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## **How sustainable are processes of social and spatial differentiation in Santiago de Chile?**

**Current situation and future scenarios for social inclusion**

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## ***Risk Habitat Megacity***

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This discussion paper presents a methodological approach to sustainability indicators and scenarios that evolved within the framework of the interdisciplinary and application-oriented *Risk Habitat Megacity* research initiative on sustainable urban development in Santiago de Chile. The aim of this discussion paper is to support regional and local planning authorities and political decision-makers in the area of housing and other urban policy fields. It will be shown how the approach was contextualized in order to contribute to the ongoing debate on methodological approaches to social sustainability and to the policy-related understanding of socio-spatial differentiation trends and their implications for social inclusion.<sup>1</sup>

## 1 Introduction

Socio-spatial differentiation is one of the decisive processes that drives the development of cities and affects the welfare of the inhabitants. The term describes the dynamic changes in the distribution of individuals, households and groups, differentiated by socio-economic status, ethnicity or demographic characteristics (age, gender) across a contingent (urban) area and over time (cf. Sabatini et al. 2001, Rodriguez and Arriagada 2004). These processes are closely linked to segregation, which is defined as the unequal spatial distribution of two or more groups within a city (or other spatial level) at a given time (cf. Massey and Denton 1988: 284f.).

The socio-spatial distribution of inhabitants in Santiago de Chile is traditionally characterized by overt inequality. For decades the city has been divided into the rich north-eastern municipalities and the rest of the city, described as poor. Low-income households are primarily located on the urban outskirts, where social housing predominates, notably in the southern and south-eastern municipalities. These construction measures have been strongly criticized for their low standards and for poor access to social infrastructure and public transport (cf. e.g. Jiménez 2010, Sabatini and Arenas 2000). The late 1990s witnessed a gradual change in these segregation patterns. Suburban sprawl and the shift in the housing market, for example, led in some areas to greater spatial proximity of well-to-do families, who tend to live in gated communities, and less privileged households (cf. Sabatini and Salcedo 2007, Kabisch et al. 2011). While several scholars see positive processes in this socio-spatial closeness (cf. Sabatini and Salcedo 2007, Salcedo 2010), others draw attention to the negative effects of social housing policies, such as the emergence of residentially segregated urban ghettos (cf. Rodriguez and Sugranyes 2005).

Residential segregation implies, among other factors, unequal opportunities for and levels of social inclusion for households from different income or social groups in Santiago de Chile (cf. Jiménez 2010, Sabatini and Arenas 2000). As a highly relevant topic for inter- and intra-generational justice, this makes socio-spatial issues such as residential segregation and social exclusion one of the most demanding sustainability fields of urban development in Santiago de Chile (cf. Barton and Kopfmüller 2011, Hölzl et al. 2011). A methodology suited to sustainability considerations of socio-spatial differentiation, however, has yet to emerge.

In the context of sustainable socio-spatial differentiation processes, the term sustainability should first of all be clarified. The multidimensional concept of sustainability, which incorporates environmental, economic and social concerns, has been discussed in depth and contested for at least thirty years. A closer look at the dynamics of socio-spatial distribution in urban areas reveals a marked relation to research on urban social sustainability, sustainable housing and sustainable communities (cf. Manzi et al. 2010, Dempsey et al. 2009, Polèse and Stern 2000). Among the many visions associated with social sustainability (e.g., social equity, social cohesion and participation), social inclusion has been identified as central to the analysis of urban socio-spatial dynamics.

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The spatial dimension is vital to social inclusion and exclusion. The common understanding of social exclusion, a topic widely discussed, principally in European cities, is the inability of specific social groups to participate fully in society as a result of barriers that emerge through social, political and economic processes (cf. Pierson 2002). Compared with poverty, which traditionally emphasizes distributional issues, social exclusion describes both a state and a process, so that the labour market and governance structures are likewise accentuated (cf. Häußermann et al. 2004: 21). Hence social exclusion also refers to inadequate levels of participation, poor social integration and low positions in social networks (cf. Musterd and Murie 2006).

Prompted by the interrelation of socio-spatial differentiation processes and their direct impact on social exclusion and inclusion in urban areas (cf. Häußermann et al. 2004, 26ff), this paper focuses on the analysis of social exclusion within the frame of social sustainability issues. The research challenges are twofold, namely, to measure social inclusion in Santiago de Chile and to assess the findings in terms of social sustainability.

The objective of this paper is therefore to contribute to the ongoing debate on methodological approaches to social sustainability, as well as to the policy-related understanding of socio-spatial differentiation trends and their implications for social inclusion. The methodological approach presented here combines the status quo with scenario analysis, using both quantitative and qualitative methods. This allows for measurement and discussion of both current and future sustainability performances (up to 2030). The overall approach presented in Section 2.1 is contextualized for processes of socio-spatial differentiation in the Chilean capital. Indicators are analysed to evaluate Santiago de Chile's current performance with respect to social sustainability, opportunities for social inclusion, and possible future sustainability trends. This facilitates the making of policy recommendations for sustainable urban development.

In pursuit of these aims, the paper is organized as follows. It first provides an outline of the methodological considerations: Section 2 presents the overall conceptual framework and explains its conceptualization and application to the specific issues of socio-spatial differentiation processes in Santiago de Chile by explaining the specific analytical steps involved in the applied methodology. Furthermore, it defines and justifies the sustainability indicators selected to measure social inclusion (Section 2.1) and clarifies the data sources (Section 2.2). Section 3 deals with historic trends and the current situation for each of the selected sustainability indicators (Sections 3.1 - 3.3) in the context of social inclusion. This is followed by a synthesis of the major sustainability deficits (3.4). Section 4 turns to possible future trends; it first puts forward storylines for three alternative scenarios (Section 4.1), which serve as a basis for the subsequent scenario analysis. Based on suggested target values, the analysis contains the findings of the scenario assessment for selected sustainability indicators (Section 4.2). The paper concludes with a discussion of the analytical framework and recommendations for measures in selected policy fields (Section 5).

## **2 Methodological considerations**

The methodology used to analyze current sustainability of social-spatial differentiation processes and future trends in Santiago de Chile builds essentially on the use of indicators and scenarios. This section explains the underlying conceptual framework and the specific analytical steps. It introduces the sustainability indicators and justifies their selection, and further summarizes the scenario approach used to project future sustainability trends. Finally, it presents the data sources.

### **2.1 The conceptual framework**

The conceptual framework for the sustainability analysis adopted in this paper is based on the operationalizing of the Helmholtz Associations' Integrative Sustainability Concept (Kopfmüller et al. 2001). In contrast to the majority of sustainability concepts that define sustainable development along 'classic' economic, ecological and social lines, the Helmholtz

Concept formulates constitutive elements of the sustainability *Leitbild*, derived from key documents such as the Brundtland report, the Rio Declaration and the Agenda 21: These elements are (1) inter- and intragenerational justice, (2) a global perspective and (3) an anthropocentric perspective. The concept operationalizes these elements in two steps. Firstly, it translates them into three general *sustainability goals* (1) *To secure human existence*, (2) *To maintain society's productive potential* and (3) *To preserve society's options for development and action*. Secondly, it concretizes these goals further by a set of *sustainability rules* (Kopfmüller et al. 2009). For example, the goal *To preserve society's options for development and action* is translated among other into the rule *Equal access for all to information, education and occupation*. In other words, equal access for all societal groups to education is considered a vital component of sustainability. This framework of sustainability goals and rules provides the basis to conduct sustainability analyses in different contexts. This is done by applying the rules to a particular situation and by selecting appropriate and context-specific indicators.

The contextualization of the framework to the sustainability analysis in Santiago was done in the *Risk Habitat Megacity* research initiative (cf. Kopfmüller et al. 2009, Krellenberg et al. 2010). In concrete terms, the sustainable development rules were translated into context specific goals. For the analysis of socio-spatial differentiation processes, the objectives particularly relate to the rule of equal access of different groups, specifically to housing, employment, recreation activities and education as well as to the rule of social-spatial mix (see Table 1). They exemplify the following sustainability dimensions established by Kopfmüller et al. (2009): social coherence of society, satisfaction of basic needs, equal access to environmental resources, education, professions, information, health and cultural facilities, and the possibility of autonomous subsistence. This contextualization leads to the first key component of the subsequent analysis, which is the description of Santiago's current sustainability performance.

The second key component is to assess the options for future action following potential scenarios for the year 2030 (cf. Kopfmüller et al. 2009, Krellenberg et al. 2010). Scenarios have become a widely accepted tool to describe potential, consistent and plausible futures and development paths. It helps to deal with uncertainties and complexities, to sensitize for behavioural change, to create participatory processes and to support decision-making (cf. e.g. Godet 2001, Heijden, van de 2004).

A global explorative framework scenario was defined with reference to existing global scenarios (cf., e.g., Raskin et al. 2002, UNEP 2007). This framework is based on a set of driving factors for social and economic development, development of institutional setups, demographic trends and technological advancement. Based on this, three alternative scenarios were formulated, each describing a different possible development path for development in Santiago de Chile until the year 2030: Business As Usual (BAU), Market Individualism (MI) and Collective Responsibility (CR) (cf. Kopfmüller et al. 2009, Krellenberg et al. 2010). Each alternative scenario is based on a distinct 'philosophy', which leads to different trends and potential mega-urban development processes, characterized by growing diversity, complexity, interdependencies and dynamics.

The basic "philosophy" of the BAU scenario is characterized by the perseverance of liberalization and privatization trends. It is assumed that whereas market forces persist, public regulation activities remain weak. Social protection measures are still in place, including subsidies for specific target groups. The leading ideas behind the MI scenario are greater individual freedom and freedom of action. The role of the markets advances to become the principal driver for all social transactions subject to the principles of supply and demand. The CR scenario is defined by more social and environmental justice, the main goal of which is tighter regulation of market activity and large public investments, the embedding of technologies in society and the decoupling of socio-economic development from resource use (cf. Krellenberg et al. 2010).

On the basis of the general framework, the sustainability performance of socio-spatial differentiation processes in Santiago de Chile consists of several analytical steps (see Figure 1).

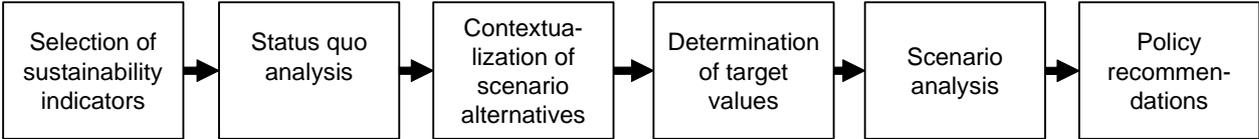


Figure 1: Analytical steps in the sustainability analysis of social inclusion

A first step consists of the selection of eight sustainability indicators to define current and potential future sustainability performances of socio-spatial differentiation in Santiago de Chile with respect to the established sustainability objectives (see Table 1). As pointed out earlier, these objectives contextualize the general rules of the sustainable development concept with respect to social inclusion and refer to the distribution of different socio-economic groups across the city, to improved housing standards and equal access to housing, green space (recreational areas/public parks), quality education, and employment.

Table 1: Sustainability indicators for the overall objective of social inclusion

Context specific sustainability objectives	Sustainability Indicators
Spatial proximity of different social and ethnic groups	Index of dissimilarity of lowly educated groups per cluster
	Isolation index of lowly educated groups per cluster
Increase in housing quality	Proportion of household overcrowding per municipality (%)
Equal access to housing	Average years of income to buy a house or apartment per municipality
	Share of social housing units in municipal housing stock (%)
Equal access to green areas	Green area per inhabitant and municipality (m <sup>2</sup> )
Equal capacity of educational services (public and private schools)	Proportion of students with higher education entrance qualification per municipality (%)
Equal access to employment	Proportion of labour force employed in municipality of residence (%)

Although further indicators relevant to social inclusion exist (e.g., unemployment, poverty, ethnic segregation or labour force participation), they are excluded from the present analysis due to restricted data availability and comparability. Other relevant indicators are social cohesion, delinquency and social networks but again there is a lack of quantitative data (for a discussion of indicators like unemployment, poverty and delinquency rates, see also Kopfmüller et al. 2009).

