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Sustainable Cities in Theory and Practice
A Comparative Study of Curitiba and Portland

Miljövetenskap
C-uppsats

Datum/Termin: 2007-06-08
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Examinator: Eva Svensson
Löpnummer: 2007: 06
Abstract

The sustainable city is a relatively recent concept which has gained increasing attention the last decades both through the international community and through grass root movements. This study aims to explore how the sustainable city can be translated from theory to practice, using the United Nations universal guide lines for sustainable human settlements as a theoretic background to a comparative case study of Curitiba, Brazil and Portland, USA. The grass root movement of the eco-city concept is also explored as it is a broader approach to sustainable urban planning then the UN HABITAT guide lines. The study focuses on the integration of land-use and transportation systems as a way to improve the efficiency of cities. A well planned and integrated land-use and transportation system can limit land-use development while reducing green house gas emissions. The study show that the key for improving urban planning is through long term political engagement. There is no city which has successfully implemented strategies for sustainable development. A common problem is the conflicting interest of growth that undermines the potential of integrating sufficient strategies. Often governments fail to address the dynamics of the concept of sustainability which must be viewed as a constant process. The city of Curitiba demonstrates that less developed nations can improve urban planning even with limited means.
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Abbreviations

CIC Curitiba Industrial City
COMEC Curitiba Metropolitan region Coordination
GHG’S Green House Gases
IBGE Brazilian Institute of Geography and Statistics
IPPUC Curitiba Research and urban Planning Institute
SCP Sustainable Cities program
SI Sustainability Indicators
UN United Nations
UNEP United Nations Environmental Program
URBS Urbanization of Curitiba
1. Introduction

1.1. Background

Cities are often viewed as the engine of growth and the key to economic success for nations.\(^1\) The view of the city as a primary source of pollutions has been neglected and the environmental movement have primarily focused on the greening of the city. However, the greening of the city has reached a deeper meaning with a holistic view of the city and the lifestyles of its citizens.\(^2\) With the majority of the world’s population being urban\(^3\) there are many problems with the modern city that needs to be addressed. Firstly, the city removes people spatially from the productive land leaving them dependent on resources from rural areas. Secondly, when planning for cities the guiding principles have been based on compartmental ideas with the objective that water, air and natural resources are free,\(^4\) resulting in serious environmental problems affecting human health and quality of life. Thirdly, cities are reflections of the values embedded in the legal constructions on which society is based, which is why it is difficult to make a fundamental change as these values needs to be reevaluated. A common problem of today is the fact that the worlds population is using up natural resources in a faster pace then it takes the earth to regenerate it.\(^5\) In addition, the rapid population growth and the increasing urbanization put a strain on governments to manage the flow of people into urban areas. The consequence of these processes generates a stress on the environment as well as the human society.\(^6\)

On the other hand, the city has a positive side due to the high concentration of people on a limited area. If properly planned and managed cities could support a high density of people with a limited impact on the environment with benefits for the economy and the human health.\(^7\) Approaches to a more sustainable urban development have been given an increasingly attention at the international community and through grass root movements. Below is a background of the United Nations Sustainable Human Settlements and the eco-city movement.

United Nations; 'Sustainable Human Settlements

The ideas about a sustainable development became internationally accepted after the publication of “Our Common Future” in 1987. The conclusion was that sustainable development should be the guiding principle for governments at local as well as the national level.\(^8\) At the UN conference on Environment and Development in Rio de Janeiro in 1992, Agenda 21 was established to manage global issues at a local level.\(^9\) Today the main work towards a sustainable urban planning is addressed at the United Nations Human Settlements Programme, UN HABITAT. In association with United Nations Environmental Program (UNEP) the Sustainable Cities Programme (SCP) has been established to improve urban environmental planning and management, a sister programme to Agenda 21. The main principles for sustainable human settlements where established through the second UN HABITAT II Conference in 1996\(^10\)

