, have also come onto the scene, although still operating on the margins of legality.

An analysis of exactions use in the United States (Altshuler & Gómez-Ibáñez, 1993), attributes the growth in their use to several factors, including:

- environmentalism,
- rising no-growth/slow-growth citizen activism,
- a general public revolt against new taxes,
- reductions in federal aid for infrastructure,
- concerns about infrastructure shortfalls, and
- fiscal impact analysis as a guide for land use decision making.

The Chilean experience to date suggests that only a few of these factors may be playing a role in the growing use of exactions. For example, growing environmentalism has certainly led to the nascent practice of levying environmental exactions (*compensaciones*) on real estate projects in Chacabuco. On the other hand, although, in general, citizen activism is on the rise in Chile (particularly linked to environmental activism), a "no-growth/slow-growth" activism does not seem to have played a role in the advance of exactions. Impact fees have only successfully been deployed in high-growth comunas with no visible "slow growth" constituency (Lo Barnechea and Peñalolén) or in Chacabuco Province, where no visible signs of citizen activism concerning the pace of development exist. On a related point, no relevant "tax revolt" movement exists in Chile – Municipal governments have little leeway in adjusting local taxes anyway. Regarding fiscal impact analyses – which aim to estimate the net impacts of proposed real estate projects on local government budgets – their use has been virtually non-existent in Chile. Except for those Municipalities concerned with the fact that low income housing requires services while providing no revenues, Municipalities apparently do not focus on the potential medium-to long-term budget impacts that growth might have budgets.

Perhaps concerns regarding infrastructure shortfalls and the *relative* reduction in financing available combine as the greatest single factor contributing to the rising use of financial exactions in Chile. Rapid motorization and a continuing growth in travel demand has largely saturated transportation infrastructure in Greater Santiago. Wealthier Municipalities have been able to finance significant amounts of concurrent infrastructure improvements, using vehicle registration fee revenues and other resources, like property taxes. In the case of Lo Barnechea and Peñalolén, with small relative tax bases and large development pressures, however, no existing revenue sources existed. Without bond issuing authority nor other means of debt-financing available, exactions levied and distributed through "Roadway Corporations" provided the only feasible way to move forward the large-scale comuna transportation infrastructure that real estate developers demanded. With no real alternative, developers largely acquiesced to the charges. In the most recent case of Chacabuco, the government is also looking to impact fees to finance the large-scale intercomunal (Provincial and Regional) transportation infrastructure. Although financial responsibility for this infrastructure falls into central (or regional) government authorities' hands, these authorities have claimed that they will not "subsidize" real estate developers in the Province through providing transportation infrastructure. The government, in this case, seems intent on short-circuiting any future potential criticisms of its road-building activity in the Province, providing itself with

protection against charges that it may have unfairly been favoring a certain region (or group of developers) with infrastructure financing.

Although now viewed as a key mechanism to finance transportation infrastructure in the area of most intense growth in the RM – Chacabuco – transportation impact fees (and transportation-related environmental impact fees) have crept somewhat quietly onto the urban development-transportation scene in the RM. This is evidenced by the fact that no clear legal basis underpins their deployment: no relevant law clearly legitimizes their existence, yet no legal battles have yet been waged in their opposition. And, just as their legal justification in Chile is unclear, so too is their technical and financial justification (due to, perhaps, the lack of a public debate which might accompany their "legalization").

Theory supports both user charges and exactions to finance infrastructure, although with a heavier reliance on user charges since most infrastructure costs (beyond basic connection) are usage-based. Since they are based on a fixed charge, impact fees provide no incentives for efficient infrastructure use. Indeed, planning for infrastructure development through impact fees without considering efficient user charges (such as congestion pricing) will almost certainly result in an over-built network. Thus, the need for congestion pricing or some closely matched proxy charge becomes clear. Absent that, exactions might provide a second best, but only if they accurately represent how costs differ among development types and locations, particularly "if the development types can be categorized to accurately reflect future consumption" (Altshuler & Gómez-Ibáñez, 1993). In the face of their realistic alternatives such as growth restrictions, impact fees, according to Altshuler and Gómez- Ibáñez (1993), provide a preferable alternative, not only avoiding some of growth restrictions' drawbacks (such as those attributed to the UGB), but also providing a useful source of revenue, an instrument for resolving growth conflicts, and a stimulus for integrating fiscal analysis with land use planning.

In Chile, transportation impact fees have shown to be a de facto replacement for the UGB (in Chacabuco) and may also prove to be a useful source of capital financing. They have not yet apparently stimulated the use of fiscal analysis, but they have contributed to some degree of "resolution" of growth conflicts. As Altshuler and Gómez- Ibáñez (1993) note and NAIOP (1999) confirms in the U.S. context, developers prefer impact fees over the apparent alternative of no or much slower growth. The same seems to hold true in Chile, as developers demonstrate a willingness to negotiate, case by case, relevant impact fees.

If, however, impact fees are to become a more widespread growth management tool in Chile, many issues must be resolved. One relates to the question of whether their deployment at a Municipal level will continue to be allowed. The current use of impact fees finds its origins in the comunas of Lo Barnechea and Penalolen, via roadway corporations. In these cases, the locally-determined exaction fees were designed to fund comuna-level infrastructure (although, in the case of Lo Barnechea they were reportedly insufficient to cover even those needs), with no consideration of greater metropolitan-level network effects. The government's process of "regionalizing" transport impact studies (and comuna EFVs) (see Section 4.7) and the current planning for Chacabuco can

overcome these problems and indeed may, since broader metropolitan-wide network effects are being calculated. The regionalization of impact fees can help minimize municipal competition in this arena which would otherwise only hamper coordinated urban development. Other issues which need to be raised relating to the further use of transportation impact fees include:

- can/should inner-ring Municipalities be fairly compensated for the development and traffic pressures that exurban growth generates (noise, pollution, disruption, etc.)?
- should future projects that might take advantage of infrastructure financed through previous projects' impact fees be charged and, if so, how?
- what are the equity effects of levying impact fees; who is ultimately paying – landowners, developers, purchasers, higher or lower income groups, current or future generations?[171]
- what is exactly being charged for through impact fees (initial capital costs, "external costs" such as congestion, maintenance, etc.) and how to ensure that widespread double-charging is not occurring (particularly if "congestion pricing" is ultimately implemented)?[172]
- what are the potential legal challenges (i.e., "takings") that might arise with more widespread impact fee application? will impact fees ultimately have to withstand a "rational nexus"[173] test in Chile's courts?
- how should impact fee payments (and "in-kind" exactions) be treated under tax laws (i.e., should they be tax deductible or exempt)?
- should transportation impact fees be directly linked to/integrated with related environmental impact fees (*compensaciones*) and should they also be deployed across all developments in all parts of the city?

This last question leads to a broader issue regarding impact fee use. It would be worth exploring the use of impact fees for all development projects in the metropolitan area, meaning that not only should residential fringe projects be charged, but so should other land uses (particularly large trip attractors, such as office, commercial and industrial parks), and developments in all parts of the city. Such an approach might even open the possibility for creating a "market" for impact fee payments or "allowances" which could be geared towards financing particular regional initiatives. This would require, however, more sound theoretical justification for the use of impact fees, particularly the environmental impact fees (*compensaciones*). These must also be drastically improved to make it clear what exactly they are being used to charged for (i.e., what is the baseline, no-build case). In its 1998 air pollution control plan, CONAMA (1998) calls for the definition of an accurate methodology for estimating travel-related emissions due to real estate project locations. Such an initiative, expanded to consider broader transportation impacts, is certainly worth further exploration, to move towards a more comprehensive approach which would: charge fees based on a comparison to alternative location options (i.e., no-build), account for locational and urban design impacts on each phase of trip-making (generation/attraction, distribution, mode choice, assignment), and allow for alternative development patterns as an alternative to fees.

Impact fees have been in effect in Chile for such a short period that their "effects" cannot be gauged. The question of how much impact fees currently cost to fulfill and who ultimately pays these costs is not really known, nor are the effects on developer and/or consumer decisions (either in location or form of development). To date, developers have been willing to go along with authorities, since the alternatives are more costly (opportunity costs of delaying project, plus legal costs that a court fight would imply). In terms of overall urban growth effects, currently impact fees do not seem to be encouraging "sprawl," since their use has been restricted to peripheral developments, essentially pushing up the costs of these. If exactions are to become a more widespread and effective development tool, however, both "in-kind" exactions (implicit in, for example, the ZDUCs) and impact fees need to be the focus of a more thorough and open debate regarding their efficiency, their equity, and the services (or infrastructure for services, such as schools and police stations) that should be financed via impact fees versus general resources (i.e., by the public at large).

6.5.3 Infrastructure Concessions

The Chilean infrastructure concessions program was born in the early 1990s as a way to promote private sector investments in public infrastructure through build-operate-transfer (BOT) schemes. In transportation infrastructure, the program's first projects were inter-urban highways and airports, although several urban highway projects have been in the planned portfolio. Currently, there are at least four roadway projects in advanced planning or bidding stages for Santiago, while several rail projects are also being investigated. Some of these projects, particularly the Costanera Norte highway, have met with severe public opposition due to justifiable criticisms regarding contributions to air pollution, disruption of inner-city neighborhoods, and lack of consideration of alternatives.