The next analytical step involves an assessment of the current sustainability situation (status quo) for each of the eight sustainability indicators and the principal deficits of social inclusion in Santiago de Chile. This analysis is based on historic trends and recent quantitative data and presented in Section 3.

Moving from the current situation to the future, a third step constructs alternative development paths of socio-spatial differentiation processes for each of the three alternative scenarios outlined earlier. This is done by determining alternative trends for a set of driving factors and related variables which determine socio-spatial differentiation processes in Santiago de Chile (see Table 2). These storylines are presented in detail in Section 4.1. They

are based on quantitative calculations, intense discussions with local stakeholders and workshops with local experts (see Section 2.2).

Table 2: Driving factors of scenarios

Driving factor category	Driving factor	Variable
Demographics	Shift in urban population	- Net migration balance - Intra-metropolitan/ intra-urban migration - Foreign immigrants - Indigenous population
Social value system	Life styles/housing preferences	- Persons per household - Proportion of extreme poverty
	Access to education	- Enrolment in public and private schools
Education	Access to and quality of education	- Aggregate average education years

This information forms the basis for the next analytical steps: the determination of target values and the scenario analysis. Quantitative normative target values are generated in light of the current sustainability performance discussed in Section 3. Target values should be understood as recommendations and can only represent an approximation. Alternative future trends are estimated for each indicator according to the overall development expected for each scenario alternative (BAU, CR and MI) for the year 2030. In line with anticipated future developments, the subsequent scenario analysis is based on a distance-to-target assessment, which measures the degree of attainment for the desired target values for each indicator. The generation of target values and the sustainability analysis are discussed in Section 4.2.

The overall findings of the distance-to-target analysis lead in a final step to policy recommendations for the field of socio-spatial differentiation, as well as to some reflections on the methodology applied. They are addressed in Section 5.

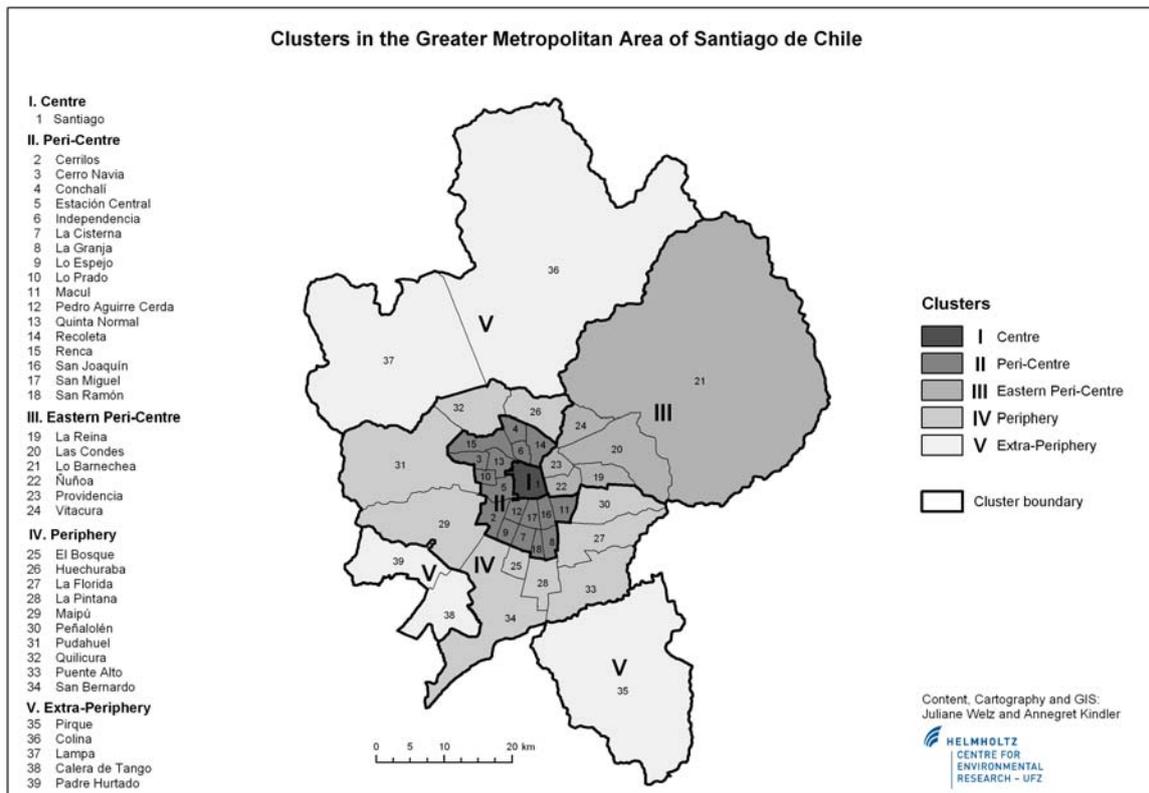
**2.2 Data**

The sustainability analysis of the indicators is based on a variety of data sources. The period from 1982 to 2006 constituted the overall time frame for statistical analysis, whereas the main time period lies between 1992 and 2009. Data is based for the most part on the National Census carried out every ten years (1982, 1992, 2002) (National Institute of Statistics, INE) and the CASEN survey (Ministry of Planning, Mideplan) conducted every two or three years.<sup>2</sup> The analysis addresses several spatial scales. The overall regional scale covers the Greater Metropolitan Area of Santiago (GMAS), which consists of thirty-nine urban and urbanizing municipalities (see Figure 2). In order to produce spatially comparable results, the municipalities in the urban area were aggregated into five municipal clusters. A set of criteria covering geographical location as well as similar socio-economic and demographic features was used to accommodate this specification. The five clusters are entitled Centre, Peri-Centre, Eastern Peri-Centre, Periphery and Extra-Periphery (see Figure 2).

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<sup>2</sup> The CASEN (National Socio-economic Characterization) survey is only partly comparable to the census data, as it is not carried out area-wide and higher-income groups are traditionally underrepresented in the samples.

Figure 2: The Greater Metropolitan Area of Santiago (GMAS) and the five municipal clusters



Source: Kabisch et al. 2011

The trends for the variables that describe the storylines of the scenario alternatives were analysed in detail, taking historic trends and stakeholder expert knowledge into account. For the most part, data was taken from the above-mentioned sources (National Institute of Statistics, INE and Ministry of Planning, Mideplan). Quantitative target values for the scenario analysis were based on several sources: international reference studies, proposals by supranational organizations, empirical data on recent indicator tendencies and knowledge from local stakeholders in Santiago. Workshops and knowledge exchange took place with local stakeholders from universities, regional and national state entities, such as the Ministry of Housing and Urbanism (MINVU) and its regional secretary, and NGOs. Topics of discussion included the indicator set, alternative storylines, potential future indicator trends, and the target values.

The aim of using these indicators and target values is to illustrate the dimensions and directions of transformation required to achieve sustainability rather than establish exact numbers or thresholds.

### 3 The sustainability of social inclusion in Santiago de Chile today

The following sections address the eight indicators embedded in the overriding topics of residential segregation and housing (Section 3.1), recreation (Section 3.2), and education and the labour market (Section 3.3), and discuss analysis results in the context of the current state of sustainability in Santiago de Chile.

#### 3.1 Residential Segregation and Housing

Residential segregation is measured by two standard indices that identify the evenness of the residential distribution of social groups across spatial units: the **index of dissimilarity** as

the most widely used measure of residential evenness and the **isolation index**, a basic measure of residential exposure, i.e., of the probability of interaction between minority and majority group members (see Massey and Denton 1988 for a broader discussion of the dimensions of residential segregation).

The index of dissimilarity measures the departure from evenness by computing the weighted mean absolute deviation of the minority proportion of each unit from that of the city. This quantity is expressed as a proportion of the unit's theoretical maximum. The resulting figures vary between 0 and 1 (0 indicates 0 per cent, 1 indicates 100 per cent) and can be interpreted as the proportion of minority members that would have to change their area of residence if an even distribution over the analysed area is to be achieved.

In spite of empirical correlation, the isolation index differs conceptually as it considers the relative size of the groups under comparison (cf. Massey and Denton 1988: 287). Likewise varying between 0 and 1, it measures the extent to which minority members are exposed to each other rather than to majority members by taking the minority-weighted average of each unit's minority proportion. According to Massey and Denton (1993: 20) "A simple rule of thumb in interpreting these indices is that values under 30 are low, those between 30 and 60 are moderate, and anything above 60 is high."

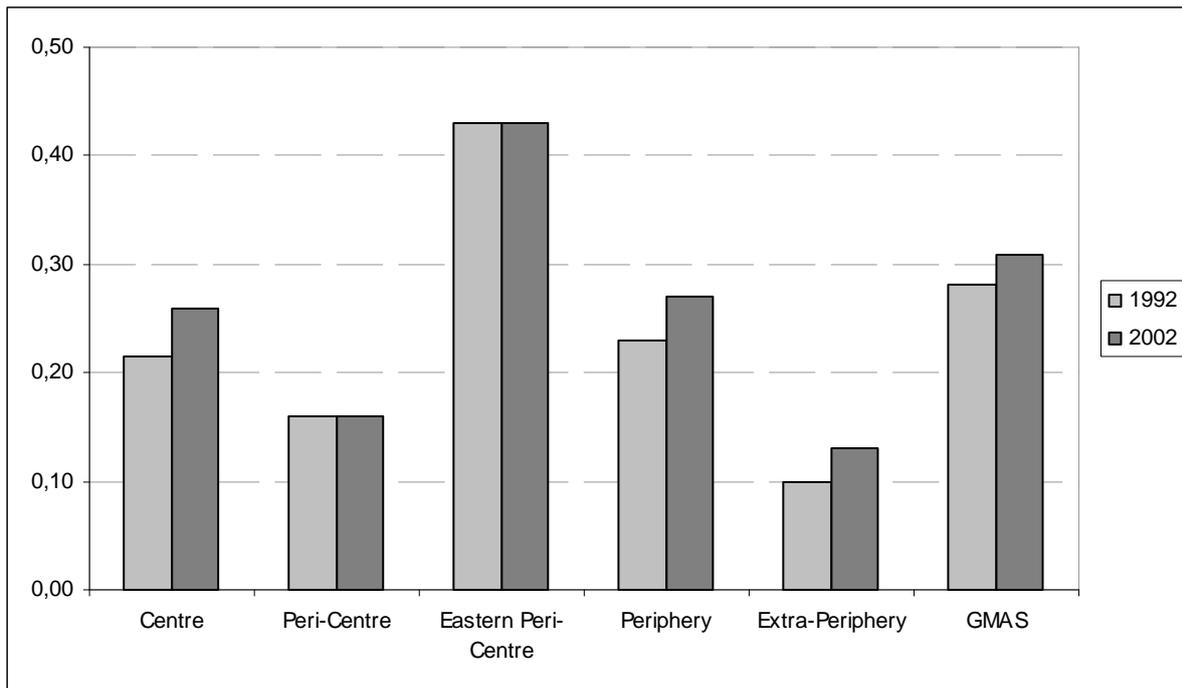
For the present analysis, both indices are applied for lowly educated groups in Santiago de Chile with up to seven years of education. The index is calculated at district level<sup>3</sup> and disaggregated for heads of household in order to ensure that only persons who have finished their education are included.

The results show that in the ten years between 1992 and 2002 the **index of dissimilarity** of lowly educated groups was slow to increase in GMAS. It rose from 0.28 in 1992 to 0.31 in 2002. In other words, 31 per cent of this educational group would have had to change their area of residence in 2002 to achieve an even distribution of this group within GMAS (see Figure 3). Massey and Denton (1993: 20) see this level of segregation as moderate despite its position at the threshold of the lower category. The concentration of similar social groups in the Centre, Peri-Centre and Extra-Periphery clusters has led to figures at cluster level that are well below GMAS average. Dissimilarity levels in these clusters have risen over the period but can still be interpreted as very low. As the sole exception, the Eastern Peri-Centre, which is predominantly inhabited by higher education groups, exceeds the level of 0.4, both in 1992 and 2002. The index in the Periphery comes close to the metropolitan average and increased across the ten-year period.

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<sup>3</sup> District level is the intermediate unit between block and municipal level in Santiago (for more information on the influence of the spatial level on segregation indices, see Sabatini et al. 2001).