\(^1\) Ooi Giok, 2005, p. 13
\(^2\) Roseland,1997, p. 16
\(^3\) Arnsberg, 2005, p.14
\(^4\) Shireman et. al., 1996, p. 219-220
\(^5\) Ecological Footprint Overview
\(^6\) Ooi Giok, 2005, p. 1
\(^7\) Ooi Giok, 2005, p. 14-15
\(^9\) Agenda 21
\(^10\) United nations Conference on Human Settlements, HABITAT II
The Eco-city
The eco-city is a relatively new concept of a framework of ideas on how cities can develop more sustainable today and in the future. The pioneers within the eco-city movement are the non-profit organization Urban Ecology, founded in Berkley, California in 1975. The aim was to “rebuild cities in balance with nature”. In association with other non-profit organizations Urban Ecology arranged the first international conference on eco-cities in 1990. Since then five international conferences have been arranged in; Adelaide, Australia 1992, Yoff, Senegal 1996, Curitiba, Brazil 2000, Shenzhen, China 2002, and Bangalore, India 2006.

Yet, the understanding of sustainable development and how it can be applied to cities is an ongoing debate. This is mainly because of the raison d’être of cities, and the many conflicting interests which justifies a limited action for integrating sustainability into urban planning. However, there are cities which have turned theory into practice such as Curitiba (Brazil) and Portland (Oregon, USA). In this study I will explore how sustainability can be integrated in urban planning in theory and practice using Curitiba and Portland as examples.

1.2. Aim and perspective
This study aims to look at how sustainable urban planning practices can be applied to cities in theory and practice to increase efficiency of land-use in relation to transportation systems. I will depart from the theoretical aspect of sustainable urban planning using the UN HABITAT II actions on sustainable transportation systems. The main objective and guiding principle within the UN is sustainable development defined as a; “development that meet the needs of the present without compromise the ability of future generations to meet their own needs”. This means a development that takes social, economical and ecological aspects in consideration. In contradiction is the urban planning of the modern society, which relies on growth as its main objective.

1.3. Research question
The aim of this study is summarized in my research question: How can cities develop sustainable in theory and practice? To answer this question I have composed following sub-questions;

1. Has Curitiba and Portland implemented an integrated land use and transportation system according to the universal guidelines on sustainable transportation systems in the UN HABITAT II article 151?

2. What are positive and negative aspects with the transportation system in Curitiba and Portland?
1.4. Concepts and Definitions

There is currently a lack of studies of sustainable urban planning, with most of the literature written over the last decade. More attention has been aimed at the scale of cities and the urge to address global issues, where the discussion on sustainability undermines the practical work.\(^{16}\) The eco-city concept which is a broader approach to sustainability the UN guidelines have different advocate’s that follow a more or less streamlined perception. Roseland argues that the eco-city connects seemingly disconnected ideas into a broad framework which can be applied by governments to integrate sustainable solutions.\(^{17}\) There is currently no single accepted definition of an eco-city which is the intention of the eco-city movement to allow cities to define sustainable urban planning from their own conditions and available means. However, this also complicates the study of the eco-city. Although there have been some attempts to define the eco-city. Roseland defines it as: “the most durable kind of settlement that humans are capable of building and a city that provides an acceptable standard of living without depleting the ecosystems or biogeochemical cycles on which it depends.”\(^ {18}\) Another definition of the eco-city is presented by Urban Ecology as; “a human settlement that enables its residents to live a good quality of life while using minimal natural resources”.\(^ {19}\) The problematic with broad definitions is the fact that the definition itself often undermines the meaning of the concept which tends to lose its intention. The eco-city should therefore be viewed as a broad framework rather then something that can be defined. The fact that the concept is not well developed makes it difficult to apply to cities in the practical work. I have therefore chosen to departure from the UN HABITAT II guidelines on sustainable human settlements, mainly because there is a written document on strategies which also can be viewed as a universal standard, as follow;

“HABITAT II Chapter 7 article 151. Governments at the appropriate levels, in partnership with the private sector, the community sector and other relevant interested parties, should

a) Support an integrated transport policy approach that explores the full array of technical and management options and pays due attention to the needs of all population groups, especially those whose mobility is constrained because of disability, age, poverty, or any other factor.