The importance of transportation infrastructure concessions to the urban transportation/ and land growth management arena cannot be discounted. As the principal projects currently being pursued are urban radial highway projects (Costanera Norte, Acceso Nor-Oriente, Sistema Norte-Sur), the program is certainly fueling urban expansion.[174] In fact, a megaproject developer in Chacabuco Province proposed the Acesso Nor-Oriente to the government's concession program and other developers in the Province frankly state that their projects cannot proceed without the highway. While these highway concessions, and their accompanying automobile-oriented urban growth, move forward, suburban rail concession projects have met with considerable delays, despite initial private sector interest (reportedly spurned by the government) in combining rail system development with station-area development and revitalization. Great potential still exists to concession out suburban rail service with land development rights, although the attraction of such a path to the private sector may well decline as the highway-oriented option advances.

To date a less pursued concession alternative, Metro infrastructure, may become a focus of concession activities in the near future. Already, the Metro has plans to concession the development/re-development of several terminal stations. Metro authorities should expand this vision to concession development rights around underutilized stations, in a program that could be linked, for example, with housing subsidies. The recent

concessioning of the urban portion of the North-South Highway, the median on which the Metro operates for several kilometers, opens up the interesting possibility to enter into joint development with the highway concessionaire for station-area developments above the highway's air rights. In a related, land-oriented possibility, the government should consider pursuing a concession scheme to further the development of the long-planned urban "sub-centers."

Finally, it is worth mentioning the concession program's general influence on urban transport policy and plans. In one respect, urban transport road concessions do offer the potential to move the entire system towards true marginal cost pricing (such as congestion pricing) of transportation infrastructure. Widespread congestion pricing, the argument goes, can move forward on the precedent set by the concessioned infrastructure as users become accustomed to the idea of paying concession tolls. In this sense, concessions may help achieve a broader transport policy goal. There is, however, the great risk that urban transport infrastructure concessions can actually undermine coherence in urban transport policies and plans, particularly if they are pursued absent an overall and prioritized transport plan.

6.6. A Recap with Additional Areas for Exploration

The above analysis highlights four principal areas where considerable progress has been made in growth management for enhancing the transportation system, yet where further improvements are necessary. Each is summarized briefly below.

Institutions. The ongoing challenges relate to institutional coordination and the need to "metropolitanize" planning and implementing authority, implying additional degrees of direct political accountability and revenue-raising powers at a "tier" of government between the Municipal and the Central. In addition:

- The need for a clear and coherent urban transport-land use policy, together with more effective means of measuring goals achievement (i.e., moving beyond simple quantitative measures, such as number of housing units built).
- Continued emphasis on strengthening relevant professional capacities, with further incentives to encourage study of relevant issues in universities and stronger incentives to make local and regional government employment more attractive.

Public Finance. Further fiscal decentralization can only occur with Regional governments more directly politically accountable and as Municipal governments prove fiscally responsible in time. Broader Municipal government financial independence will continue to be curtailed due to national income redistribution needs and may not actually be desirable anyway from a metropolitan management perspective. Other relevant issues:

- A critical need for property tax revaluations or some form of mechanism that can allow for appreciated land values due to public infrastructure investments.
- Marginal, full-cost transportation pricing, including congestion pricing and charges for transportation pollution effects.

- Clear financing plans tied to local and regional transportation plans (and clear delineation of transportation revenues and expenditures at a regional level)

Land Planning. Despite a well spelled out land planning framework and institutional lines of responsibility, the process in Chile is hampered by a combination of excessive bureaucracy and private sector pressures, unjustified (and perhaps unachievable) plan goals and objectives, poor sectoral integration, a lack of financial reality, and in some cases unclear mechanisms for enforcement. Specifically:

- Even though land plans must now more explicitly account for transportation demand, land plans still need to more adequately reflect development intensity potential based on high capacity transport corridors and nodes (such as Metro stations).
- Land plan goals – such as the urban "sub-centers" concept, open space preservation, cultural/historic preservation – need to be clearly linked to financial or other instruments, such as subsidies, tradeable development rights (these might even be used to halt the further development of *parcelas de agrado*), and densification bonuses.
- Specific instruments and penalties are needed to ensure that provisions (such as low income housing) in new planning guidelines (ie., for ZDUCs) are adhered to.

Financial Instruments. The government has three principal financial instruments to deploy in managing transportation and urban development, two of which, concessions and impact fees, are relatively new.

- Subsidies, particularly low income housing subsidies and urban revitalization subsidies, have shown to be effective in achieving their general goals, however the low income housing subsidies have had undeniable urban expansionary effects and need to be re-designed to reduce their dependence on low cost lands, while urban revitalization subsidies should be more explicitly linked to available transportation infrastructure capacity, such as underutilized Metro stations.
- Impact fees, both for transportation infrastructure development and transport-related environmental *compensaciones* are apparently becoming increasingly important, however their existence needs to be justified, legalized, and formalized, their effects need to be better understood on efficiency and equity grounds, and they should be more soundly analyzed and methodologically substantiated.
- Highway infrastructure concessions may only accelerate urban expansion trends, while, to date, rail-based and Metro-oriented concessions have not been actively pursued; the use of concessions to promote joint development around Metro stations should be explored, as should concession-financing of other public transport infrastructure and concessioning of other related urban development projects, such as the urban sub-centers.

6.6.1 Growth Management for Mobility

The bulk of evidence presented in this paper suggests that authorities have not aggressively pursued urban growth management for specifically achieving transportation,

mobility, or accessibility goals. Most of the provisions in place in Chile have been created for purposes other than mobility enhancement, reflecting the historical disconnect between authorities responsible for land planning and those responsible for transportation. Some planning instruments, such as Greater Santiago's land use plan (the PRMS), have contained specific measures aimed at guiding land development to reduce transportation burdens through the identification of urban "subcenters." The lack of tools to actually promote subcenter development has, however, limited their realization to date.

Recent trends indicate more explicit attempts to link land planning and transportation system impacts. For example, the relatively longstanding obligation for real estate developers to include transportation infrastructure within their projects has been under a process of refinement and improvement, seen in the formalization of requirements for increasingly sophisticated transportation system impact studies (EI/ST). The new ZDUC regulations, for certain developments in the Province of Chacabuco, also aim purposely at creating semi-autonomous developments to reduce external transportation demands that these exurban developments will otherwise create. At the comuna land plan (PRC) level, the requirement that all PRCs must now be subjected to a roadway feasibility study (EFV) and the related growth in the use of transportation impact (and transportation-related environmental impact fees) further strengthens the land development-transport link. Nonetheless, as mentioned in Section 6.4.2, these tools have not yet been used to explore the potentials of, or to create incentives for, pursuing alternative development patterns as a means of reducing or changing transportation system impacts. Finally, in its current process for developing a transportation plan for Santiago, SECTRA specifically identifies several land management initiatives to improve the transportation system: improving the location of education facilities to reduce school trip demand; promoting new commercial and service subcenters; and changing residential location tendencies (including through a shift in the structure of housing subsidies).

These proposed initiatives mark an important shift in transportation authorities' apparent willingness to pursue growth management for mobility goals. Whether they will be able to effectively deploy the suite of Chile's currently available growth management tools to achieve these goals and/or devise additional tools remains to be seen. Table 6.1 identifies the broad range of specific urban growth management tools available for Santiago and their theoretical, practical, and potential impacts. Other related measures discussed throughout this document, such as improvements to property tax revaluations should also be pursued. We hope this review and critique will further encourage and facilitate the deployment of the relevant instruments.

Table 6.1
Principal Growth Management Instruments and Their Transportation Effects

Instrument	Theoretical Transport Effects	Practical Transport Effects	Future Potential
Land Use Plans (PRMS, PRCs)	Should link transport-land use planning, ensuring network capable of handling proposed land uses.	Historical disconnect between responsible authorities; no serious transport analysis behind land plans; plans emphasis on road infrastructure.	Signs of increasing requirements for transport analysis underlying plans; still, need to look beyond infrastructure provision as transport solution.
Urban Growth Boundary (UGB)	Could increase densities, cluster land uses, decrease travel distances.	Somewhat slowed urban outgrowth, but likely led to uncoordinated/poorly equipped suburbanization.	Uncertain future status; likely being replaced by other instruments.
Low Income Housing Subsidies	Uncertain.	Have exacerbated transport conditions by fueling urban expansion.	Could be linked to public transport corridors/stations or mixed use areas.
Other Housing Subsidies (incl., DFL2)	By lowering home ownership costs, increase land consumption, expansion & transport demand.	Uncertain, but theoretical effects are likely holding somewhat true.	Will likely continue; issue should be studied to judge effects on land & housing market & urban expansion.
Urban Revitalization Subsidies	Encourages more efficient use of existing transport infrastructure & decrease travel demands.	City center residential revitaliztion has likely reduced some travel demand.	Needs to be tied to transport capacity (i.e., Metro) and maybe replicated for other land uses (i.e., commercial).
Agricultural Land Law	Created the *parcelas de agrado* "loophole," allowing some degree of uncontrolled suburban expansion.	Widespread *parcelas de agrado* have fueled expansion, undermined UGB, prevented adequate facility provision.	Difficult to revert due to legal, political obstacles; may be mitigated by ZDUCs.
Roadway Impact Studies (EI/ST, EFVs)	Should ensure that real estate projects and land plans have adequate transport provision.	Have improved project and plan development recently; continued emphasis on infrastructure.	Will continue to be refined/improved; need to encourage alternative mitigation (i.e., demand management/densification)
Environmental Impact Studies	Could ensure that real estate projects minimize transport impacts.	Currently have produced nil transport effects.	Could be restructured to have incentives for transport demand mgmt.
Exactions and Impact Fees	Should ensure that real estate projects "internalize" transportation effects.	Have increased developers' transportation infrastructure responsibility.	Could be restructured to have incentives for transport demand mgmt.
"New City" Regulations (i.e., ZDUCs)	Could ensure self-contained urban areas, reducing external travel demand.	Not yet clear whether projects will materialize as planned; may create longer net travel distances.	Need mechanisms to enforce plan fulfillment & flexible design standards to allow "new urbanism."