Figure 3: Index of dissimilarity for lowly educated groups per cluster (1992-2002)

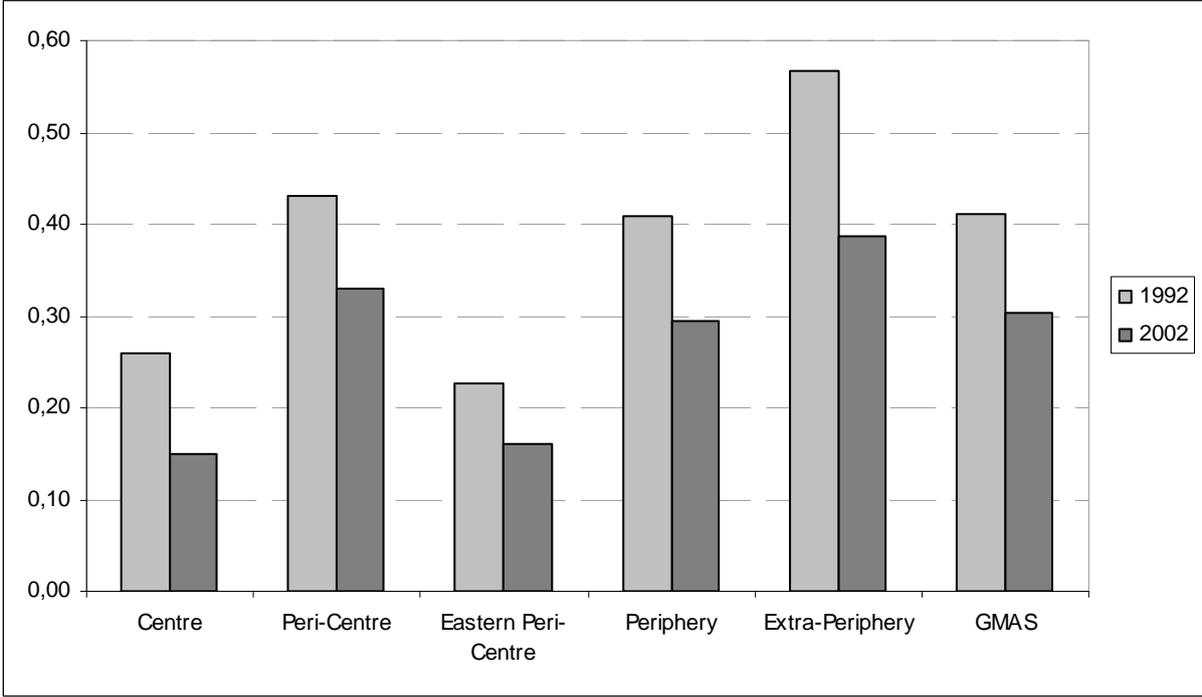


Source: INE 1992, 2002

The overall increase in the indices in all but the Peri-Centre and Eastern Peri-Centre, where they remained stable, could be explained by selective intra-urban migration tendencies, as well as to the general trend of rising educational levels. Enhanced levels of residential segregation are proven notably for academics (for an overview of all educational groups, see Table 6 in the Appendix).

Analysis of the **isolation index** reveals a strong decline in values from 0.41 to 0.30 in GMAS between 1992 and 2002 (see Figure 4). This means that the statistical probability of lowly educated people encountering other members of the same group dropped to 30 per cent. Hence the spatial isolation of lowly educated groups clearly diminished in GMAS for this period. Although an overall decrease holds true for all clusters, the figures dropped conspicuously in the Extra-Periphery, where the index reached almost 0.6 in 1992 and had fallen to below 0.4 in 2002. The mushrooming of gated communities in both the Extra-Periphery and Periphery can be argued for reduced figures in these clusters (cf. Sabatini and Salcedo 2007). The lowest and therefore 'best' results were achieved for the Centre (0.15) and Eastern Peri-Centre (0.16). With figures at approximately 0.30, however, the isolation index is still relatively high in the Extra-Periphery, Peri-Centre and Periphery.

Figure 4: Isolation index for lowly educated groups per cluster (1992-2002)



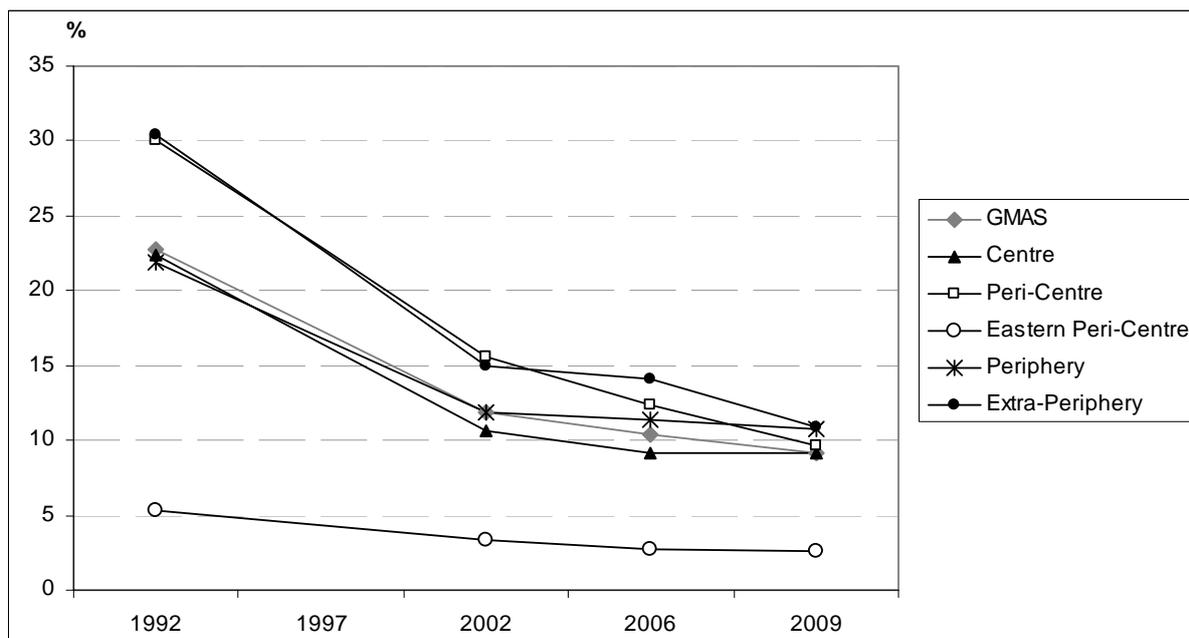
Source: INE 1992, 2002

It can be assumed that, as in the case of the index of dissimilarity, selective intra-urban migration tendencies and the overall trend of rising educational levels are responsible for these developments (for an overview of all educational groups, see Table 6 in the Appendix).

The figures further demonstrate the various facets of segregation: although characterized by the most uneven distribution of lowly educated groups (see index of dissimilarity), the Eastern Peri-Centre displays a very high probability of interaction between lowly educated groups and others. In contrast, the Extra-Periphery has a very low index of dissimilarity but a high degree of isolation. These discrepancies can be traced to the relative size of the lowly educated group analysed in the respective clusters. While the percentage of the lowly educated in the Eastern Peri-Centre is relatively low, it is quite high in the Extra-Periphery.

Another key dimension for the sustainability analysis of socio-spatial differentiation processes in Santiago de Chile in the context of housing is overcrowding, an illustrative example of the failure to meet basic needs. The **proportion of household overcrowding** per municipality represents households with less than one room per 2.5 persons and provides information on the standard of housing in the municipalities. Figure 5 shows the development of household overcrowding in the five clusters between 1992 and 2009.

Figure 5: Proportion of household overcrowding per cluster (1992-2009 (%))



Source: INE 1992, 2002; Mideplan 2006, 2009

In the seventeen years between 1992 and 2009, the proportion of household overcrowding declined in almost all municipalities of the Greater Metropolitan Area (GMAS: from twenty-three to nine per cent, cf. Table 5 in Appendix). Since differences between municipalities in the clusters are greater than those between the individual clusters, data interpretation will focus on the municipalities (see Figure 5).

Only one municipality in the Eastern Peri-Centre (Providencia) shows an increase in household overcrowding (see Appendix, Table 4). The overall situation has therefore improved over the period although strong differences between municipalities still exist. Reductions of fifty per cent and over were observed for all clusters. In the Peri-Centre, Periphery and Extra-Periphery this positive trend is primarily due to the vast amount of social housing construction introduced in the early 1990s (cf. Salcedo 2010). The strongest relative decline can be seen in the municipalities of Vitacura and Las Condes (both Eastern Peri-Centre), which currently show the lowest absolute numbers of overcrowding of all municipalities (see Appendix, Table 4). With the exception of Lo Barnechea, this is likewise true for all municipalities in this cluster. The four remaining clusters, notably the Periphery and Extra-Periphery, show considerably higher percentages of overcrowding (approx. eleven per cent, cf. Figure 5). In Cerro Navia and San Ramon (Peri-Centre), and in La Pintana and Peñalolen (Periphery), overcrowding is between fourteen and nineteen per cent (see Appendix, Table 4).

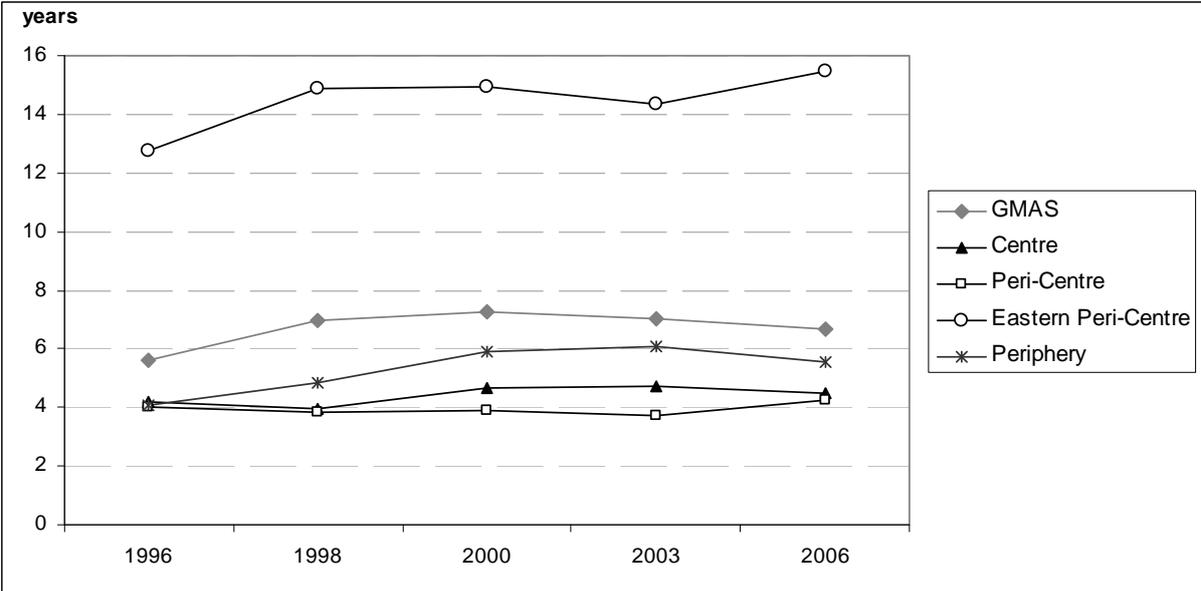
The decline in many of the municipalities decelerated between 2002 and 2009 (possibly due to different data sources – National Institute of Statistics and Ministry of Planning – for the years 2006 and 2009). The proportion of overcrowding in some municipalities even increased after 2002 (e.g., Quilicura, Lo Barnechea, Lo Prado and Independencia).

Another indicator refers to the sustainability rule of equal access to housing, and the role of house prices and available income. The **average years of income to buy a house or apartment** indicator outlines the number of annual incomes a household requires to buy a house or a flat. It is based on prices for houses and apartments sold and the average annual household income across all municipalities in the Greater Metropolitan Area<sup>4</sup>. Taking the median income as the basis (e.g., \$481,000 for the year 2006) avoids outlier influence.

<sup>4</sup> The income variable refers to total household income (including income from employment and independent work, subsidies, income from rent and lease, pensions, income from capital).