b) Coordinate land-use and transport planning in order to encourage spatial settlement patterns that facilitate access to such basic necessities as workplaces, schools, health care, places of worship, goods and other services, and leisure, thereby reducing the need to travel.

c) Encourage the use of an optimal combination of modes of transport, including walking, cycling and private and public means of transportation, through appropriate pricing, spatial settlement policies and regulatory measures.

d) Promote and implement distinctive measures that discourage the increase of private motorized traffic and reduce congestion which is damaging environmentally, economically, and socially, and to human health and safety, through pricing, traffic regulation, parking, and land-use planning, and traffic abatement methods, and by providing or encouraging effective alternative transport methods, particularly to the most congested areas.

\(^{16}\) Ooi Giok, 2005, p. 12
\(^{17}\) Roseland, 1997
\(^ {18}\) ibid
\(^ {19}\) Urban Ecology
e) Provide or promote an effective, affordable, physically accessible and environmentally sound public transport and communication system, giving priority to collective means of transport with adequate carrying capacity and frequency that support basic needs and the main traffic flows.

f) Promote, regulate and enforce quiet, use-efficient and low-polluting technologies, including fuel-efficient engine and emission controls and fuel with a low level of polluting emissions and impact on the atmosphere and other alternative forms of energy.”

1.4. Material and Methods

1.4.1. Delimitation

I have chosen to delimitate the study to focus on what I believe is one of the key aspects of sustainable urban planning; a well integrated land-use and transportation system. Although the main focus is on the transportation system I will depart from the relevant articles from UN HABITAT II chapter 7 article 151 on actions to achieve sustainable transportation in human settlements. In the practical examples I will focus on the variables presented in section 1.4.2. In addition to the variables in following section I have also included other aspects which I find relevant to help explain certain factors as the two cases are unique.

1.4.2. Operationalization

In order to compare the UN HABITAT II article 151 I have selected following variables that I will include in the case studies of Curitiba and Portland;

1. Population density
2. Zoning policies
3. Modes of transportation
4. Public transportation usage rate
5. Automobile usage
6. CO₂-reduction plan

1.4.3. Material

The study is primarily based on literature studies and scientific reports on urban planning. The main sources used for the practical part of the paper are from official websites from the city of Curitiba and Portland and other political institutions. I consider the sources as reliable.

1.4.4. Validity and reliability

The operationalization of the aspects studied and making it measurable is difficult particularly since the cities differ in many aspects. This is also a common problem for policymakers today. In this case the selected variables I have chosen are to be viewed as a frame though there is not enough room for measuring all aspects. I have selected what I believe are key components for measuring the sustainability of an integrated land-use and transportation
system to make it comparable. Another limitation is finding adequate facts about the cities. This affects the outcome of the analysis as not all variables could be measured and the information used is not up to date.

1.5. Disposition

The theoretical aspect of the sustainable human settlements and the eco-city will be studied in the next chapter in order to clarify the meaning of respectively concept and the differences between them. The impact of the modern city on the environment is also studied in this chapter to better enlighten the current and future problems of cities and the additional strain caused by rapid urbanization and population growth. The third chapter presents the practical aspect in the case studies of Portland and Curitiba. In the fourth and analyzing chapter I will compare UN HABITAT II article 151 with the case studies using the variables as a background. In chapter five I will discuss the results from the analysis before the conclusion and reflections in the final chapter.

2. Urban Development

The development of cities has been based on ideas that natural resources such as air and water are free commodities. As a consequence the origins of many global environmental problems caused by air- and water pollution are related to cities and consumption patterns. The common problems urban areas are faced with are overcrowding, environmental issues and related health issues, social disruption and inadequate housing and infrastructure.

2.1. Problems

The development pathway with a rapid urbanization has contributed to a change from local to global production systems. In addition people today are also more dependent on ecosystem services then at any other time in history particularly developed nations as they require a high input of material and energy to maintain themselves, affecting ecosystems and their life support functions. Due to the fact that urban populations do not produce much of what they need to sustain themselves the ecological foot print of the city is high. Studies showed that the city of Vancouver depends on a productive output of a land area 180-200 times larger than the political boundaries of the city to maintain its population. As a consequence the lifestyle and development of the modern society has contributed to the global environmental problems the human society is faced with today such as; climate change, air- and water pollution, toxic chemicals and hazardous wastes, conservation and loss of biodiversity, deforestation, and environmentally related health problems.