6.6.2 Transportation for Growth Management?

In this paper, we have focused primarily on growth management to achieve transportation/mobility goals. We have not focused specifically on transportation to achieve growth management goals, although there is some overlap in much of our analysis. Some researchers (see Gómez-Ibáñez, 1985) discount the effectiveness of using transportation policy to effect urban growth. Authorities in Chile have clearly embraced this philosophy in, for example, the provision of Metro infrastructure; the fact that sections of the initial Lines 1 and 2 failed to generate expected land use changes has since been used to write off the potential that future Metro development might have on helping to achieve desired land use patterns. Without getting into the long-standing debate on the role of Metros on urban growth, we have opted simply to recommend that the government look more closely at promoting future development around the current Metro infrastructure – this constitutes growth management for mobility, since growth is being focused on existing high mobility services.

One recent private sector development project, the *Maestranza* de San Bernardo, shows the apparent market viability of rail-oriented urban development, in a project that the government has encouraged. Ultimately, however, public transportation-oriented land development cannot rely entirely on rail-based opportunities. The bus system, which still carries the great share of passenger trips in the city, should also be a focus of public transport-oriented urban development initiatives. Indeed, private sector bus operators should consider joint-development opportunities of their own, as a way of strengthening their future customer base. This, however, would require ongoing improvements in the bus system itself (since most users seem to abandon it at the first chance); in this sense, transportation improvements cannot be separated from growth management possibilities.

6.6.3 Other Issues and Areas for Further Research

Many other recent analyses have focused on a broad range of measures to improve urban growth management in Santiago. SUR (1999a), for example, offers a comprehensive menu of financially-based growth management tools, including many of promise and with precedent in Chile, such as providing tax exemptions for development projects in the "public interest." Without wanting to further add to the array of possibilities for the Santiago metropolitan area, we have instead chosen to focus primarily on incremental improvements to the existing system, looking at the most promising tools in place and assessing their future potential. Nonetheless, there are three additional areas that we feel need to be highlighted, particularly due to their lack of mention in most other references on the subject in Chile.

Fiscal Impact Analysis. First, although running the apparent risk of further complicating the development impact analysis process (which currently requires environmental impact assessments, transportation impact studies, and in some cases urban impact studies), the use of some form of fiscal impact analysis should be conducted for development projects – at least those of a certain scale. Fiscal impact analysis aims to assess the medium- to long-term impacts that real estate developments will have on government coffers. Basically, the goal is to ensure that the public costs associated with new developments

(road maintenance, street lighting, school operations, etc.) will be adequately covered by the subsequent revenues that a development will generate (property taxes, user fees, etc.). Such analyses are not easy to carry out, and involve many challenges such as establishing a baseline, calculating marginal costs, and accurately allocating the costs of "public goods" (i.e., parks, schools) to various projects. Nonetheless such analyses can help ensure that a "balanced" and sustainable amount of development takes place. In addition, such analyses bring several additional potential benefits, such as helping to educate Municipal governments (and comuna residents) on the real financial costs and benefits that projects imply, not to mention improving the general understanding of Municipal financing issues. The possibility also exists to combine such analysis with transportation and environmental impact analyses. Hollis et al. (1997), for example, provide a framework for an integrated evaluation of economic, social, transportation and environmental impact analyses, allowing for quantitative and qualitative considerations.

Urban Design. On a more qualitative note, the metropolitan area seems ripe for a revolution in urban design. While the private sector, particularly the megaproject developers, has been moving forward some innovations in urban design, including some aspects of the "new urbanism," there has been a general critique in Chile about the lack of "aesthetic" in most modern development. The root of these criticisms lies in part in the public sector; specifically MINVU's urban design standards (such as roadway design standards), which many fault for being too excessive in their requirements for roadspace, thereby eliminating the possibilities for more pedestrian-oriented urban designs, narrow streets, and other design characteristics attributed to new urbanism. These standards require revision. At the same time, lack of market innovation has to be attributed to developers and consumers, who (respectively) fail to take risks on or to demand alternative development patterns. In this respect, the government and the private sector can come together to promote alternative neighborhood design through design competitions and/or studios, involving, for example, university teams. Such competitions should span the range of urban design challenges, from low income housing to upscale suburbs and all points in between.

Urban Form & Travel Behavior. Finally, and tying the qualitative issues of design back into the quantitative, there is a sore need for more analysis of the effects of the built environment on travel behavior in Greater Santiago. Chile has a highly sophisticated transportation modeling community, excellent university transportation departments, and good quality household travel data. Surprisingly, there has been little, if any, research and subsequent academic (or public) debate on the influences of urban form on travel behavior. Such empirical research is critical to understanding the true possibilities of growth management for improving transportation system performance. Recently, the creator of a land use-transport model for Santiago presented the potential for extending the model framework to explore local area factors such as "cycling, walking, pedestrianisation, location of bus and Metro stations and concentration of retail and services" (Martínez, 2000). So future work in Santiago might already be moving in this direction.

6.7 The Market

This paper has outlined the major, and apparently increasing, role that private sector developers play in the form of growth in Santiago, both through their own projects and their pressures for plan modifications and highway infrastructure development. The market clearly is an important, and perhaps the dominant force, in urban growth trends; however, one cannot forget that the market will only deliver what the public sector allows (or what the private sector can effectively wrestle from public sector provisions). There are some signs that the public sector has effectively led the private sector to achieve public goals. The use of housing subsidies provides a good example. Another example is Providencia's inducement of the private sector to respond to the Municipality's desire to foment a new urban center around the Metro Line 1. The market has been much less responsive to other lines of the Metro, however and perhaps even less responsive to "planned" developments, such as the "sub-centers."

The market has also shown signs of spontaneously spawning project innovations that fall in line with stated public sector goals. Several megaprojects, for example, plan to incorporate bicycle infrastructure, aspects of traffic calming and other transportation enhancements. Furthermore, the developers of Chicureo may subsidize commercial interests in early years to ensure that its goals of mixed use development are actually achieved. The *Maestranza* de San Bernardo marks one of Santiago's only modern example of public transport-oriented development. More broadly, recent researchers have developed the hypothesis that current market trends and private sector actors may actually be improving Santiago's chronic spatial social segregation (see Sabatini, 2000).

In the end, both the public and private sectors have keys and components to progress and future advances will require more public-private cooperation and innovation. Public-private partnerships have shown to be useful in, for example, the case of the Municipality of Santiago's Development Corporation. Although other Municipalities are now precluded from forming a Development Corporation, such an entity is not crucial to strengthening the possibilities for private sector collaboration.[175] Municipal governments need to adopt a more "entrepreneurial" attitude – as evidenced by the positive examples of Santiago, Providencia and Las Condes. At the same time, the private sector must learn to better understand the realities of the public sector. There will not, indeed there cannot, always be a convergence of public and private interests. Nonetheless, the private sector should look hard for development opportunities that satisfy the public interest and the government should reward those projects which do (such as allowing design leeway for alternative urban design projects which adequately seek to promote pedestrian travel).

6.8 On a Final Note: The "Vision"

There is no shortage of criticisms from the general public, the private sector, and public authorities alike on the "quality of life" in the Santiago metropolitan area. Citizens express general dissatisfaction through public surveys and various opinion polls, while academics and professionals lament the loss of public space and the poor aesthetic of most of Santiago's modern development. Authorities are overwhelmed by the challenges of managing chaotic urban growth and impatient citizen and private sector demands,

while the private sector criticizes the bureaucratic realities of project approvals and dreads the market uncertainty created by public sector wavering. Some of these perspectives result as natural by-products of a rapidly growing and metamorphosing urban area – people, policies and markets take time to adjust to the new realities that they themselves create.