Housing prices and household income are both inflation adjusted. Results for the different clusters are shown in Figure 6.

Figure 6: Average years of income for the acquisition of home ownership per cluster, 1996-2006



Source: MINVU Observatorio Habitacional 1996-2006; Mideplan 1996-2006

The number of income years to buy a house or apartment in the Greater Metropolitan Area has increased since 1996 from five to approximately seven years (see Figure 6 and Appendix, Table 5). Values in the Periphery began at four years in 1996 and had risen to six years by 2003, before easing off again. Values for the Centre and Peri-Centre remained close to the 1996 level up until 2006<sup>5</sup> (cf. Figure 6). In general, the amount of income required varies significantly between and within the clusters. While in the Centre and Peri-Centre buying a house or apartment takes approximately four years of income, in the Periphery, on the other hand, almost six years are needed, while figures for the Eastern Peri-Centre reached over fifteen years.

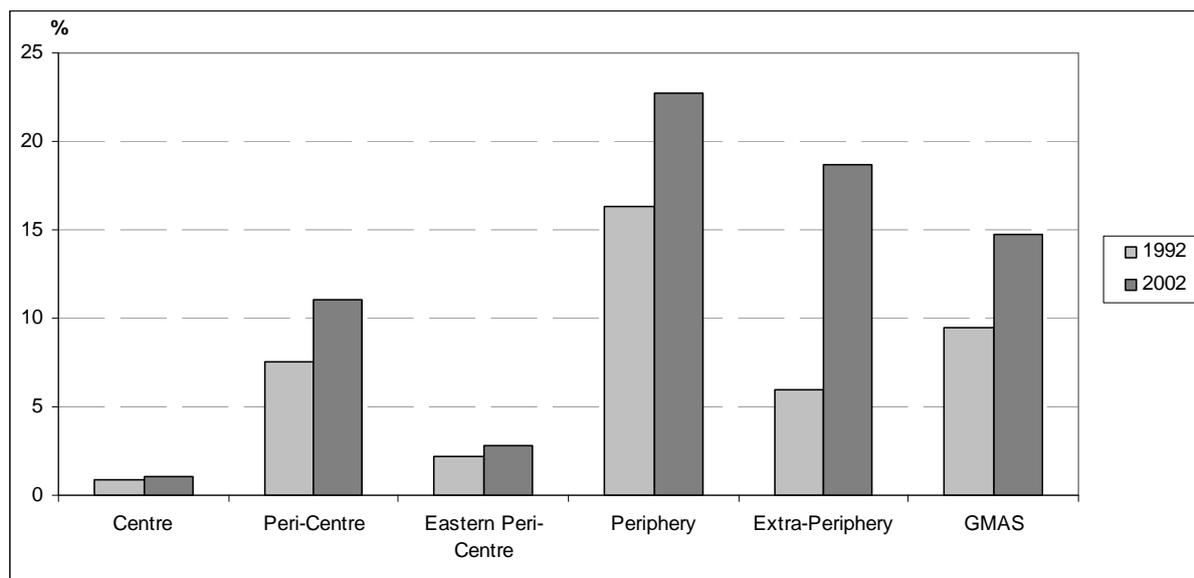
Moreover, growth rates are highest in the Eastern Peri-Centre. Accordingly, Las Condes, Vitacura and Lo Barnechea (all Eastern Peri-Centre municipalities) head the list with twenty average income years and over, while El Bosque (Periphery) with about two years has the lowest figures.

The conclusion can therefore be drawn that low-income households have little or no opportunity of buying a flat in the Eastern-Peri-Centre, not least due to lack of social housing subsidies in these communes (cf. Hidalgo 2007).

In addition to the aforementioned indicator, the **share of social housing units in the municipal housing stock** likewise underpins the goal of equal access to housing. This highlights the spatial component of housing, since the proportion of social housing units provides information on the access of lower-income households to affordable housing. The analysis refers to data on social housing construction from 1979 to 2002 (see Figure 7).

<sup>5</sup> Data was unavailable for the majority of the municipalities in the Extra-Periphery.

Figure 7: Share of social housing units in municipal housing stock per cluster (1992-2002 (%))



Sources: Hidalgo 2007; INE 1992, 2002

In terms of meeting basic needs, the results indicate that the overall amount of new social housing units in the Greater Metropolitan Area increased heavily between 1979 and 2002. In the frame of the social housing programme *vivienda básica*, more than 200,000 units have been constructed during this period (cf. Hidalgo 2007) and the average municipal share increased from nine to almost fifteen per cent (see Figure 7). However, distribution varies significantly between municipalities, and sustainability rules have not been sufficiently met. More than two-thirds of the social housing units constructed in this period are located in the Periphery. This is equivalent to an average share of approximately twenty-three per cent in the municipalities belonging to that cluster. Highest concentrations can be found in the municipalities of La Pintana, San Bernardo (both Periphery), Renca (Peri-Centre) and Colina (Extra-Periphery), with proportions of more than thirty per cent. In contrast, the Centre and Eastern Peri-Centre (with the exception of Lo Barnechea) contained almost no social housing (proportions below three per cent in 2002, see Appendix, Table 4).

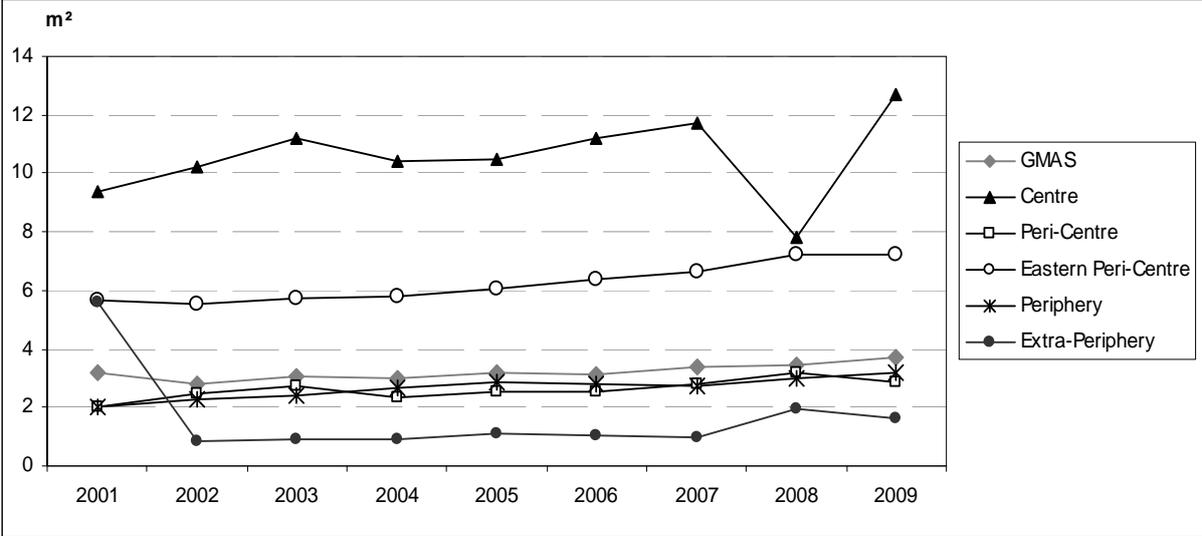
More recent social housing subsidies (*Fondo Solidario de Vivienda I*), introduced in 2006, pursue the prevailing of the social housing concentration in the Periphery (cf. Kabisch et al. 2011). The two municipalities with the highest allocations are Puente Alto and San Bernardo. The Peri-Centre and Extra-Periphery also show relatively high numbers of newly subsidized social housing units (highest figure in Colina). It is worth noting that the growing proportion of second-hand housing in the social housing stock of the Metropolitan Region enables inhabitants to remain in their neighbourhoods and thus to preserve their social networks (cf. Brian et al. 2009).

The spatial distribution (concentration) of newly constructed social housing units in Santiago de Chile has hitherto frequently led to a range of problems such as a) spatial concentration of low-income households associated with low public revenues and low quality social services, b) homogeneous social networks, c) low inhabitant perception of economic opportunities, and d) emergence of ghettos and the stigmatization of specific neighbourhoods. As a result of their location on the outskirts and poor access to public transport, these neighbourhoods often suffer from lack of connectivity with the rest of the city. The socially homogeneous composition of the population leads to disadvantaged inhabitants with comparatively low access, for example, to education, health, work and recreation services. The ensuing ghettos are severely affected by youth unemployment, drug abuse, criminality and teenage pregnancy (cf. Rodriguez and Sugranyes 2005, Figueroa et al. 2010, Sabatini and Brain 2008).

### 3.2 Recreation

Green areas are key to human well-being, equal access to which all are entitled. It is one of the top concerns in the context of urban improvements in the 2008 survey of urban life produced by the Ministry of Housing and Urbanism (MINVU) (cf. Barton et al. 2011) and a permanent topic in Santiago’s media. Green space is not only vital to recreation, but also to ecological services such as climate regulation and storm water infiltration (cf. Reyes an Figueroa 2010). Since the distribution of green areas constitutes a challenge for Santiago in terms of social equity, **green area per inhabitant and municipality** is a further indicator in the sustainability analysis of social inclusion. Green areas are defined here as green space maintained by the state.<sup>6</sup>

Figure 8: Green area per inhabitant and municipality at cluster level (m<sup>2</sup>)



Source: SINIM 2001-2009

Figure 8 illustrates that between 2001 and 2009 the available green space per inhabitant increased slightly from 3.2 to 3.7 m<sup>2</sup> per capita in the Greater Metropolitan Area with the construction of new parks (see Appendix, Table 5). On the other hand, the overall expansion of urban uses intensified in the same period, prompting the elimination of vital green areas, conspicuously in peripheral locations that were not maintained, and hence excluded from the definition used. The total amount of maintained green spaces in Santiago de Chile is well below the WHO guideline of nine m<sup>2</sup> per capita and it is to a large extent unequally distributed, leading to an environmental justice issue (cf. Romero and Vásquez 2005). People living in the Centre and Eastern Peri-Centre are favoured with a relatively high amount of green space, i.e., approx. seven m<sup>2</sup> per capita and over. The rest of the city’s inhabitants has access to merely 1.5 - 3.0 m<sup>2</sup> per capita. Figures for the peri-central municipalities Quinta Normal and Pedro Aguirre Cerda are less than 1.3 m<sup>2</sup> per inhabitant. The situation is even more challenging in Calera de Tango and Padre Hurtado, where figures are below 0.9 m<sup>2</sup> per capita (see Appendix, Table 4). Moreover, Reyes and Figueroa (2010) established that green areas in lower-income neighbourhoods are significantly smaller than those in higher-income neighbourhoods.

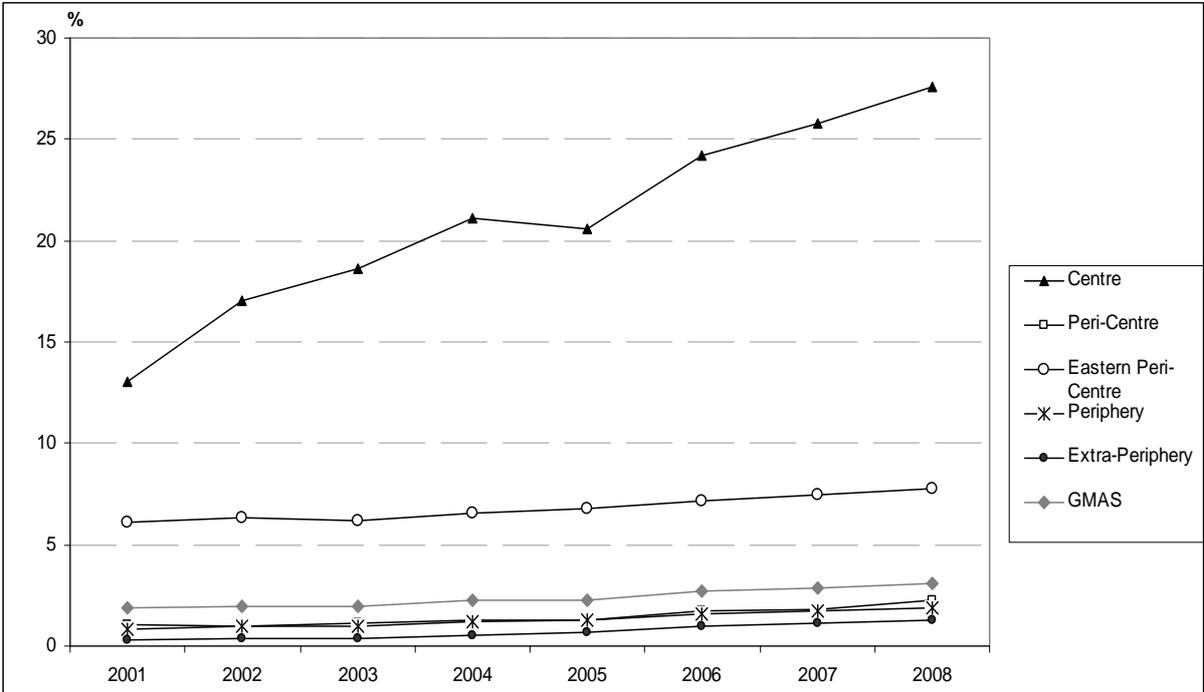
<sup>6</sup> The figures do not take natural green areas into account. Hence municipalities particularly on the outskirts of GMAS (e.g., Vitacura, La Reina) with large natural green spaces in the Andean Piedmont indicate a smaller percentage of green space than other sources report. On the whole, it should be remembered that data for this type of analysis is scant, so that conclusions must be drawn carefully.