Demographic patterns and related issues

One of the greatest problems governments are faced with today is handling the rapid urbanization and fast growing populations. Today the majority of the world’s populations live in urban areas. In developed countries this has been a reality for decades while in

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21 Ooi Giok, 2005, p 13-14
22 ibid
23 Ooi Giok, 2005, p. 9
24 Ooi Giok, 2005,p. 1
25 Arnstberg, 2005, p. 14
developing nations some populations are still predominantly rural although the rate of urbanization and population growth is the highest in these areas.  

About 88% of the population growth occurs in urban areas from which 90% takes place in mega cities in developing countries. The consequences in developing nations are severe due to practical issues of insufficient infrastructure and lack of means to make improvements. The socioeconomic situation generates informal settlements due to high poverty rates and unemployment.  

The population is a factor of concern to urban sustainable development due to the efficiency which cities are accommodating the people.

In the globalizing world the population distribution patterns will become increasingly complex as well as the impact on the environment from the population's demand on resources and materials. Another concern of the high density of people is quality of life particularly the space available for open areas and parks. Even the ecosystems in the city is producing services which until recently haven't been recognized. The important aspect in sustainable development planning is to include the balance between resource use and the population where the population density could be viewed as a measure of the efficiency of the settlement based on consideration of the territorial footprint of the city populations.

**Health issues**

The link between environment and human health is related to the exposure of environmental hazards, natural and human caused. Pollutions from human activities are the major contributor of health problems related to foremost air and water but also soil and food. Air pollutions in particular are causing severe health effects such as respiratory diseases. Water pollutions from unsanitary water are generates the spread of waterborne diseases. Human activities can also intensify natural hazards through the modification of land when constructing water supply or drainage, and from intense agriculture and horticulture practices which erodes the soil.

**Environmental issues**

The issue of climate change and the emissions of greenhouse gases (GHG's) is the most severe environmental problem of today where transportation is the major contributor. Finding an effective transportation infrastructure to limit GHG emissions is a major challenge for sustainable development. Another severe problem is the fact that the worlds population are using up natural resources in a faster pace then it takes the earth to regenerate it. In addition the trends show a strong correlation of growing incomes and the increasing volume of non-hazardous solid waste. It is therefore important to recognize this strong link between the processes of production and consumption in order to develop strategies for reducing the waste generated and to create waste recycling initiatives for consumers and producers.

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27 Arnstberg, 2005, p. 14
28 Ooi Giok, 2005, p. 137-138
29 Daily, 1997
30 Ooi Giok, 2005, p. 148
31 Ooi Giok, 2005, p. 175-176
32 Ooi Giok, 2005, p. 185
33 Ooi Giok, 2005, p. 175-176
34 Ooi Giok, 2005, p. 150
35 Ecological Footprint Overview
36 Ooi Giok, 2005, p. 162-163
37 Ooi Giok, 2005, p. 173
2.1.1. Sprawl and Mega cities

Urban sprawl is characterized by monofunctionality where housing, offices, malls and industrial areas are separated in clusters, also called monofunctional clusters. This type of development is especially prominent in the USA. A part of the explanation to why these monofunctional cities develop is due to the market and the lower costs of large-scale production compared to mixed-use developments. The greater risks involved with mixed-use development also affects the democratic process since it includes more actors with interests in the development plan. This can affect the realization of the project. Laws that supports sprawling development! The major change that sprawl brings is that cities are no longer planned for people but rather for auto-mobiles. Consequently, sprawl increases commuting and reduces the amount of public spaces. It also exploits vast areas of land in an inefficient way contributing to major habitat losses. The problems when trying to solve issues of urban planning such as sprawling lays in the fact those cities are economical systems which are dependent on their growth potential. In turn this is stressed by national governments as the success of cities is viewed as an indicator of the success of nations in the global economy. There is an important distinction to make between growth and sprawl, as urban growth often is viewed as a sign of increasing welfare.