These perspectives, however, are reactions to a situation that all actors have played a role in developing – although to date government authorities and private sector "megaplayers" have arguably had more influence than the typical citizen consumer. Again, as proposed in the previous section, the urban development market responds to the rules that the public sector establishes. The main problem in this respect is that those rules are designed to guide development to achieve often ill-defined or poorly substantiated "public interest" goals. Part of the challenge comes from the heavy focus on quantitative goals and numerically measurable outcomes – such as number of low income housing units built or kilometers of streets paved – which effectively mask how such goals might be undermining other objectives such as preservation of open space. At the same time, certain objectives, such as the creation of urban sub-centers are not tied to any effective policies to ensure implementation nor any indicators to measure their successful implementation or effectiveness. In short, there is no clear, broadly shared vision of what the metropolitan area "should" look, much less any meaningful measures with which to indicate progress towards such a vision.

While some might be quick to dismiss calls for a consensus-building process of metropolitan "visioning," such an exercise carries important ethical and political implications, beyond its potential for improving planning. Annually, roughly US$ 1 billion is invested in transportation infrastructure and real estate projects in the Metropolitan Region; that such large amounts of money are spent in shaping the city, with marginal input from the general public is troubling. Some efforts have been made to improve public input in planning processes, such as CONAMA's development of the air pollution prevention plan.[176] Public interest groups (such as Acción Ciudadana por el Medio Ambiente and Ciudad Viva) have also played an important role in pressing the government to open up its planning and investment decision-making processes. Nonetheless, major progress remains to be made. For example, MINVU recently attempted to present to Congress a new General Law of Urbanization and Construction, with virtually no participation from other public institutions or the general public. Facing sharp criticisms, MINVU has since returned to the process, with a broader participatory effort underway. This is certainly a positive step in the right direction.

Ultimately, however, a broader effort (such as the Portland (OR, USA) Region 2040 planning effort) will likely be necessary to truly open up the transportation and the land use planning process and define a commonly shared vision of the future. Such an effort might also help create a stronger and more representative regional government. Boisier (2000) argues that regional governance in Chile cannot occur without the creation of a regional culture and regional "identity." What better way to craft a regional "identity" than through an open, public discourse on what all residents of the metropolitan area want the region to look like?

Notes

[1] Hopefully, growth management to enhance the transportation system will bring benefits to other areas of concern (such as the environment) as well. Ensuring such benefits, however, would require additional detailed study.

[2] The Governor of each Provincia is directly subordinate to the Intendente (Governor of the Region), essentially serving as the supervisor of services within the Intendente's area of responsibility. Beyond this role, and the role that the Provincial government plays as an interlocutor for public participation in regional development plans, the Provincial government has an apparently minimal role in development issues and is not detailed further in this paper.

[3] According to Subdere (2000b), the Constitution and laws in Chile make a clear distinction between national government and administration. According to this distinction, the government can only deconcentrate powers, while adminstration can decentralize. Subdere (2000b) also notes that a strong centralist political culture predominates in Chile, which also affects inhibits decentralization.

[4] The project has received financial and technical support via German bilateral aid.

[5] While in theory MOP is responsible for inter-urban transportation, for many years it was involved in infrastructure and planning specific to urban areas (especially before the existence of MINVU). MOP was also the entitity originally responsible for the construction of the METRO and continues to play an influential role in urban infrastructure, especially today through its transportation infrastructure concessions program.

[6] This paragraph and the following are based on Chapter 2 from Malbrán (2000).

[7] This philosophy would also be embraced in the planning and development of the Metro system.

[8] Correa (1991) estimates that in Santiago by 1990 nearly 4,000 more buses than necessary were operating in the city, consuming an extra $24.4 million per year in fuel and emitting an excess 10.4% of particulate emissions into the urban air. Furthermore, poor maintenance produced an estimated $31 million per year in excess fuel costs and a 77.6% increase in bus particulate emissions. In terms of fare increases (due to cartelization), Thomson (1993) notes that bus fares in Santiago experienced a ten-fold increase relative to the minimum family wage between 1977 and 1987.

[9] In Santiago, the first step was outright state purchase of the oldest vehicles on the streets – 2,600 buses at a cost of US$14 million to the government. Later, the government launched a transparent and apparently effective route bidding process which produced remarkable results in recent years including: a reduction and modernization of the bus fleet (number reduced from 13,500 to 9,000 and average age reduced from 14 years to 4 years), implying a private sector investment of US$500 million in vehicle stock; improvement in service quality (uniform signage, more comfortable vehicles, etc.); improved vehicle emission characteristics (more than half the fleet complies with EPA-91 or 94 standard); modernization of the bus companies; and, importantly, stabilization of the bus fares (Dourthé, et al, 2000).

[10] The government hopes to "rationalize" automobile use through calls for road pricing, the legal basis for which has remained frozen in Congress since 1991.

[11] MOP's first forays into the field of urban/regional travel forecasting during the 1990s were related to a study of the Macro-Zona Central (including the RM), using the land use-transport modeling package MEPLAN (see, i.e., MECSA-INECON, 1993). More recently, MOP contractors (interestingly, the Industrial Engineering Department of the University of Chile instead of the Transport Engineering Department) have been using the software package EMME/2 for planning in the northern RM provincia of Chacabuco (see DII-UC, 2000).

[12] In 1991, the government initiated the concession program with legislation allowing the private sector to build and operate transportation (and other public service) infrastructure through a build, operate, transfer (BOT) mechanism.

[13] The comuna is the equivalent of a local town or city, the government of which is normally referred to as a Municipality (Municipalidad); in this paper we use comuna to refer to the geographical area and Municipality to refer to a comuna's government.

[14] There have been several government plans and projects in recent years which have specifically aimed to move beyond the confining definition of Greater Santiago. In 1993 the government published a study of future infrastructure needs of the so-called Macro-Central Zone (the Metropolitan Region plus two adjacent Regions) (see MECSA-INECON, 1993). More recently, the Pollution Prevention and Control Plan for the

Metropolitan Region is aimed specifically at the entire RM, since the entire RM has been declared in violation of air pollution standards (see CONAMA, 1998). Other efforts include the project OTAS and the development of the PRDU (both discussed in the text). Also, SECTRA has indicated plans to at least include the Provincia of Chacabuco in the next Origin-Destination Study scheduled for 2001.

[15] One indication of attempts to decentralize economic growth away from the RM is the relative level of public spending in recent years which declined for the RM through the 1980s and early 1990s. In 1993, per capita public spending in the RM was 60% of the national average (24,000 pesos vs. 39,500 pesos) (GORE, 1995).

[16] From 1907 to 1952, for example, Santiago's annual growth rate ranged from 2.9% to 3.3%, while that of the rest of the nation's cities with more than 20,000 residents ranged from 2.4% to 2.6% (Sutter & Sunkel, 1982).

[17] Preliminary data for 1998 (INE, 1998) indicate that the RM had virtually the same annual growth rate for the period 1992-1998 (2.0%) as that for 1980-1992 (1.97%).

[18] Quinta Normal, Estación Central, P. Aguirre Cerda, San Miguel, San Joaquín, Ñuñoa, Providencia, Recoleta, Macul, and Independencia.

[19] Total population in these Municipalities declined by a total of 3% between 1970 and 1992.

[20] It is important to note that this declining density gradient is based on the *average* of the population densities of the comunas within each ring. There is considerable variation in densities across individual comunas within each ring.

[21] For planning purposes, such as Roadway Impact Studies, population is still calculated according to an average 5 persons per household (as dictated by Ordenanza General de Urbanismo y Construcciones, Título 2, Artículo 2.2.5 (see, for example, CITRA, 1999).

[22] MINVU in the 1994 Land Use Regulatory Plan for Santiago (Minvu, 1994), estimates a 2020 population for Greater Santiago in the range of 7,200,000 to 9,300,000 and adopts 8,700,000 as a rough estimate for the Plan.

[23] The phenomena of land "invasions" or "illegal" settlements of urban land goes by different names in the countries of Latin America. In Chile, while sometimes referred to as "poblaciones" or "ciudades callampas" (mushroom cities), they are now formally referred to as "campamentos" or "asentamientos precarios" (precarious settlements) by the government.

[24] The foothill comuna of Peñalolen may be the main exception to massive segregation. This comuna is relatively integrated with very poor poblaciones directly adjacent to the highest classes.

[25] According to CED (1990), the new administrative division of comunas in 1981 was done as part of a specific government policy to create homogeneous urban zones.

[26] Urban expansion in the 1970s was also probably significantly slowed by the economic turmoil of that decade in Chile (related to the government of the Unidad Popular, 1970-73; the 1973-74 oil crisis; and the economic restructuring undertaken by the military regime).

[27] The estimated areas of urbanization for the period 1992 – 1997 were derived by superimposing aerial SPOT photographs from 1997 on digitized existing blocks corresponding to the 1992 census (from INE).

[28] The relative mix of land uses in a comuna is calculated by first estimating the percentage of a comuna's land uses dedicated to each type of land use. An index of relative mix is then calculated as the average of the standard deviations of each land use percentage from the average percentage land use (since a total of 7 land uses are possible, the average land dedicated to each land use in all cases is 14.29). The lower the index (average standard deviation), the higher the relative mix of uses within a comuna. For Greater Santiago, the relative mix index is 17; only nine comunas have average standard deviations below this index, indicating that only a few comunas contain a good mix of land uses.