### 3.3 Education and Labour Market

The sustainability analysis of social inclusion in Santiago de Chile is complemented by two further indicators that reflect education and the labour market. They are presented and discussed in this section.

In terms of capacity improvement for future generations and equal access to education, labour, information, and health and cultural facilities, the analysis concentrates exemplarily on education and equal capacities for public and private educational services. The indicator **proportion of students with a higher education entrance qualification per municipality** – measured as school-age children with more than 450 scores in secondary school examinations – allows for assumptions on the quality of education. The available data refers to school locations. Although this provides facts on municipalities where students of higher education attend schools, it does not supply information on where the students live. Figure 9 shows data for the indicator in the different clusters.

Figure 9: Proportion of students with a higher education entrance qualification per cluster (2001-2008 (%))



Source: SINIM 2001-2008

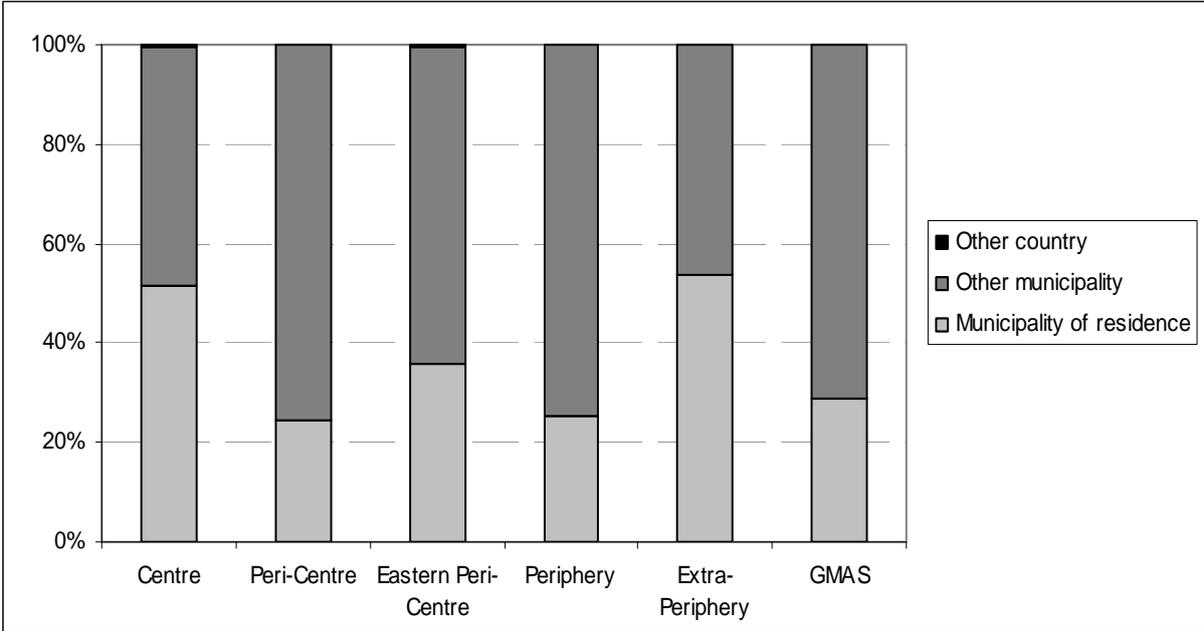
In terms of quality the overall performance of education in the Greater Metropolitan Area has improved over the last ten years. The average number of students with a higher education entrance qualification has almost doubled (2001: 1.9 per cent, 2008: three per cent, cf. Appendix, Table 5). With the exception of the Eastern Peri-Centre, this applies to all spatial clusters, albeit from very different baseline values. Figures for the Centre are significantly higher when compared with the four other clusters. With approximately twenty-eight per cent of students with a higher education entrance qualification, the municipality of Santiago (according to the latest available data from 2008) has now surpassed that of Providencia (nineteen per cent). Both are way ahead of the other municipalities (see Appendix, Table 4). Educational levels are highly diverse, not only between but within the clusters, notably in the Peri-Centre and Eastern Peri-Centre. The proportion of students in the Peri-Centre, Periphery and Extra-Periphery entitled to higher education averaged between 1.0 and 2.0 per cent. Especially in the Peri-Centre, several municipalities failed to reach even 1.0 per cent (e.g., Lo Espejo and Cerro Navia), whereas La Cisterna and San Miguel have a share of eight and nine per cent, respectively (see Appendix, Table 4). According to the PISA study

for the year 2006, student socio-economic differences account for a significant number of between-school differences in Chile (cf. OECD 2006). The performances presented correlate to a certain degree with the types of schools (private, state-subsidized and public). In the Eastern Peri-Centre and the Centre, for instance, where the proportions of private schools are large (fifty-five and eleven per cent), have the highest values for students with higher education. Furthermore, the proportion of students at subsidized schools is growing in all clusters, as it decreases at public schools (SINIM 2009). Consequently, students who can't afford attending private or at least subsidized schools, which are moreover unevenly distributed over the city, are highly disadvantaged. And student who are able to pay school fees, but live in the peripheral clusters, have to accept long daily ways to school.

The workplace and its associated commuting are crucial elements in the debate on labour market opportunities and social inclusion. This is considered by taking the **proportion of labour force employed in the municipality of residence** as a key indicator. It provides information about access to employment and captures the amount of daily commuting required.

In 2002, approximately twenty-nine per cent of the labour force in the Greater Metropolitan Areas was employed in the municipality of residence (see Figure 10 and Appendix, Table 5). The Peri-Centre and Periphery are the clusters with the lowest proportion of the labour force working in the home municipalities (between twenty-four and twenty-five per cent). Figures in the municipalities Lo Prado, San Ramón and La Pintana are even below twenty per cent (see Appendix, Table 4). In the Eastern Peri-Centre, however, on average more than thirty-five per cent of the labour force has a job in the municipality of residence, although differences between the municipalities in this cluster are high. More than fifty per cent of the labour force in the Centre and Extra-Periphery are employed in their municipality of residence. Unfortunately, it is not possible to make assumptions on time trends, as the data has only been surveyed since 2002.

Figure 10: Proportion of labour force employed in municipality of residence per cluster (2002 (%))



Source: INE 2002

The gravity of the results of this indicator increases when other municipalities where people work are considered. This is highlighted by the following examples: combining neighbouring municipalities in the category “municipality of residence” raises the proportion of the labour force living near their place of work to between sixty and eighty per cent in several of the

municipalities in the Eastern Peri-Centre. In contrast, the figure remains low in La Pintana or Puente Alto (Periphery) at approximately thirty per cent (cf. INE 2002). Furthermore, about half of the labour force of these two municipalities pursues jobs at the other end of the city, for instance in Las Condes or Providencia, indicating a long and possibly stressful daily commute to work. These figures are confirmed by data on commute lengths. For instance, while the daily commute for people living in the Centre and Eastern Peri-Centre takes about thirty minutes, the journey lasts approximately fifty minutes for those living in the Periphery (see Appendix, Table 8).

### **3.4 Synthesis of the current major sustainability deficits**

This section summarizes the principal sustainability challenges and spatial characteristics revealed by the status quo sustainability analysis of socio-spatial differentiation processes in Santiago de Chile.

With regard to segregation levels, the isolation index, in particular, points to severe sustainability deficits in several clusters. This is due, for example, to the high spatial concentration of social housing projects. The enhanced risk of social exclusion is aggravated by the alarmingly low percentage of green areas per capita in many of Santiago's municipalities. Moreover, the education indicator reveals a high inequality of educational opportunities in the Chilean capital and thus, of sustainability deficits. These indicators specifically illustrate the merit of adopting an integrated policy approach to meet these sustainability deficits.

The following objectives for the future can be summarized for the individual indicators: the indices of dissimilarity, described for Santiago as moderate (cf. Massey and Denton 1993), should be slightly reduced. The same applies to the isolation index, in order to stimulate the probability of interaction between different social groups. With respect to overcrowding, overall progress has been made in improving housing conditions in the last fifteen to twenty years. Further action is required, nonetheless, if this basic need is to be met in both social and spatial terms. Figures for the indicator "average years of income to buy a house or apartment" reveal that the achievement of more balanced prices would be a desirable sustainability objective. As mentioned earlier, the distribution of social housing is one of the most demanding sustainability issues of socio-spatial differentiation in Santiago. At the same time the spatial distribution of services and infrastructure should be equalized in all parts of the city. As the indicators demonstrate, this applies particularly to green areas, where the challenge is to meet the WHO standard of nine m<sup>2</sup> per capita and to greatly increase the amount of green space in defined municipalities. Likewise in the context of education, vast efforts are required to increase and equalize opportunities. Finally, from a sustainability perspective a reduction in the current amount and length of commuting is important for two principal reasons: on the one hand, to facilitate access to the job market and equalize the quality of life, and, on the other hand, to lessen congestion and air pollution in the Metropolitan Area.

The sustainability deficits differ considerably from one cluster to another. To conclude the status quo analysis, the key findings are summed up for the municipal clusters:

The "best" results are reported for the Centre. Facilities such as green space, high quality education and jobs are positive in comparison with other clusters. Overcrowding has declined radically, segregation levels are relatively low and the required number of income years to buy a home has remained almost unaltered in the last decade. However, the cluster carries signs of gentrification and social housing units are rare and well below the GMAS average. It is highly probable that current residents will be displaced, so that the number of socio-economic groups benefiting from good access to services and infrastructure will diminish.

Municipalities in the Peri-Centre suffer from unusually low proportions of green space. Stigmatization tendencies and social isolation must be stated for some locations, where

overcrowding and low quality education is still conspicuous. Other municipalities are affected by urban renewal programmes and may face similar challenges to those of the Centre.

The Eastern Peri-Centre traditionally attracts well-off households. Segregation levels are clearly above average and housing prices in this cluster dictate that property ownership is confined to a small proportion of privileged households.

The Periphery is characterized by two 'extremes'. The first is related to the pronounced risk of social exclusion as a result of the vast number of social housing units in these clusters, leading to homogenization of the poorest families. Furthermore, the geographic location of this cluster in the city has implications for its inhabitants, a large proportion of whom are consequently disadvantaged, not least with regard to access to the labour market. However, a decreasing isolation of lowly educated groups points out to opportunities for social inclusion.

Although the incorporation of the Extra-Periphery into the city is still at an early stage, it is already confronting problems of considerable magnitude, similar to those of the Periphery (high proportions of overcrowding and social housing, coupled with poor access to green space and a high standard of education). Here, however, the labour market offers some opportunities for social inclusion.

The overall findings confirm considerable sustainability deficits in terms of social inclusion in GMAS with strong spatial differences.

#### **4 Sustainability analysis of alternative socio-spatial scenarios for the year 2030**

Section 4 discusses three alternative storylines for the future (Section 4.1), which form the basis of the scenario analysis in Section 4.2. As presented in Section 2, they build on the three philosophies that describe potential development paths for Santiago 2030. This allows for reflection on future trends and provides action-oriented knowledge for local stakeholders.