Today some cities are losing citizens at the same time as sprawl increases. The average shrinkage rate of the cities in the world is 25 %. For instance 1970-1990 the population in the city of Detroit decreased by 8 %, at the same time the political boarders of the city increased by 28 %. Another example is Kansas City which between 1990 and 1996 increased the city area by 70 %, when during the same time the population increased by 5 %. This has been the over all trend for cities in the US. The average population density in US cities 1970 to 1990 decreased by 23 % at the same time the road mileage doubled. 38 Often the focus of sprawl developments is on developed countries in west but this development is also occurring in less developed countries. The city of Lagos in Nigeria has 14 million inhabitants and is sprawling in a rate which according to the estimates made by the UN will make Lagos the largest city in the world in 20 years. 39 In contrast to sprawl is the increase of mega-cities, with populations over 10 million. Most of the mega-cities are situated in developing countries where poverty is widely distributed 40

2.2. Sustainable Urban Development

2.2.1. Sustainable Human Settlements

The first UN Conference on Human Settlements where held in Vancouver in 1976 and resulted in the Vancouver Declaration on Human Settlements. It addresses the issues of inequality between North and South as well as environmental degradation with a main focus on improving the quality of life. Since then UN have had other conferences that stressed important aspects of social, economical and environmental issues, which are summarized in the HABITAT Agenda and presented at the HABITAT II Conference in Istanbul, Turkey 1996. 41 At the United Nations Conference on Environment and Development 1992 in Rio de Janeiro, Brazil a framework on sustainable development of human settlements where established. It also addresses the components of the sustainable development and the

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38 Arnsberg, 2005, p. 55-56
39 Arnsberg, 2005, p. 14
40 Ooi Giok, 2005, p. 137-138
41 UN HABITAT
necessary actions and means at local, national and international levels for a successful implementation. In the Global Plan of Action following aspects of sustainable human settlements are presented;

- Sustainable land use,
- Social development; eradication of poverty, creation of productive employment and social integration,
- Population and sustainable human settlements development,
- Environmentally sustainable, healthy and livable human settlements,
- Sustainable energy use
- Sustainable transport and communication systems,
- Conservation and rehabilitation of the historical and cultural heritage,
- Improving urban economies,
- Balance development of settlements in rural regions and
- Disaster prevention, mitigation and preparedness, and post-disaster rehabilitation capabilities.  

2.2.2. The eco-city concept

The eco-city concepts have been influenced by other movements that developed over the same period such as; healthy communities, appropriate technology, community ecologic development, social ecology, the green development, bioregionalism, native world views and sustainable development. The eco-city is a framework which connects these ideas. The main principles for developing eco-cities are presented below:

1) “Revise land use priorities to create: compact, diverse, green, safe, pleasant, and vital mixed use communities near transit nodes and other transportation facilities,

2) Revise transportation priorities to favor foot, bicycle, cart, and transit over autos, and to emphasize “access by proximity”; 

3) Restore damaged urban environments, especially creeks, shore lines, ridge lines, and wetlands,

4) Create decent, affordable, safe, convenient, and radically and economically mixed-housing,

5) Nature social justice and create improved opportunities for women, people of color and the disabled,

6) Support local agriculture, urban greening projects and community gardening;

7) Promote recycling, innovative appropriate technology, and resource conservation while reducing pollution and hazardous wastes,

8) Work with business to support ecologically sound economic activity while discouraging pollution, waste, and the use and production of hazardous materials,

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42 UN HABITAT II
43 Roseland, 1997
9) Promote voluntary simplicity and discourage excessive consumption of material goods,

10) Increase awareness of the local environment and bioregion through activist and educational projects that increase public awareness of ecological sustainability issues."

Finally, in contrast to the UN guidelines the eco-city concept has a wider approach to sustainability with a wider focus on fundamental changes including lifestyles. Yet the ideas are far undeveloped making it difficult for cities to apply in practice. The UN guidelines have a universal standard including written documents on guidelines for actions. The problem still remains that the definitions in the documents are too diffuse making it possible to interpret in a multitude of ways.