[29] Number calculated by taking the total net fixed assets as of 1999 and adding all accumulated depreciation to date (from Metro, 2000a). This may be an underestimate of actual investment costs over time due to the historical appreciation of the dollar relative to the peso. Kain and Liu (1994) doubt Metro's claimed investment costs, suggesting: some cost items may have been overlooked or not included by MOP (Metro's original builder); the exclusion of the opportunity cost of capital and disruption costs to road system users during construction; and, the costs imposed on road users due to (in their opinion) MOP's decision to under-maintain the nation's roads to pay for the Metro.

[30] Sale of automobiles with catalytic converters has been mandated for the RM since September 1992. Number of vehicles affected by restriction calculated based on RM private fleet growth to 1998, assuming $1/4^{th}$ of vehicles sold in 1992 had catalysts, all vehicles sold since have catalysts and an annual vehicle

scrappage rate for non-catalyst vehicles of 5%. The government has recently approved the extension of the restriction to vehicles with catalytic converters on days of extreme pollution (so-called emergency days – typically around 5 per year). Nonetheless, this measure has not yet been implemented and – despite general public support – faces severe opposition from the auto industry and many vehicle owners.

[31] All trip characteristics described, unless otherwise noted, come from SECTRA's travel survey of 1991 (SECTRA, 1991). The information is for the 34 comunas of Greater Santiago; additional information on the RM is unavailable.

[32] The 1991 Origin-Destination study breaks public transport trips out accordingly: Bus, 48%; colectivo, 1.7%; Metro, 3.7%; Auto-Metro, 0.2%; Bus-Metro 1.6%; Colectivo-Metro, 0.7%; Others-Metro, 0.2%.

[33] Daily average calculated from ridership reported for the first four months of 2000 (EFE, 2000).

[34] The number of "Other" trips hovers around 50,000 trips per 15 minute interval from 10:00 am to around 8:00 pm, before slowly tapering off.

[35] According to data derived from vehicle registrations, the total motor vehicle fleet in the RM from 1986 to 1998 grew at a rate of 6.8% per year, with the most rapid growth among private vehicles (6.7%), taxis (10%), and trucks (7.9%). In 1998, the RM accounted for 45% of the nation's motor vehicle fleet, including 50% of the private vehicles (based on data from INE, 1986-1996; INE, 1999).

[36] The number for 1998 is based on vehicle registrations in the RM (INE, 1999) and estimated population in the RM (INE, 1998). In this estimate for private vehicles we include vehicles registered as jeeps, vans and pickups, although many of the latter two are used for commercial purposes. Counting all these registered vehicle types as private vehicles produces the same 1991 motorization rate as that resulting from the 1991 household travel survey – 89 vehicles/1000 pop. (SECTRA, 1991) – so we consider this categorization of the private vehicle fleet to be relatively well calibrated.

[37] Regressing auto ownership on auto mode share (for all trips) by comuna yields an r^2 of 0.97, t =30.8.

[38] Based on cross-sectional analysis of 1991 comuna-by-comuna data, the elasticity of auto mode share with respect to auto/1000 = 0.80 (ln[autos/1000] and ln[auto mode share]) (t=21.6, adjusted r^2 = 0.93). Based on 1998 motorization rate, this elasticity implies an auto mode share of 21.5%. Alternatively, using the two aggregate data points from 1977 and 1991 gives a simple elasticity (based on percentage changes) of 1.22, implying an auto mode share for 1998 of 24.4%.

[39] According to Chilean Law (Ley 19.011), the rights to operate urban bus services can be competitively concessioned (as opposed to completely free of entry) when congestion, pollution and/or public safety is a major concern.

[40] In 1991, between 80 and 85 percent of all bus lines crossed through the center of the city (Hohmann, 1991).

[41] The Metro, prohibited from operating surface level public transport, has agreements with some bus companies to provide a feeder bus service to some stations – with approximately 22 routes in operation, the most successful being one which links, via a short circuit, a terminal station of Line 1 with an upscale shopping mall. In general, Metrobus accounts for a small share of passengers accessing (1.8%-3.4%) and leaving (1.1%-4.7%) Metro stations (Metro, 2000b).

[42] A 1995 study by the Ministry of Transport (MINTRATEL, 1995) found particular qualitative characteristics that made individuals prefer auto use instead of public transport use, including: door-to-door availability, assured seating, space to carry personal items, music of choice, privacy (or at least selection of travel companions), and air conditioning. Survery participants further delineated particular characteristics of public transport use that were considered to be "reductions in personal liberty," including having to accept decisions of the driver in terms of speed and route and having to endure the presence of odors, sounds, and other factors (in particular, singers and vendors which are typical on buses in Santiago). These "reductions in personal liberty" were contrasted with the "expansion in personal liberty" that participants associated with the auto.

[43] A pilot Executive Bus Service ran temporarily in 1998, but was not put into permanent service.

[44] The 1991 travel survey is based on user reported travel times, not distances.

[45] The regression is done on comuna-wide public transport mode share. Metro presence is captured via a dummy variable indicating the presence of a Metro station in the comuna. Clearly, this is a very rough measure, but more detailed zonal level information was not available. While the regression shows only moderate explanatory power (adjusted r^2=0.60), both auto ownership and Metro presence show the expected signs and are statistically significant (t=6.89 and 3.79, respectively). Comuna density, on the other hand was not statistically significant (Data from SECTRA, 1991 and INE, 1992). Interestingly, Kain

and Liu (1994) present a similar regression (using a logarithmic functional form for vehicle ownership and the statistically insifnificant variables of population density and the ratio of public vs. private vehicle travel time to the city center), but come up with results showing Metro presence (also measured by a dummy variable) to be statistically insignificant in public transport mode share. It is unclear where the source of difference in our results lie, since both are based on aggregate comuna data from 1991.

[46] Since 1995, the Metro has recorded operating surpluses, ranging from approximately $100,000 (1995) to over $3 million (1996). In its operations accounting, Metro income includes fares, publicity, rent (locales in stations) and others; expenses include personnel, energy, maintenance, other costs, and depreciation (of rolling stock and infrastructure). With this method, Metro's 1999 operating surplus was $266,000. Ignoring depreciation, but including financing costs (Metro is responsible for debt assumed for rolling stock and operating system equipment) and other non-operational costs, and adjusting for monetary changes, Metro's annual surplus (1999) equals approximately $15.3 million (derived from Financial Statements in Metro, 2000a).

[47] Line 2 was built at the same time as today's urban portion of the Panamerican Highway, the location of the Line in the median was a cost-saving measure and was not part of the line's original trajectory. In the case of Line 5, less than 50% of the route runs underground; again a cost-saving measure, which produced an infrastructure not well integrated into the city. The portion of Line 1 passing through the heart of today's commercial Providencia was originally supposed to run along the river two blocks North of the current route, which would have resulted in a cheaper construction cost, but would not have produced what is today, arguably, Santiago's finest example of integrating rail transit infrastructure with urban development.

[48] The Line 2 Terminal at Vespucio would be integrated with the planned upgrade (via concession) of the Ring Road, which in its Southern Section would include a segregated busway linked directly to the Metro Station. At Quinta Normal, the government plans to locate the station for future suburban rail (concessioned services to Melipilla/TilTil), though the future of these projects is not at all certain.

[49] It is not entirely clear what led to this increase in walking. One possible factor may have been the increase in real public transport fares during the time-frame indicated (as discussed previously). Another possible reason is a difference in survey methodology and/or definition of a trip between the two surveys (i.e., the 1977 survey could have under-reported walking trips).

[50] Average distance based on: weighted overall average of 18 minutes walk trip time (reported peak period walk trip times ranged from 17 to 19 minutes and off-peak reported walk times were about 18 minutes, from COMPIIT [1992]) and an assumed average walking speed of 5 kilometers/hour.

[51] Again, it is important to note that trips less than 400 m are not included in these data.

[52] The survey assumed that no inter-zonal trips could be done by bicycle.

[53] Of total motorized trip-makers, 10% would be willing to consider bicycle use, about half of which would actually make a bicycle trip. Almost 30% of students would be willing to consider bicycle use for their school trips, nearly half of which would actually make them.

[54] Controlling for auto ownership, the land use mix index is statistically significant (t=5.23) and positively correlated with a comuna's walk mode share, although the explanatory power of the equation is moderate (adjusted $r^2 = 0.846$). The larger the land use mix index, the more homogenous a comuna's land use, so that the positive correlation means more homogeneous comunas have more walking.

[55] Density, for example, is measured based on a comuna's entire land area, which might well underestimate density for peripheral comunas (such as Lo Barnechea) with a large share of undeveloped or undevelopable land.

[56] A general overview of environmental problems in the RM can be found in CONAMA (2000b); a detailed diagnosis of the RM's air pollution problem can be found in CONAMA (1998, 2000a).

[57] Declared 12 June, 1996 by Supreme Decree No. 131/96, issued by the General Secretarial Ministry of the Presidency.

[58] According to the 1997 emissions inventory (in CONAMA, 1998), more VOCs are emitted into Santiago's air than NO_x, which makes it likely that NO_x "constrains" ozone formation and should thus be targeted to reduce ozone concentrations.