##### **4.1 Three alternative storylines**

In the following, the three storylines will be elaborated on the basis of demographic, socio-economic and educational variables. The aim is to contextualize the three alternative scenario philosophies "Business As Usual", "Corporate Responsibility" and "Market Individualism" (see Section 2.1), and to make assumptions on future socio-spatial differentiation. In addition to quantitative calculations, the storylines are based on intense discussions with local stakeholders.

###### **a) Business as Usual**

In the Business As Usual scenario, public revenue increases at local level. State subsidies are limited nevertheless and the rapidly growing privatization of former public tasks leads to stagnation of public investment in the education sector. In accordance with these privatization tendencies, the number of students in public schools continues to decline while enrolment in state-subsidized private schools becomes more common. Correspondingly, in the housing sector the number of newly constructed housing units remains stable and even decreases slightly as the state reduces its expenditure for subsidized housing programmes, turning away from 'quantitative' targets towards small-scale 'qualitative' interventions. Construction of new social housing units continues mostly on the urban periphery.

Labour migration to the capital perseveres in 2030. However, since out-migration continues its past trend, the overall net migration balances of the Metropolitan Region of Santiago (RMS) and Greater Metropolitan Area of Santiago (GMAS) remain negative. There is, however, a general increase in the total population of Santiago due to longer life spans. The proportion of the population living in the urban areas of RMS remains high. The flow of intra-urban migration will intensify as those who benefit from economic growth seek new locations. A significant number of households across all educational levels move to the municipalities in

the Periphery, where housing is available for a variety of socio-economic groups. On the other hand, municipalities in the Peri-Centre experience negative net migration balances, notably losing households from low and middle educational groups that move to the Extra-Periphery. Residents with higher educational attainment continue to move to the Centre and Eastern Peri-Centre, drawn by the urban infrastructure. These groups likewise tend to move to the Extra-Periphery, where the housing supply develops at a more rapid rate. There is a slight downturn in migration from neighbouring countries. Foreign immigrants tend to move to existing communities in the Centre and selected communities in the Peri-Centre.

The trend towards house ownership and larger plot sizes leads to land conversion for 'urban' uses particularly on the urban periphery. The number of building permits issued in GMAS is rising steadily, with the exception of the Periphery, where the number is in decline. Nonetheless, the Periphery remains the area with the highest number of building permits in GMAS as a whole. Land values are on the increase across the city. New housing construction and gains from land speculation produce a sharp increase in land values, especially notably in the Extra-Periphery municipalities, where they figured in the past at the lowest end of the scale. The same can be said for the Eastern Peri-Centre, traditionally the most expensive cluster.

Santiago in 2030 experiences the effects of demographic change. As a result of the overall economic improvement in Chile, the number of persons per household continues to subside in almost all municipal clusters. There are, however, significant variations in the clusters. Household sizes are small in the Centre, where the gentrification trend is more and more apparent. In contrast, the average number of persons per household remains high in municipalities of the Extra-Periphery, for the most part with social housing and a rural setting.

Poverty rates remain at the level of the 1990s. More than a few communities in the Peri-Centre and Periphery, on the other hand, have pockets of extreme poverty. As social programmes are only accessible to the poorest of the poor, a deprived underclass continues to exist. This inequality is likewise reflected in the educational structure. There is evidence of a moderate increase in the average years of education in the Extra-Periphery, while all other clusters maintain their levels.

The trend towards socio-spatial mix in the Periphery continues to some extent. Well-educated households, however, tend to return to their 'traditional' location in the Eastern Peri-Centre or to move to the 'rejuvenated' Centre cluster. At the same time, patterns of large-scale segregation of lower education groups persist in 2030 and social barriers remain largely unchallenged.

## **b) Collective Responsibility**

In the Collective Responsibility scenario, 2030 sees the regional economy and the role of municipal government enhanced, while public revenues at local level increase. Evidence of strong local governments is conspicuous in the growing public investment in the education sector, leading to a higher number of students at public schools. Nevertheless, the number of students at private state-subsidized schools remains stable.

As a result of efforts at decentralization and deconcentration, Santiago loses its significance as Chile's economic centre. The overall population growth rate slows down almost to a standstill. Housing developments and job opportunities in the new regional poles lead to further outward migration from the metropolitan region, stemming migration flows to the metropolitan area. Consequently, the net migration balance of both RMS and GMAS is negative. For the same reason the stream of foreign immigrants to the metropolitan region has taken a downturn. The small number of foreign immigrants who come to Santiago move to established migrant communities in the Centre and Peri-Centre. In terms of intra-urban migration, and contrary to the beginning of the millennium when many middle- and highly educated residents preferred to live on the urban fringe, out-migration to the Extra-Periphery has almost disappeared across all status groups in 2030. Economic and social enhancement, and the gradual shift in social values have led to a lessening of social barriers

within and between the different communal clusters. Residents from different social status groups live in close proximity. Middle- and upper-class residents rediscover the Centre and selected municipalities of the Peri-Centre as desirable places to live. This carries with it the risk of gentrification. Migration from the Periphery to the Peri-Centre is accompanied by a decline in the number of lower-educated residents in the Periphery.

Demographic aspects (increasing out-migration), concentration on density management and the slowing down of urban periphery expansion lead in particular to a reduction in the demand for development areas. This helps to stabilize building permit figures for new dwellings. These demographic, social and economic trends generate a scaling down of the housing deficit and a smaller demand for new social housing units in almost all areas of Santiago. The number of new social housing units remains stable, with evidence of a slight decline. Construction is essentially distributed across municipalities in the Centre, the Peri-Centre as well as the Eastern Peri-Centre, corresponding to popular demand. As a result of strict housing policies and a decline in the demand for new residential land, land values come to a halt. Even the Eastern Peri-Centre shows signs of an ebb in this context.

Since processes of individualization do not intensify in 2030, economic and social achievements lead to only a moderate reduction of the household size in the Centre and Peri-Centre.

Vast efforts in the interests of social equity trigger a further decline in the number of people living in extreme poverty. Vast public investments in the education sector, the strengthening of local self-help networks and the growing significance of empowerment at local level enhance the economic circumstances of almost all residents. A more equitable framework for regional education is established accordingly and lowers social barriers. An increase in the aggregate average education years reflects the overall improvement in educational standards and access opportunities. The result is a consistency in the quality of education and homogenization of educational structures. The year 2030 nevertheless sees the persistence of an educational elite.

In light of the strong emphasis on redistributive measures, social justice and educational equity, social cohesion is on the increase in the Collective Responsibility scenario and socio-spatial segregation in decline.

### **c) Market Individualism**

The Market Individualism scenario is a world of massive economic growth. Public revenues at local level, however, fail to increase. For the public sector, low taxation, including low business taxes, means less benefit from economic growth. The cutback in public revenues brings with it a reduction of public investment in education. At the same time, the management of education lies in the hands of private firms to a growing extent. Consequently the state has less influence on the direction of this major service sector and the number of students in state-subsidized private schools has dropped. Figures for students in public schools show evidence of a further decline.

The loss of state influence on the allocation of basic services is also evident in the housing sector. The number of new social housing units is declining in all communal clusters of Santiago. The in-migration of lower-income groups to RMS is nevertheless increasing due to the role of the city as Chile's economic hub, as is the demand for adequate and affordable housing. This leads to a major housing deficit in GMAS and thus to an increase of informal settlements on the urban periphery.

The inhabitants of Santiago do not benefit equally from economic growth. A small percentage of the total population still lives in extreme poverty. This proportion may increase slightly in certain locations of the Periphery. One explanation for this development is the retrenchment of social programmes to combat poverty.

In this scenario, rising expectations of employment and wealth in RMS generates in-migration and a flow from rural to urban areas within the region. The total population of RMS

and GMAS continues to increase, with annual growth rates stabilizing at approximately two per cent. The share of urban population rises in comparison with the rural population. The net migration balance is positive. The partly unbridled in-migration to RMS and GMAS leads to a corresponding growth of informal settlements.

Social and economic differences intensify and are reflected in unmistakable spatial differentiation. Residents with higher educational attainment repopulate the Eastern Peri-Centre to escape thriving informal settlements and high levels of violence in the Extra-Periphery. They are likewise attracted by the significantly superior infrastructure. On the contrary, the small number of residents with poor educational backgrounds tends to leave the Eastern Peri-Centre. While the majority of this group lives in the Extra-Periphery, the group of middle-educated households will primarily occupy the Periphery. Hence this scenario is characterized by expansion of the urban periphery in all directions and a high level of residential segregation.

Santiago's function as a global city has the potential to attract a growing number of people from neighbouring countries to RMS. Migration flows from abroad will thus increase. Most immigrants move to municipalities with established immigration communities (e.g., Independencia, Vitacura, Las Condes or the Centre).

The increase in social spatial polarization is also indicated by significant differences in household size. Particularly in the Centre, where individualization tendencies are most apparent, household sizes are in decline. In contrast, household sizes in the municipalities of the Periphery and Extra-Periphery are bigger, as more in-migrating lower-income groups join existing households of family members as so-called 'allegados'. Due to reduced public investment in education and the rapid privatization of the education sector, the equality of opportunities for education remains highly differentiated both socially and spatially, as seen in the distribution of public schools and subsidized private schools. Accordingly, average educational years are increasing, particularly in the Centre and Eastern Peri-Centre. People in low-income groups are struggling to meet their basic educational needs. Market regulation deficits in the education sector are evident.

Rising in-migration leads to a greater demand for new building land. Accordingly, land values increase in the Centre, which is associated with business districts and gentrification processes. As a result of urban renewal this is also the case in the Peri-Centre. The return of the elite to the Eastern Peri-Centre prompts an increase in land values. Land values – and consequently building permits – in the Extra-Periphery, on the other hand, are stagnating in the face of a growing number of informal settlements. The Periphery and Eastern Peri-Centre show continued growth in the number of building permits issued, which is affected positively by weak land-use restrictions.

## 4.2 Scenario analysis

The scenario analysis of the eight sustainability indicators follows the development paths described in the storylines of the three alternatives for the year 2030 (see also Section 2.1). An assessment framework (see Table 3) serves as the basis to evaluate the three scenarios by comparing expected "alternative future trends" with proposed target values for the year 2030 for each indicator. Starting from past trends and the latest figures available for all sustainability indicators (at both cluster and GMAS level), first of all, normative target values are generated in the light of current sustainability performance discussed in Section 3. Secondly, alternative future trends are estimated for each indicator according to the overall development expected for each scenario alternative and the estimated target values for the year 2030.

The generated target values should be understood as recommendations and can of course only represent an approximation.

As evident from the status quo analysis and several stakeholder discussions, the **index of dissimilarity for lowly educated groups** needs to be reduced in the future. The

recommendation for the year 2030 is to lessen this sustainability indicator to approximately 0.20 for GMAS. In clusters, where lower levels are already attained, today's figures should be maintained.

For the second segregation indicator the conducted analysis and debates with experts lead to the same proposition. That is, the **isolation index** needs to be reduced to 0.20 (or maintained below this figure) in all spatial clusters.

The sustainability indicator **proportion of household overcrowding** should be reduced to at least five per cent per municipality up until 2030. This target is closely based on existing proposals to reduce overcrowding to approximately fifty per cent below current values, and is supported by comparisons with OECD countries (cf. Kopfmüller et al. 2011). Due to spatial differences in the figures for this indicator between the municipalities, the suggested reduction by half is broken down to municipal level and leads to a reduction of the current average rate of ten per cent per municipality to approximately five per cent. Besides counteracting household overcrowding, this target translates to equal spatial patterns throughout the city of Santiago de Chile.

In the case of **years of income to buy a house or apartment** the objective is to facilitate access to housing property in all clusters. The existing wide margin should consequently be reduced and a more differentiated stock needs to be provided. Based on recent trends, it is recommended that the disparity in the required income years between the clusters should be reduced by twenty to twenty-five per cent and the figure needs to be kept stable. The margin for the clusters of the Greater Metropolitan Areas should thus be approximately four to twelve years of income required to purchase a house or an apartment in 2030. This would allow for greater access of low-income households to well-equipped municipalities while continuing to guarantee high standard homes in these areas.