2.2.3. Sustainability Indicators

To translate sustainability into practice is a problematic phase. It is therefore important to identify the elements of sustainability. This is especially important to decision-makers due to the different interpretations of the concept of sustainability. One way is to assess and measure sustainability by applying Sustainability Indicators (SI’s). The indicators can be viewed as variables in order to make sustainable development applicable. The ideal indicator should be able to reduce large quantities of data to its simplest form of where it still retains the essential meaning of the questions asked of the data. The process of selecting SI’s is important in the progress to integrate sustainable development in concrete action plans. Important functions with SI's are;

1) Assess conditions and trends,
2) Be comparable across places and situations,
3) Assess conditions and trends in relation to goals and targets,
4) Provide early warning information,
5) Anticipate future conditions and trends; such as air pollution indicators?

Sustainability indicators have been focused on quantitative data which restricted the concept of sustainable development to numerical variables. But indicators can also be ordinal variables or ranks. The foci on quantifiable data of national states or local governments are due to the means and capacity; to conduct the necessary measurements and statistical analyses that are required to develop these indicators. Just as well as the Gross Domestic Product alone can’t assess the outcome of economic development, the concept of Sustainable development can’t be confined in numerical data. When selecting indicators the nature of the indicator as well as the hierarchal level has to be considered in order to make a right analysis. Another implication of sustainable development reports today is how specified the data presented should be. Since a more simplistic presentation could allow for a comparison. Another aspect that is important to include is the fact that the indicators are inter-linked; within and between systems. The inter-relationship between different indicators is therefore just as important as the indicators themselves. Crucial for the process of collecting data on indicators is transparency and that it can be easily understood, especially when data is compared between cities or states. Most research is based on a national basis not on a city-level which is why it is difficult for cities to address the sustainability problem. Time and spatial scale which needs to be included in the conception of sustainable development are neglected, partly due to the lack of capacity and skills which have been prominent in the case

44 Roseland, 1997
of urban-level indicators and could explain the low priority given to assessing sustainable development at different spatial scales. A spatial design of sustainable development is crucial if the concept should work in practice and in the policy process. The temporal aspect is also important due to the dynamic in the process of sustainable development.

Indicators

Often cities lack well coordinated environmental management strategies for sustainability. Introducing SI's would not only manage the environmental impact of urban growth but also ensure that growth is not on the expense of nature or ecological integrity locally or else where. Key indicators are air and water quality standards, particularly for cities where large concentrations of people live. These indicators have a considerable effect on the quality of life and the living standards. These are useful indicators as most cities are more likely to monitor some aspects of air and water quality. However, little effort has been made in understanding the process of tracking the effects it has on the urban environmental quality. It is more likely that urban governments adapt sectoral approaches in the monitoring of the urban environmental quality.  

3. Case studies; Portland and Curitiba

3.1. Portland

The metropolitan area of Portland includes five counties in the state of Oregon and one in Washington state and holds a total population of 1,928,009 people. The political boundary of Portland city covers an area of 376.5 km². It is located between the rivers of Willamette and Columbia and was originally a port city. Portland is the largest metropolitan area in Oregon and is the regional commerce center. During the late 1960's Portland experienced a rapid urban growth particularly at the Willamette Valley. As a result urban pollution and sprawl increased resulting in a declining livability. These where the major push factors during the influence of Governor Tom McCall which contributed to Oregon's planning revolution. The focus was to make land use state wide not just local. In the City of Portland there was a political will that also influenced the change from elected mayors and through civic engagement in urban growth issues.

3.1.1. Institutions and policies

A time line of relevant policies;

- 1972 The Downtown Plan
- 1973 Statewide Planning goals including Goal 14 and the establishment of an Urban Growth Boundary.
- 1983 The Regional Transportation Policy
- 1995, the 2040 Growth Concept.