[59] See Escuderio (1996) and CONAMA (1998, 2000a) for a more detailed diagnosis of air pollution history, problems, achievements.

[60] An estimated 36% of industrial facilities and only 4% of households currently have access to wastewater treatment.

[61] 57% of residents are at slight risk of hearing loss, 21% at a moderate risk, and 1% at high risk. Data from 1989; more recent data not available.
[62] As mentioned in Section 3.3, there is significant variation in this average: upper income eastern comunas enjoy more than 20 m^2 of greenspace per resident, while the poorest comunas have less than 1 m^2 per resident.
[63] The only exception is the government's creation of free-trade zones (in Iquique and Punta Arenas), where residents can purchase items free from custom duties (a central government economic development policy for these regions of the country).
[64] If investments by the state-owned companies METRO (urban rail) and EMOS (water and sanitation) are excluded from total public spending, the share of IDR increases to 16%.
[65] Municipalities were given the option of delaying reappraisals until the year 2000, in which case the applicable property tax was 2%; in addition, for non-agricultural, non-residential properties or residential properties appraised at more than US$38,000 (in 1995), the government would charge an extra 0.6%, funds which would go directly to the central government. All properties appraised at less than US$12,000 were exempt from property taxes. ACHM (1995) reports that as of July 1, 1995, 200 of the country's 342 comunas had opted to apply the reappraisal.
[66] Any land with an assessed value greater than \$15 per m^2 (according to ACOP-CNSI[2000] only two comunas in 1995 had average land prices less than this value) is subjected to this tax. The surcharge is 100% the relevant tax rate on on all value over the \$15 per m^2 although land which is valued at 30% or less of the exempted property value (see Table 4.1) does not have to pay the surcharge (ACHM, 1995).
[67] During registration "season" Municipalities go out of their way to make vehicle registration easy, setting up booths at shopping centers and on sidewalks. Residents are not restricted to registering their vehicles in the comuna of residence.
[68] Efficiency measured based on increases in Municipal income, improvements in educational performance, spending on personnel training, budget surplus, community spending relative to total spending, investment per capita (ACHM, 1995).
[69] As of 1994, the pump price for premium gasoline in Chile (approximately US\$1.80 per gallon) was slightly below the developing country average (\$1.87) and well below the Western European average (\$3.69) (World Bank, 1996).
[70] These estimates do not include MINVU and Municipal government expenditures for urban streets and roads. Over the period 1990-1995, MINVU spent approximately \$80 million per year on urban streets and roads (\$330 million total over the five year period from World Bank, IDB, and its own funds; see World Bank, 1997).
[71] Expenditure levels for construction, maintenance, planning and administration based on review of MOP, MINVU, MINTRATEL and a select number of Municipal budgets; revenues based on average vehicle registration costs and estimated fuel excise tax revenues.
[72] Such a subsidy could be justified based on the fact that the Metro produces benefits to road users (by reducing traffic congestion), although we doubt that Metro's congestion-reduction benefits on their own merit such a subsidy level. Nonetheless, the suggestion by Kain & Liu (1994) that the rest of the country has been subsidizing the construction of Santiago's Metro is apparently incorrect.
[73] Since most roadway revenues affect automobile users, principally from middle and upper income sectors, these funds might be subsequently distributed to other income groups.
[74] The wide range depends on whether one attributes to respirable particulates (PM_{10}) due to road dust the same health cost as PM_{10} from tailpipe emissions. Regardless, the range represents the minimum, since the costs are based only on human capital costs of morbidity and mortality, not the myriad other effects of air pollution (see, also, Zegras & Litman, 1997b).
[75] Under optimal investment and pricing policies, short-run and long-run marginal costs will be equal to each other and the toll; since highway capacity in Santiago is not optimal for current traffic levels, short run marginal cost pricing will generate revenues greater than costs (see Gómez- Ibáñez, 1999).
[76] In essence, shorter trips subsidize longer trips. This pricing system does not charge more distant residents the real cost of travel; which may produce spatial distortions. Unfortunately, since most of users who travel the greatest distances are the poor – often living (due to government housing policy) and working on different edges of the periphery – distance-based prices would punish those who can least afford it. Nonetheless, the government should look for another mechanism to rebate the poor for bus travel and encourage distance-based bus fares, not only to reduce the cross-subsidy among users (poor subsidizing

poor), but also to ensure the continued viability of the bus system. As the city continues to expand (perhaps encouraged by flat fares), bus operating costs increase, while revenues per km decrease, threatening operators' bottomline. Additional cross-subsidies are provided by regular bus users to students (who pay one-third the regular fare). It is not clear why – if the government determines that students' fares should be subsidized – the student subsidy should be paid by public transport users (again, typically the poorest) and not the general public at large. In addition, since the majority of motorized school trips occur by bus and during peak periods (see Section 3.5.2), this policy burdens an already saturated peak-period bus capacity.

[77] Based on information courteously provided by Pedro Sabatini D., Gerente Desarrollo, Metro, SA.

[78] Glaeser (1994) recommends linking local leaders' compensation to land prices, which should serve as a bellweather of community success.

[79] The literature is long on effective intergovernmental transfer issues, dealing with vertical and horizontal equity between and among government levels, identifying "correct" inter-jurisdictional prices (i.e., for spillover goods such as some roads, ecucation, health) and developing the appropriate transfer mechanism which can ensure accountability, transparency, and good governance. For a good overview, see Bahl & Linn (1992).

[80] This is not to say that educational quality does not have locational effects, just that the incentive is not as strong as in the U.S. Furthermore, the geographic variation in educational quality (both public and private schools) does have very important transportation effects (for example, an estimated 80% of Providencia's primary and secondary school students come from outside the comuna); indeed, improving the geographical distribution of quality educational opportunities is often cited as a key to reduce the heavy demands that school trips place on Santiago's peak travel periods (see, for example, SECTRA, 1994; CONAMA, 1998).

[81] The description in this section draws primarily from MINVU (1998).

[82] Other modifications not mentioned here include changes that attempt to eliminate the duplicity of legal powers attributed to the Municipalities, norms relative to the procedures for regional plan approval, and the definition of concepts such as urbanization, subdivision, lots, etc.

[83] When the population of the comunas involved surpasses 500,000 residents the area is denominated "metropolitan" and the relevant plan is the Metropolitan Regulatory Plan (Plan Regulador Metropolitano or PRM) (IG-PUC, 1999).

[84] With new environmental legislation the development of PRMs and their modification now requires an environmental impact study, which mandates broader institutional and public participation.

[85] We do not discuss here another planning instrument at the comuna level – the Comuna Development Plans (Planes de Desarrollo Comunal or PLADECO). PLADECOs are, by law, obligatory instruments, through fewer than 50% of comunas in Chile have them. In theory, the PRC should reflect, spatially, the development plans of the PLADECO, however, there are many cases of a comuna with a PRC without a PLADECO or vice versa, or cases of the two instruments done without coordination and the subsequent lack of (financial) reality of the PRCs (IG-PUC, 1999).

[86] For the calculation of gross minimum densities, areas restricted from development can be netted out of the total area; for the calculation of gross maximum densitites, the calculation can be made over the entire land area.

[87] A PRC can be more restrictive than the law allows, but not less restrictive.

[88] To confront the financing challenges, in November 1998 the Regional Government approved approximately US$ 3 million in Regional Development Funds (FNDR) to support 20 comunas in the creation of PRCs (SERPLAC-RM, 1999a) (approximately $150,000 per comuna).

[89] The "requirement" is actually a recommendation published in a MINVU Circular; however since MINVU evaluates all PRCs, the recommendation for EFVs is a de facto requirement.

[90] For example, in Portland, Oregon the growth limit legislation was accompanied by rules speeding up the development permitting process for land within the growth boundary (resulting in lower development costs).

[91] Housing prices in Portland from 1990 to 1998 rose more rapidly than any other major US metropolitan area and over twice as fast as the national average for major US metropolitan areas. Nonetheless, during the 1980s, when the UGB was also in effect, Portland's housing prices rose less than the national average. So the effects of the UGB on housing prices are not entirely clear, as at least some of the increase in home prices might be due to the amenities of living in the area that the UGB itself brings (NAIOP, 1999).