With respect to the **social housing units** indicator, a more equal distribution of social housing in GMAS is advocated for 2030, ideally an approximation of the social housing unit share to roughly fifteen per cent of the municipal housing stock in all clusters. The goal is to increase the number of social housing units in general and to erect more social housing units in particular in municipalities where land values are so high that social inclusion is difficult to improve. In order to avoid the trend towards neighbourhoods with a socially excluding homogeneous social composition, the target value for social housing should not be overexceeded. The proposed share of approximately fifteen per cent refers to current experience and demand, and should merely serve as orientation.

For the future, the challenge for the indicator **green areas per inhabitant** is not only to meet the WHO standard of nine m<sup>2</sup> per inhabitant in the Greater Metropolitan Area of Santiago, but to strongly increase green areas in the Peri-Centre, Periphery and Extra-Periphery, in order to establish more social justice. Thus, the target value of nine m<sup>2</sup> should be attained in all thirty-nine municipalities of GMAS.

In light of these empirical trends, educational standards must be further increased in the future if the OECD average is to be reached. It is likewise vital to reduce the disparate educational performance of the municipalities (i.e., of the different school types: private / subsidized / public). As a target value for 2030, it is thus recommended that the **proportion of students with higher education entrance qualifications** per municipality be raised to approximately ten per cent of all students.

Finally, against the background of the status quo analysis, the **proportion of labour force employed in municipality of residence** is to be increased to fifty per cent per cluster up until 2030.

Each of the three scenarios is analysed along these categories (Status quo indicator values, Target value for 2030s and Alternative future trends), based on a three-step evaluation or 'traffic-light system'.

	Target will not be attained (value unchanged or worse)
	Target will be approached but not attained
	Target will be attained

It is estimated for all indicators whether the desired target values for the year 2030 would be attained, approached but not attained or not be attained under the different development paths described in the storylines.

Table 3: Scenario Analysis

	Cluster	Status quo & target value 2030		Alternative future trends			Scenario analysis		
		2002	Target	BAU	CR	MI	BAU	CR	MI
Index of dissimilarity for lowly educated groups		2002	Target	BAU	CR	MI	BAU	CR	MI
	GMAS	0,31	0,20	+	-	+			
	I	0,15	0,15-0,20	+	0	+			
	II	0,16	0,16-0,20	+	0	+			
	III	0,43	0,20	0	-	+			
	IV	0,27	0,20	+	-	++			
Isolation index for lowly educated groups		2002	Target	BAU	CR	MI	BAU	CR	MI
	GMAS	0,30	0,20	-	-	+			
	I	0,15	0,15-0,20	0	-	-			
	II	0,33	0,20	-	-	0			
	III	0,16	0,16-0,20	0	-	+			
	IV	0,29	0,20	-	-	+			
Proportion of household overcrowding (%)		2006 (%)	Target (%)	BAU	CR	MI	BAU	CR	MI
	GMAS	10,37	5	-	-	0			
	I	9,10	5	-	-	-			
	II	12,40	5	0	-	0			
	III	2,69	2,69-5	-	0	-			
	IV	11,35	5	0	--	+			
Years of income to buy a house or apartment		2006	Target	BAU	CR	MI	BAU	CR	MI
	GMAS	6,69	6,69	+	-	++			
	I	4,48	4,48	0	-	++			
	II	4,26	4,26	0	-	+			
	III	15,47	12	+	-	++			
	IV	5,55	5,55	+	-	0			
Share of social housing units in total housing stock (%)		2002 (%)	Target (%)	BAU	CR	MI	BAU	CR	MI
	GMAS	14,71	15	+	0	-			
	I	1,08	15	0	+	0			
	II	11,03	15	+	+	-			
	III	2,83	15	0	+	0			
	IV	22,71	15	+	-	-			
Green area per inhabitant (m <sup>2</sup> )		2009 (m <sup>2</sup> )	Target (m <sup>2</sup> )	BAU	CR	MI	BAU	CR	MI
	GMAS	3,93	9	+	+	-			
	I	12,73	12,73	+	-	0			
	II	2,89	9	0	+	0			
	III	7,20	9	+	0	-			
	IV	3,20	9	+	++	--			
Share of students with higher education entrance qualification (%)		2008 (%)	Target (%)	BAU	CR	MI	BAU	CR	MI
	GMAS	3,10	10	+	++	0			
	I	27,58	10-27,58	+	+	+			
	II	2,26	10	+	++	0			
	III	7,77	10	+	+	++			
	IV	1,86	10	+	++	0			

	V	1,30	10	++	++	-			
Proportion of labour force employed in municipality of residence (%)		2002	Target (%)	BAU	CR	MI	BAU	CR	MI
	GMAS	28,77	50	0	+	-			
	I	51,51	50-51.51	0	0	0			
	II	24,45	50	0	+	-			
	III	35,60	50	+	+	+			
	IV	25,20	50	0	+	-			
V	53,92	50-53,92	+	0	+				

The symbols used in the table stand for the following trends:

++	Strong increase
+	Increase
0	Stable
-	Decrease
--	Strong decrease

For the case of the Business As Usual scenario, the analysis suggests that if past trends continue in the future, only a minor increase in social sustainability will be achieved. It is probable that the suggested target values will be attained in terms of access to education, creation of local jobs, and residential segregation (the isolation index rather than the index of dissimilarity), whereby clusters perform unevenly. The Peri-Centre and Periphery clusters are most likely to perform below target. Bearing the key assumption in mind – equity must be increased in order to achieve greater social sustainability – none of these four indicators is evaluated positively. In most cases, the status quo will remain unchanged. Less satisfactory are the cluster results for the proportion of household overcrowding and the correlation between household income and house prices. The Centre at least is expected to be in a position to reduce overcrowding to a reasonable level (with the Eastern Peri-Centre even eliminating the problem). As past trends persevere, specifically green areas and the proportion of social housing in the clusters fail to fulfil the proposed sustainability targets for 2030. In the Periphery and Extra-Periphery, where the concentration of social housing has already reached a high level, social housing construction will remain stable. Accordingly, there will be no increase in green space where it is already insufficient (Peri-Centre, Extra-Periphery). On the contrary, green space may even decrease in the context of further urban expansion.

The key findings of the Collective Responsibility scenario allow the conclusion that by and large the scenario generates positive trends. This is particularly true for education and housing prices (as direct consequences of this philosophy). CR appears therefore to have the right (political) framework conditions for the realization of improved and spatially more equal quality of education, as well as better access to housing in all municipalities of the Greater Metropolitan Area. Segregation could remain stable or even be reduced, although it is highly unlikely that the spatial concentration of social groups will be removed by 2030 in the Eastern Peri-Centre, where it was highest. Due to changing migration patterns, social isolation will likewise remain high in the Extra Periphery. In this scenario it is still difficult to reach the target figures set for the proportion of household overcrowding and social housing in the different clusters. The availability of green space and employment in the municipality of residence (or a neighbouring municipality) will increase; however, achievements will not meet the target in all spatial clusters. The Centre comes out well in this scenario. Here, all indicator targets will be reached. The other clusters balance each other out with results between target fulfilled and target approached. As the sole exception, figures for the amount of green space in the Eastern Peri-Centre will not improve. Maintaining the relatively high values, however, could be seen as an acceptable outcome.

In view of the strong emphasis on market regulation and privatization of former public sector activities and tasks, the Market Individualism scenario shows evidence of greater socio-spatial inequality and segregation throughout the city. The trends are not conducive to social inclusion. The worst trends refer to the development of green areas and the years of income required to buy a house/apartment. Evaluation of the 2030 trends in household

overcrowding, social housing and access to education indicate only a marginal improvement. The change most likely to occur is the reduction in segregation and the creation of more jobs, albeit long daily commuting. It is unlikely that inequalities between the clusters will undergo change. The background to this assumption is the almost negligible increase in the number of jobs in the Peri-Centre and Periphery in the MI scenario, as distinct from the employment growth in areas of the city with currently a high volume of attractive jobs. Again, it is the Centre that comes out best; in this scenario, target values will be attained for at least four indicators. The Eastern Peri-Centre and Extra-Periphery follow suit in this context. In the Peri-Centre, the index of dissimilarity for precarious educational groups is the only indicator to come close to the proposed target (a result of low starting values rather than explicit policy measures). The results for the Periphery are slightly more positive. As in the Collective Responsibility scenario, there will be a minimal increase here in the labour force share. The target values for the percentage of social housing and correlation between house price and income will likewise be attained or approached. Unlike the CR scenario, however, the underlying reasons are the shortage of subsidies in the case of social housing and the declining appeal of the cluster as an affordable place to live.

Summing up the tendencies for all clusters and for all three scenario alternatives, it can be stated that the best results will be achieved for the Centre. The highly privileged Eastern Peri-Centre cluster performs well. The Periphery and Peri-Centre remain subject to the greatest disadvantages. While the three alternative scenarios indicate varying trends for the selected sustainability indicators, all of them share the estimation that current socio-spatial discrepancies and the sustainability deficit of social inclusion will persevere and even be compounded in the future (with the exception perhaps of the 'Collective Responsibility' scenario). The predictions reveal that this is unlikely to take place GMAS wide. Instead, the scenarios envisage positive trends ('increase in sustainability') in some municipal clusters (notably the Centre) and negative trends (decrease in sustainability) in other municipal clusters (the Periphery, but interestingly the Eastern Peri-Centre to some extent also). This suggests that in some instances discrepancies in sustainability levels between municipal clusters are likely to widen in the future, while in others the gap will probably narrow.

## **5 Conclusions**

With the intention of supporting regional and local planning authorities and political decision-makers in the field of housing and other urban policy fields, this paper showed how the use of indicators and scenario analysis can be applied to specific sustainable issues such as social inclusion. In the following some observations are translated into possible responses.

On the whole, it can be stated that any policy in Santiago de Chile concerned with social inclusion must not only be selective in terms of the target group (i.e., less well-off households) but also spatially sensitive, both in terms of where an intervention in the city is to take place and on what scale or magnitude. The two policy fields whose interventions are likely to have the most significant effect on sustainability indicators are state housing (in particular social housing programmes) and education policies. Both policy fields have paid little attention to targeted and location-specific interventions, although of late there are signs of change in the housing policy (cf. Salcedo 2010). A range of more general policy areas related to these core elements impact on social inclusion: (i) interventions in the public transportation system to improve services in disadvantaged municipal clusters and to achieve greater access to employment; (ii) location of service infrastructure, recreational facilities and employment that may influence the opportunities and the image of a specific location; (iii) modified land uses and zoning, as well as control over land speculation; iv) policies that support communities to enhance their social capacity and social networks in order to develop their neighbourhoods. This requires a fundamental rethinking of government policy away from the delivery of welfare towards supporting and enabling endogenous capacities of local communities in disadvantaged areas. In the following, concrete measures for the above-mentioned policy fields are suggested.

With the idea of stimulating socially mixed housing in order to increase social inclusion, Chile's social housing policy has recently moved towards including more qualitative objectives that incorporate building material standards, measures to upgrade neighbourhood open spaces, the capacity of beneficiaries to expand housing units over time, and social housing subsidies for used houses (see also Salcedo 2010). Another line of intervention in the context of the housing policy discussed by a group of scholars (see, e.g., Sabatini and Salcedo 2007) (Ciudad Bicentenario) is a reduction in the scale of concentration and spatial isolation of poor groups; in other words an increase of spatial proximity and social diversity. This concept, however, is a long way from being accepted by local stakeholders and potential residents. A reduction in the concentration of poor households could be brought about by further small-scale programmes to increase opportunities to live in consolidated city areas with higher land values. These programmes would undoubtedly increase the immediate cost of social housing programmes. Revenue savings for municipalities, however, would justify such a move, since social expenditure and complementary costs for infrastructure provision would be lower in the long term. This could be implemented in the form of subsidies, differentiated according to municipality land values and should be legalized, e.g., in the form of quotas in the municipal regulatory plans (PRC). Another option is to enforce housing quotas for low-income households in new development projects, as already implemented in large-scale projects ('Conditioned Development Zones' (ZODUC) and 'Conditioned Development Projects' (PDUC)) on the outskirts of the city. In practice, however, experience shows that such 'top-down' measures are (a) difficult to implement and monitor, and (b) are detrimental to low-income residents in terms of potentially adverse location effects such as high transportation costs. A further process and somewhat unintended side effect of real estate development is the relocation of high-income households to low-income neighbourhoods, a phenomenon found primarily on the urban periphery.