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45 Ooi Giok, 2005, p. 109-110  
46 Gibson and Abbot, 2002  
47 Stephenson, 1999  
48 Gibson and Abbot, 2002  
49 Statewide Planning Goals  
50 2004 Regional Transportation Plan  
51 The Urban Growth Management Functional Plan
• 1996, the Urban Growth Management Functional Plan.\textsuperscript{52}
• 1997, the Regional Framework Plan.\textsuperscript{53}

The first initiative to improve management issues in Portland was through the Downtown Plan 1972 with a complement in the Central City Plan 1988. The plan was influenced by the cooperation between citizen activists, city officials and businesses with the main points where;

- Improving public transit possibilities,
- Establishment of parking garages,
- Retail reinvestment and
- Creating attractive public spaces and streets capes\textsuperscript{54}

In 1973 the nation's first comprehensive planning act the Statewide Planning Goals was established during the influence of Governor McCall. The document requires local governments to formulate comprehensive plans to meet the goals. As a result Metro was established in Portland 1978 with the authority over the management and design of an urban growth boundary (UGB).\textsuperscript{55} Metro comprise of a six member council and is the only elected multipurpose regional government in the US with an increasingly important political role. The UGB has worked to increase density of the urban development as a response to the sprawl development in post-war America.\textsuperscript{56} The UGB marks the separation between rural and urban and defines land that can support urban services such as roads, sewers, and water lines. Keeping development within the boundary protects farm and forest land from sprawl.\textsuperscript{57}

The 2040 Growth concept was adopted in 1995; it defines regional growth and development in the Portland region. It sets the direction for implementing policies in Metro’s functional plans and the regional framework plan. The time span covers 50 years starting at 1990. It’s a plan that includes land-use and transportation policies that will allow the Portland metropolitan area cities and counties to manage growth, protect natural resources and make improvements to facilities and infrastructure while maintaining the regions quality of life. An additional document was adopted the Urban Growth Management Plan was adopted in 1996 as tool in to help meet the 2040 growth concept, with more specified strategies.\textsuperscript{58}

\textsuperscript{52} ibid
\textsuperscript{53} The Regional Framework Plan
\textsuperscript{54} Gibson, and Abbot, 2002
\textsuperscript{55} Stephenson, 1999
\textsuperscript{56} Gibson and Abbot, 2002
\textsuperscript{57} 2040 Growth Concept
\textsuperscript{58} Urban Growth Functional Management Plan
In 1996 Metro adopted an *Urban Growth Management Functional Plan* to allocate 500,000 new residents and jobs anticipated by 2017 within the USB. According to a charter of 1992, local jurisdictions must modify their own zoning and land use regulations to implement functional plans. The objectives of the Plan include: (1) housing and job targets for each of the area’s 24 cities and incorporated portions of three counties that will require higher overall densities; (2) requirements for minimum development densities for new housing averaging 80% of the zoned maximum; (3) exclusion of big box retailing from industrial zones; (4) minimum and maximum parking ratios for new development; (5) a requirement that Metro develop specific affordable housing goals; (6) a provision for UGB expansion if enough communities demonstrate that the targets won’t work.  

The Regional Framework Plan was adopted in 1997 and amended in 2005. The framework covers all policies and requirements on land-use adopted by Metro including:

1. Regional transportation and mass transit systems;
2. Management and amendment of the urban growth boundary;
3. Protection of lands outside the urban growth boundary for natural resource, future urban or other uses;

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59 Gibson and Abbot, 2002
4. Housing densities,
5. Urban design and settlement patterns;
6. Parks, open spaces and recreational facilities;
7. Water sources and storage;
8. Coordination, to the extent feasible, of Metro growth management and land use planning policies with those of Clark County, Washington; and

The Regional Transportation Plan (RTP) is adopted by Metro and revised every four years since 1983. The plan sets the direction for regional investments of transportation options which has to be in the plan to receive federal and state funding. The RTP guides investments in the region’s transportation system to reduce congestion, build new sidewalks and bicycle facilities, improve transit service and access to transit and maintain freight access. The plan recognizes that most travel in the region will continue to be by auto but also provides with alternatives to driving alone such as transit, walking and bicycling, commuter rail and carpooling. In 2000 the Office of sustainable Development was created out of the former solid waste and recycling Division, the Bureau of Environmental Services and the Energy Office. The purpose of the office is to integrate sustainability in the political institutions and provide leadership.