[92] Average annual economic growth was actually slightly higher from 1994-1997 (8.13%) than from 1990-1994 (7.89%) based on data from Banco Central (2000).
[93] Data is based on average of advertised sale prices (not necessarily actual price at sale) of land in each comuna in Greater Santiago, according to advertisements in Chile's principal newspaper *El Mercurio* (as compiled and reported in ACOP-CNSI, 2000). The UF is a financial unit used in Chile which accounts for domestic inflation. In this sense, the prices presented in the figure are real prices. Converting these prices to US$ (using relevant UF/Peso conversion and US/Peso conversion) will not accurately represent real prices in Chile due to changes in US/Peso exchange rate not reflected in US inflation. The average value of a UF in 1990 was approximately US$20.00 and in 2000 is approximately US$29.50. Thus, the average price of land in Greater Santiago by mid-2000 was US$178 per m^2.
[94] Sabatini (2000) says that "the rise in prices of urban land cannot be attributed to restrictions on supply that might have been produced by government restrictions in the markets" and notes that the data support this finding, a fact ignored by most.
[95] There are questions regarding the accuracy of data on land prices – these are all based on newspaper-advertised price of land. Urbe (1995) using a different source for the same type of data presented very different rankings for the comunas with highest land appreciation during the period 90-94; of the thirteen top comunas in Urbe, only 4 (Cerro Navia, Conchalí, Las Condes and Macul) coincide with those derived from ACOP-CNSI (2000).
[96] Any residential construction over four stories requires an elevator, which substantially increases building construction (and operating) costs. Another impediment to high-rise public housing or essentially any type of apartment buildings as opposed to a single family unit is the inability to expand the living space – an expansion cannot be added to a small apartment, while a single room home can be expanded when financing permits.
[97] Within "progressive housing" there are two additional types of subsidies. One is a "second stage" subsidy aimed at allowing families to expand their housing built with an initial subsidy. The other is a subsidy aimed essentially at allowing relatives (*allegadas*) to share a family member's land parcel by constructing there.
[98] Two other subsidies which we do not detail here are aimed specifically at: 1) senior citizens and 2) union workes, who apply through their respective union.
[99] In effect, construction firms can take a special credit against the IVA (value added tax), equal to 65% of the tax debited from their sales. Since a typical firm's margins are much lower than 65%, this remainder from this exemption can be credited to other taxes or refunded from the government (Jorratt, 2000).
[100] Based on data available on applicants during the period 1996-1999 (Cordesan, 2000): 52% had an annual salary less than US$5,200 and 71% had an annual salary less than US$7,000; 57% were single, 54% were 21-40 years old.
[101] During the period of the law's validity, only a few Municipalities in the country actually formed development corporations; those that were formed are able to continue operating today.
[102] These *Parcelas* are only those that have been developed by companies as subdivision projects and do not include the many individual lots that might also be available. The market demand for many of these lots may not, however, be particularly high, since many unsold lots have been on the market since 1990 (see DII-UC, 2000).
[103] Legislation has officially ended the potential for further subdivisions under DL3516. However most landowners in the country subdivided long ago (with immediate intentions to sell or not) and the law is not retroactive.
[104] The authors thank Raul Barrientos (from SEREMITT) for contributing information and ideas contained in this section.
[105] While MOP has taken the lead on this study, SECTRA, SEREMITT, and MINVU are also playing an important role. Furthermore, while the first draft of the transport plan has focused on roadways, there are now explorations to study the viability of various rail-based public transport projects for certain travel corridors.
[106] Based on a sample of 14 real estate projects in Greater Santiago that were in the approval process during 1998-2000, an average of 24% of developable area is donated to roadspace. Using average comuna land price values (from ACOP-CNSI, 2000) and an estimated paving cost of US$20/$m^2$, the combination of land and paving costs indicated an average implicit per housing unit cost of road infrastructure provision of

US$11,000 (information drawn from documentation available on the CONAMA web-site regarding project approvals [www.conama.cl]).

[107] Reportedly, Lo Barnechea underestimated the per unit impact fee and the resources gathered were insufficient to cover all financing needs.

[108] Three comunas (Lampa, Colina, and Til-Til) comprise the Province of Chacabuco; at least two comunas adjacent to Chacabuco (Huechuraba and Quilicura) will also suffer transport impacts of development in the Province.

[109] The scenarios were: actual situation (no change in use of Cousino Macul), but increasing density to that specified in PRMS (150) – Alternative I; the PRMS including the project, entire comuna at average density of 150; variable density across the development from between 150 to 179; and finally the entire development at a density of 179. The effects of density did not effect trip generation rate, nor mode share; instead, they applied a morning peak period trip generation rate similar to the comuna of La Reina (with similar socio-economic characteristics as those projected for the development) based on 1991 O-D survey – 1.39 trips per hour per home (62% auto mode share) and an attraction rate of 0.95 trips per hour per home (27% auto mode share).

[110] Various mass public transport projects have been proposed for Av. Tobalaba, which runs from Providencia southward, directly passing by the Cousiño Macul project. No plans have yet moved beyond the conceptual stage.

[111] The result depends on when the EI/ST is done and the timing of other real estate projects in the area of influence, which could produce speculative behavior in terms of when projects (and/or their EI/STs) are pursued, as well as on future planned system interventions by authorities (MIDEPLAN, 1998).

[112] The authors thank Patricio Vallespín (Executive Director of Chile Barrio and ex-Secretary of COREMA) and Gianni Lopez (Director of COREMA) for information and ideas presented in this section.

[113] The threshold limits are equal to 0.1% of the total emissions level of each pollutant as estimated in the 1997 emissions inventory. These values were to be revised in 2000, but currently the threshold limits for a given activity are: PM10 – 10 tons/year; CO – 100 tons/year; NOx – 50 tons/year; VOC – 100 tons/year; SOx – 150 tons/year (CONAMA, 1998).

[114] The greenspace requirement needs to be closely monitored with assurance that project proponents are not taking credit for spaces already green.

[115] The authors were unable to obtain technical information regarding how the amount of emissions to be offset were actually calculated (i.e., number of trips, trip distances, vehicle emission characteristics, etc.).

[116] The standards for provision of these services are disaggregated according to different types of uses and are based on minimum sizes per certain population levels (see SEREMI-MINVU, 1998).

[117] With 2% of the land to be developed at densities of 300 to 400 persons per hectare and 3% at 401 to 500 persons per hectare.

[118] There are, apparently, six AUDPs with private sector proponents (DII-UC, 2000).

[119] ESTRAUS is a simultaneous supply-demand equilibrium model. For additional details see, for example, Malbrán (1994, 2000).

[120] SECTRA commissioned a bicycle demand study in 1996 (Iacobelli, et al, 1996) and a preliminary bike network design, producing a detailed pilot network for the comunas of Ñuñoa and San Bernardo and an estimated investment cost for all of Greater Santiago of US$130 million (Latina, 1997). No further work has been pursued to date.

[121] Kain and Liu (1994), for example, suggest that SECTRA was forced to produce an economic analysis for Line 5 of the Metro that would justify its construction.

[122] Potable water, water treatment, and irrigation infrastructure were also examined, but not in the same level of detail.

[123] Ten of the macro zone study's urban subcenters are situated on the "orbital" highway, including five on the eastern portion, which is also known as the Pie Andino – a controversial segment running at 1000 meters in the Andean foothills (urbanization above 1000 m is prohibited) – see following paragraph in text.

[124] The future of this rail project is highly uncertain. The government rejected previous private sector proposals to develop the segment to Til-Til and it now seems that the southern section from the city center to Melipilla will be the first section developed, if it is proved feasible.

[125] The information on recent plan development comes from personal communication with Henry Malbrán R., from SECTRA.

[126] For example, over half of the measures (54 of 104) are transportation-related; responsibility for their implementation depends on 15 different institutions.
[127] Even its powers in this regard are limited, since all Ministries comprise CONAMA's Council; when a particular government project comes up for review (such as a MOP highway or SERVIU housing project), government sectoral interests influence EIA approval.
[128] It is important to note that these numbers are based on planned investments, not all the programmed investments necessarily have been carried out according to schedule.
[129] Estimate provided by Vicente Dominguez, lawyer and head of Real Estate Developers Association (*Asociación de Inmobiliarios*).
[130] As mentioned in Section 4.5.2, all types of housing construction are virtually exempt from the value added tax (see Jorratt, 2000). Home purchasing is facilitated by one of the most mature mortgage financing industries in the region – over 80% of home purchases in Chile are via mortgage. For commercial real estate, property leasing has been the biggest growth sector in Chile's leasing market in recent years – in 1995, commercial real estate comprised 22% of the total value of the domestic leasing portfolio, approximately $396 million (Hot Property, 1995).
[131] After the first Malaysian firm became involved in the *Maestranza* de San Bernardo project, another Malaysian company purchased a 600 hectare tract of land in Pirque, a predominantly agricultural comuna on the southern edge of Greater Santiago, with approximately 15,000 residents. The PRMS prohibited development on the land, a fact that was apparently ***not*** shared by the seller to the Malaysian firm at the time of purchase. Although the Mayor of Pirque apparently pushed for Municipal approval of the project, MINVU rejected it on the grounds of its violation of the PRMS. Since international funds are involved and thus risks of the project being brought before international trade authorities (i.e., WTO and its relevant institutions), the Ministry of the Economy and the Ministry of Foreign Relations have been involved. There is still no resolution of the issue. To encourage approval of the project, the Malaysians have, reportedly, offered several transport infrastructure contributions – including extending Metro Line 5 to Puente Alto, contributing to the proposed mass transit project on Av. Tobalaba, building several bridges over the Maipo River to facilitate Pirque's connections to Greater Santiago, contributing to the construction of the Pie Andino, among others.
[132] In 1990: 8 of the 10 comunas with the cheapest land prices are included in the above list and all of these comunas had land prices 30% or less of the average; 16 of 20 comunas with the cheapest land prices were also in this list of "high growth," with land prices at 60% or less of the average.
[133] From 1992-1997, relative share of Greater Santiago's m^2 of building permits issued: southeast - Puente Alto, La Florida, and Peñalolén, 24% of residential; north/northwest - Quilicura, Renca, and Huechuraba 42% of industrial and Quilicura 13% of commercial; west/southwest – Maipú, Pudahuel and Cerrillos 24% of industrial, Maipú 13% of residential; and Maipú, Cerrillos and Pudahuel 13% of commercial; in the south, only El Bosque showed some degree of concentration, approximately 8% of industrial permits issued (CCC, 1992-1998).
[134] From 1992-97, relative share of Greater Santiago's m^2 of office building permits: Las Condes, 40%; Providencia, 24%; Santiago, 18%; Vitacura, 10%; Huechuraba, 4%; Quilicura 1.4%.
[135] The coefficient of variation of average comuna land prices declined from 1.31 in 1990 to 0.84 in 2000.
[136] For example, the average price in Las Condes, La Reina, Florida, Penalolen, and Lo Barnechea in mid-2000 was $240 (8UF) per m^2 (ACOP-CNSI, 2000).
[137] For example, information drawn from a sample of 29 real estate projects in Greater Santiago that were in the approval process during 1998-2000 indicated a total value of the land under development equal to almost $690 million (based on the total m^2 of each development and the average land price in the relevant comuna). The developments ranged in size from 1 hectare to 105 has., with an average size of 15 has (information drawn from documentation available on the CONAMA web-site regarding project approvals [www.conama.cl]).
[138] Today, there are no parcels available in Greater Santiago for under 1 UF ($30) per m^2. According to SUR (1999a), social (public) housing is not viable at land prices greater than 0.6 UF ($18) per m^2.
[139] Unit size based on number of m^2 approved in building permits and number of units approved. This data was used to calculate an average (m^2 per unit) for each year 1992-1997 for each comuna. The average unit size for each comuna was then calculated across the entire period 92-97; city-wide average is the average of each comuna's 92-97 average. For the wealthy comunas, the averages in m^2 are: Providencia, 105; La