Measures of this kind could contribute to equalizing spatial access to goods, although they continue to provoke heated debate on whether the desired effect of social interaction between different social groups is achievable in the first place (see, e.g., Jiménez 2010).

Another policy field is the improvement of equal access to education. Despite student protests several years ago, promises of reform to the educational system have not yet materialized in Santiago de Chile. Although the budget for education doubled from 2000 to 2008, it remains below the OECD average, indicating the crucial need for a further increase. In the interests of increasing opportunities for students living in poor municipalities, the quality of teaching at public schools and the access to subsidized schools must be tackled. This requires stronger public control and subsidies for lower-income groups. Until such time as education is acknowledged as a public good for which the state claims responsibility, however, decisive reforms will not be pushed through. Considerable efforts are therefore needed if cultural values are to change.

Equal opportunities for recreation are seen as a third important policy field. Since the termination of the Programme for Urban Parks established under Frei's government in the 1990s, little has been done in Santiago in the way of green space maintenance. Although funds are available, e.g., from the National Fund for Regional Development, numerous poor municipalities are unable to provide for the upkeep of public spaces. New concessions planned by the Ministry of Public Works are currently under discussion and may well result in an increase in green areas in Santiago. Due to the logic of profit and return pursued by public-private partnerships, however, the question arises whether these models are able to meet the goal of not only broadening the amount of green space but also providing all urban residents with equal access. It would be useful in any case to identify a public regional institution, such as the Regional Government, for the coordination of new green space projects. Civil society should be involved from the outset to guarantee transparent processes and self-identification, as well as the just distribution and non-discriminative use of green space.

Finally, and more generally, strategic implementation control of planning instruments and the regulation of housing development projects is crucial, for example, to achieving multifunctional neighbourhoods where housing, jobs, social services, commercial uses and green areas is adequately and justly available. It is further recommended that the neighbourhood scale be accounted for in land use plans. Stigmatized areas have a special need for territorially coordinated initiatives to improve services and social programmes (cf. Sabatini and Salcedo 2007). To address the tenacious image attached to certain neighbourhoods, additional measures such as public relations campaigns are required. Participatory measures to encourage residents to identify more closely with their location could contribute to counteracting negative connotations. Municipal budgets would have to be strengthened to accommodate these measures, for example by making municipal compensation funds more efficient and implementing local aid programmes. All in all, it would be helpful to develop a common *Leitbild* for the Metropolitan Area and draw up development plans of a locally and regionally more integrative nature.

The methodology applied in this approach proves to be complex and perhaps hard to communicate and/or to replicate. Stronger 'simplification', on the other hand, would not be useful since it would make adequate assumptions on future trends impossible. The elaboration and application of the analytical scenario approach implies the continuous involvement of local stakeholders, including political decision-makers, and with it the opportunity of discovering the gravest shortfalls of socio-spatial differentiation. Although expert knowledge was part of the analysis, further expert discussion and participatory processes in Santiago could help to legitimize the proposed targets and time frames. Furthermore, acceptance and participation are key conditions for the 'practical' implementation of such an approach and make ongoing validation of the selected sustainability indicators indispensable.

This kind of approach might seem more suited to support an integrated urban development approach in the targeted policy fields of housing, recreation, education, employment and strategic planning than to one selected urban policy field. This would likewise require an institution with the capacity to incorporate a sustainability concept of this kind in its planning strategy and guarantee its implementation. Santiago de Chile, however, is confronted with the enormous challenge of overlapping responsibilities and the absence of a regional state authority with decision-making powers, so that elaboration and implementation of a sustainability approach of this magnitude would by necessity be a long-term process. For final considerations it is therefore still too early.

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## 7 Appendix

Table 4: Indicators on municipal level

Municipality	Household overcrowding (%)		Years of income to buy a house or department		Proportion of social housing units at housing stock (%)		Green area per inhabitant (m <sup>2</sup> )		Students with higher education entrance qualification (%)		Labour force employed in home municipality (%)
	1992	2002	1996	2006	1992	2002	2003	2009	2001	2008	2002
Santiago	22.38	10.58	4.22	4.48	0.85	1.08	11	12.73	13.05	27.58	51.51
Cerrillos	22.83	13.42	3.42	4.46	2.72	21.45	5.29	6.59	0.97	2.14	27.95
Cerro Navia	34.53	21.99			8.74	10.89	2.24	3.27	0.07	0.25	20.68
Conchalí	27.86	15.51	4.57	3.44	7.32	8.05	2.13	3.56	0.28	1.30	22.01
Estación Central	22.21	13.98	3.82	5.25	4.55	5.19	3.06	4.74	1.57	3.03	27.25
Independencia	16.49	10.56	3.59	3.96			1.36	1.39	2.58	6.05	29.11
La Cisterna	18.28	10.81	3.99	3.62	2.66	2.69	1.37	1.61	4.28	8.79	26.38
La Granja	26.61	16.65			19.45	23.00	1.52	1.67	0.25	0.81	20.32
Lo Espejo	32.02	19.03	4.43		1.09	8.05	5.94	1.56	0.08	0.18	22.13
Lo Prado	26.57	16.18			13.20	21.47	1.98	3.35	0.12	0.35	15.57
Macul	17.09	9.87		5.15	15.53	17.17	4.28	4.78	1.64	2.73	22.17
Pedro Aguirre Cerda	25.73	14.92	3.14			3.10	2.18	1.29	0.20	0.61	22.77
Quinta Normal	25.05	16.09	2.78	3.00	0.30	0.34	1.02	1.12	1.31	3.53	32.12
Recoleta	26.24	16.45	7.32	4.82		1.25	2.19	3.42	1.75	3.12	31.42
Renca	29.94	18.45	1.88	3.47	31.01	37.44	3.76	3.1	0.28	1.33	25.65
San Joaquín	24.80	14.93	3.68	3.83	2.11	2.54	4.16	3.66	0.65	1.90	25.23
San Miguel	16.30	10.35	5.30	5.86	1.74	1.64	2.20	2.74	5.55	9.56	27.43
San Ramón	32.25	20.23			12.75	16.71	1.60	1.31	0.53	1.27	19.84
La Reina	9.09	5.39	13.20	11.74	2.74	2.44	3.12	4.07	3.36	6.00	26.65
Las Condes	3.20	2.50	22.47	24.09	1.39	1.72	5.86	6.53	5.28	5.98	40.88
Lo Barnechea	17.16	7.30	6.20	7.20	17.71	23.50	7.32	9.85	3.01	3.33	48.93
Ñuñoa	6.54	3.46	9.11	19.70	0.88	1.02	5.22	7.28	4.90	8.71	22.09
Providencia	2.68	3.09	7.98	7.78	1.43	1.11	5.92	5.93	16.47	18.94	39.06
Vitacura	1.26	1.12	17.69	22.33			7.07	9.54	7.58	9.39	36.98
El Bosque	25.72	15.93	4.06	2.21	17.93	25.95	2.08	1.76	0.69	2.02	21.70
Huechuraba	35.59	17.52	11.09	9.01		4.43	1.72	4.56	0.06	0.56	25.12
La Florida	15.42	9.11	3.86	6.18	18.39	17.47	2.33	3.06	1.86	4.38	21.71
La Pintana	30.61	20.88	1.14		35.40	53.33	2.90	2.98	0.10	0.78	18.62
Maipú	12.77	6.87	3.06	4.20	7.87	11.28	4.26	3.31	1.25	2.09	25.67
Peñalolén	27.76	15.46	5.89	11.61	9.19	18.38	2.96	4.18	0.50	1.53	22.13
Pudahuel	27.10	14.62	2.60	4.17	21.69	26.11	2.99	3.29	0.09	0.37	22.05
Puente Alto	17.89	9.90	2.18	4.51	13.98	24.62	1.85	3.04	0.75	1.79	25.19
Quilicura	22.87	10.22	3.02	4.66	14.01	24.38	1.00	3.3	0.34	1.37	28.94
San Bernardo	26.93	14.10	3.87	3.41	18.01	30.80	1.80	2.53	0.97	1.67	40.65
Calera de Tango	27.86	13.14			1.42	4.54	1.01	0.68	0.31	1.86	54.38
Colina	31.43	14.06			9.28	30.40	1.06	2.67	0.41	1.80	59.59
Lampa	32.25	16.78		3.69			0.07	1.75	0.15	0.37	61.56
Padre Hurtado	-	16.44					0.47	0.87	0.23	1.03	32.16
Pirque	25.44	12.60			7.48	16.26	1.98	2.22	0.45	1.46	58.25

Sources: INE 1992, 2002; Mideplan 1996-2006; MINVU Observatorio Habitacional 1996-2006; Hidalgo 2007; SINIM 2001-2009

Table 5: Values for indicators on spatial cluster level

	Index of dissimilarity for lowly educated groups		Isolation index for lowly educated groups		Household overcrowding (%)		Years of income to buy a house or apartment		Proportion of social housing units at municipal housing stock (%)		Green area per inhabitant (m <sup>2</sup> )		Students with higher education entrance qualification (%)		Labour force employed in municipality of residence (%)
	1992	1992	1992	2002	1992	2006	1996	2002	1992	2002	2003	2009	2001	2008	2002
Clusters	0.13	0.13	0,26	0,15	22.38	9.10	4.22	4.48	0.85	1.08	11.18	12.73	13.05	27.58	51.51
Centre	0.16	0.16	0,43	0,33	30.03	12.40	3.99	4.26	7.55	11.03	2.72	2.89	1.02	2.26	24.45
Peri-Centre	0.43	0.43	0,23	0,16	5.28	2.69	12.78	15.47	2.22	2.83	5.75	7.20	6.09	7.77	35.60
Periphery	0.23	0.23	0,41	0,29	21.84	11.35	4.08	5.55	16.32	22.71	2.39	3.20	0.85	1.86	25.20
Extra-Periphery	0.1*	0.1*	0,57	0,39	30.47	14.11	--	--	6.00	18.70	1.83	1.64	0.33	1.30	53.92
GMAS	0.28	0.28	0,41	0,30	22.78	10.37	5.60	6.69	9.46	14.71	3.09	3.73	1.86	3.10	28.77

Sources: INE 1992, 2002; Mideplan 1996-2006; MINVU Observatorio Habitacional 1996-2006; Hidalgo 2007; SINIM 2001-2009

Table 6: Index of dissimilarity for all educational levels per cluster, 2002

2002	Precarious (0-7 years of education)	Basic (8-11 years of education)	Secondary school (12 years of education)	University (13-16 years of education)	Doctorate (> 16 years of education)
Centre	0.26	0.21	0.09	0.16	0.29
Peri-Centre	0.16	0.08	0.06	0.22	0.37
Eastern Peri-Centre	0.43	0.27	0.1	0.1	0.2
Periphery	0.27	0.14	0.13	0.28	0.37
Extra-Periphery	0.13	0.07	0.13	0.14	0.37
GMAS	0.31	0.19	0.12	0.30	0.53

Source: INE 2002

Table 7: Isolation index for all educational levels per cluster, 2002

2002	Precarious (0-7 years of education)	Basic (8-11 years of education)	Secondary school (12 years of education)	University (13-16 years of education)	Doctorate (> 16 years of education)
Centre	0,15	0,20	0,23	0,34	0,21
Peri-Centre	0,33	0,29	0,22	0,18	0,08
Eastern Peri-Centre	0,16	0,13	0,16	0,38	0,36
Periphery	0,29	0,30	0,25	0,25	0,10
Extra-Periphery	0,39	0,29	0,18	0,14	0,10
GMAS	0,30	0,28	0,23	0,27	0,24

Source: INE 2002

Table 8: Mean time and distance of daily commute per cluster, 2001

	Time (min)	Distance (m)
Centre	29	6110
Peri-Centre	40,9	10103
Eastern Peri-Centre	33,3	9263
Periphery	49,8	14123
Extra-Periphery	41,5	17368
GMAS	41,8	11688

Source: Encuesta Origen Destino de Viajes 2001