Reina 125; Las Condes, 160; Lo Barnechea, 203; Vitacura, 208. There are 13 comunas with average unit size under 50 m^2.

[140] Except for the few units sold above $250,000, for which the number of house and apartment sales were the same (Urbe, 1995). Also, it is important to keep in mind that in this data on sales, owner constructed homes are not included; as these are typically of the highest classes, a good number - Urbe (1995) estimates that 75% of houses in the upper class are owner constructed – of high income homes are left out of this data.

[141] Sabatini (2000) suggests that the growth in demand for apartments during the early 1990s grew from a fear of increase in crime and insecurity after the end of the military regime.

[142] In the exclusive El Golf neighborhood of Las Condes, the time to liquidate the entire stock was over five years (64 months), while in Vitacura it was three and a half years (43 months) (CCC, 2000).

[143] The high priced apartments in Las Condes were all located in the exclusive neighborhood El Golf.

[144]The points made here were drawn, in part, from conversations with Osvaldo Fuenzalida of Fuenzalida Propiedades.

[145] The annual amount of housing demanded varies and is disaggregated by consumer income groups. Projection is based on average annual economic growth of 4.5%, continuation of current trends of income redistribution but a decreasing rate of improvement in Gini coefficient, a 1% annual rate of loss of housing stock (approximately 1/2 due to changes of use and 1/2 due to depreciation), and a cascading of depreciating properties from higher income classes to lower.

[146] The ACOP-CNSI numbers do not include owner-built residences, while the CCC data on building permits does not translate into units offered per year (only number of units authorized to be initiated in a year).

[147] The authors thank Eduardo Spencer, Project Manager of Fuenzalida Desarrollos Inmobiliarios, for project details reported in this section.

[148] Subject to further market analysis. Fuenzalida estimates that apartments will only be viable at a minimum sales price of $120,000 to $135,000 (4,000 to 4,500 UF).

[149] The authors thank Alberto Carvacho, Jefe de Unidad Plan Metropolitano SEREMI-Vivienda, for project details contained in this section.

[150] We were unable to get precise numbers on the total land available for development, with sources indicating sizes in the range of 42 to 74 hectares.

[151] Although the project was initiated at the beginning of the current economic downturn, home sales have roughly met developer expectations (see *Estrategia*, 1999).

[152] The average price range in Greater Santiago from 1990 to 1994 was $60 to $120; in Lo Barnechea, prices in 1990 were already $45; southern middle class neighborhoods of competition (La Florida, Peñalolén, and Maipú) were already double the estimated price in Chacabuco and already urbanizing and appreciating rapidly (data from ACOP-CNSI, 2000).

[153] The authors thank Cristian Cominetti, Manager of Operations for Chicureo Desarrollos Inmobiliarios, for providing information on Chicureo City.

[154] The developers apparently proposed the formation of an environmental project fund, but the authorities reportedly rejected the idea.

[155] As mentioned in Section 4.3.2, the PRI would be for the Provincia of Talagante (Penaflor, Tlagante, El Monte, Isla de Maipo), the Provincia of Melipilla (Melipilla, San Pedro, Alhue, Maria Pinto, and Curacavi), Buin and Paine.

[156] The authors thank Mario Paredes Gaete, the developer behind Angostura, for providing information on the project.

[157] CIS (2000) provides no additional information on the sources of this elasticity increase, but we speculate that it likely derives from expectations for ongoing industrialization of the economy and more capital (and space) intensive industrial processes.

[158] The PRMS established an 18 month period within which existing industrial facilities could continue operation within the Vespucio Ring Road. After that point, these industries could only expand if they adopted the technology required to transform them into “non-offensive” or if the Municipality made special petition to allow the use to remain. Reportedly, only one industrial site petitioned to stay during the 18 month grace period and only when the industries began asking for building permits to expand were they informed that they had to leave. This has posed a vexing problem to Municipalities and industrial sites alike and the only legal means to revert this problem now is to eliminate this condition in the PRMS.

[159] Bernardo Küpfer M., Manager of Enea.
[160] The authors were unable to arrange meetings with anyone involved in Ciudad Empresarial. The estimated investment costs come from Zegers (2000) and *Estrategia* (1997). It is likely that the high cost $250 million includes the cost of construction of the three initial anchor buildings (otherwise the investment costs per m^2 [$347] are higher than the current sale price [$330]).
[161] The floor space constructed by Sencorp in Sanhattan comes from data on the individual buildings available on the company website. Despite repeated attempts, we were unable to meet with representatives from Sencorp.
[162] Different rail proposals have been floated by various private consortia to build a rail line along the southern banks of the Mapocho, eastward through Vitacura to the edge of Lo Barnechea.
[163] The authors thank Bernardo Küpfer M., Manager of Enea, for graciously providing information presented in this section.
[164] It is often pointed out that no translation for the English word "accountability" exists in Spanish.
[165] Including the nation's geography, the history of indigenous peoples' resistance, external wars, a judicial and administrative inheritance from Spain, and the state fulfilling the role of the "Patron" after rural-urban migration in the 1900s.
[166] Boisier (2000) quotes Pinochet talking to the Intendentes: "you are the President's representatives in the Regions, not the Regions' representatives before the President."
[167] MINVU, for example, ostensibly, has the powers to ensure fulfillment of planning guidelines, since they have legal authority to reject building permits and COREMA and SEREMITT have similar authorities.
[168] It is important to mention that metropolitan planning can effectively be placed in the regional government for the Metropolitan Region (RM), since Greater Santiago and its area of influence is essentially the entire RM (although it actually now extends into Regions V and VI). For other metropolitan areas in the country, the regional government covers much larger areas and may not be well suited to metropolitan planning. In many of these cases, this does not pose too serious of a problem since most other metropolitan areas in the country are effectively contained within a single comuna (Municipal government). The principal exceptions, at the moment, are Chile's other large metro areas: Viña-Valparaiso, Concepción-Talcahuano.
[169] Universities in Chile often work on contracts for the government in related fields (transport and land use modeling, for example). Government educational research funds (i.e., FONDECYT) often supports work in this field as well. Furthermore, MIDEPLAN recently developed a project in collaboration with the University of Chile and the Catholic University to form an urban research laboratory, which will focus on conducting and updating travel surveys, land use databases, etc.
[170] In addition, the lack of public participation in transportation planning and infrastructure investment decisions suggests that forcing higher land valuations on property owners due to decisions that they were not involved in might be unfair.
[171] If exactions move towards a fully regionalized implementation, some of these equity problems might be overcome.
[172] Answering this question is complicated by the lack of fiscal impact analyses and the unclear public information regarding the current state of transportation system financing (revenues and expenditures).
[173] In other words, if challenged, could it be shown that impact fees are aimed at fairly achieving valid regulatory objectives?
[174] A recent spate of rapid middle class suburbanization in the Buenos Aires Metro Region has been attributed to the "successful" radial highway concession program there (see Menckhoff & Zegras, 1999).
[175] Further, it might be possible for the Regional Government to form a Regional Development Corporation.
[176] Another interesting example is the use by some comunas (i.e., Las Condes, Providencia) of public referendums to help decide certain planning and public investment strategies.

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