Public involvement
Portland has a history of public participation and is known for its many avenues of neighborhood and civic input where the driving forces between the Downtown Plan and the later Central Plan was a result of. A neighborhood association was established in 1974 to serve as a forum for local neighborhoods (later the Office of Neighborhood Involvement). An alliance was also created in Portland between local business and residents to work towards win-win solutions for all parties involved such as creating concentrated job possibilities and improve transit.

3.1.2. Land use pattern

The first development of Portland was at the west bank of the Willamette River. Today this is the central business district. From a radial circle three miles from the retail core includes all the major important regional institutions and civic facilities. From the 1950's and forth the development of sprawling suburbs increased greatly. The introduction of UGB halted the development by keeping the development within the boundary while establishing a denser development with transit accessibility and through the reuse of downtown areas. The city of Portland has adopted an “industrial sanctuary” policy to protect established warehouses and light industrial districts close to the central business core, excluding housing and strip malls to hold industrial workplaces close to potential workers. Mixed-use urban centers inside the urban growth boundary are one essential aspect of the 2040 Growth Concept. These are higher density centers of employment and housing that are well served by transit to form compact areas of retail, cultural and recreational activities in a pedestrian-friendly environment. During the 1970's Portland built 40 km of rail for light rail with the ambition.

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60 The Regional Framework Plan
61 2004 Regional Transportation Plan
62 Metro Transportation Planning
63 The City of Portland Office of Sustainable Development
64 Gibson and Abbot, 2002
65 ibid
66 Stephenson, 1999
to expand with 100 km the next 30 years. Next to the major train stations mixed-use housing where established.\textsuperscript{67}

\textbf{Changes related to land use and population growth}

The pressure of development has caused the limits of the 2040 Plan to exceed (figure: 3.3.). The plan anticipates that the UGB will be expanded but with small incremental. The limitation supply of land in combination with a rapid population growth has affected the goal of affordable housing. Another problem caused by the high housing prices has contributed to a scarcity of low income houses and a need for preserving existing houses from becoming market-rate which resulted in conflicting interests with private developers.\textsuperscript{68}

\textbf{Figure 3.2.} Portland Metropolitan Region 2040 from Metro

Facts about land-use and density;

- The metropolitan population increase by 25 % 1980-1994 at the same time urban development increased by 16 %.
- Population density was 1,533/km\(^2\) in 2000
- Density of dwelling units increased from 5-8 dwelling units/acre, 1994-1998.
- The average lot size shrank by 50 % 1978-1998.

\textsuperscript{67} Arnstberg, 2003 p. 60-61
\textsuperscript{68} Gibson and Abbot, 2002
• In the 1990's 37% of the new jobs were created at infill's and redevelopment sites.  

3.1.3. Public transportation system

The public transportation system is managed by Tri-Met covering three counties. The *Tri-Met* operates a bus system and a MAX light rail service. At the downtown area there is a fare less square to encourage the use of transit down town.

![Tri-Met System map from the Tri-county Metropolitan Transportation District of Oregon.](image)

**Figure 3.3.** Tri-Met System map from the Tri-county Metropolitan Transportation District of Oregon.

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69 Gibson and Abbot, 2002
70 ibid
71 Tri-Met
Trends of commuting in Portland have been compiled in following tables;

**Table 3.1. Commuting statistics from the US Census Bureau**

<table>
<thead>
<tr>
<th>Transportation mode:</th>
<th>Portland number</th>
<th>Portland percentage</th>
<th>US percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public transportation (incl. taxicab)</td>
<td>33,410</td>
<td>12.3 %</td>
<td>4.7 %</td>
</tr>
<tr>
<td>Motor vehicle</td>
<td>204,688</td>
<td>75.6 %</td>
<td>88.0 %</td>
</tr>
<tr>
<td>Walking</td>
<td>14,192</td>
<td>5.2 %</td>
<td>2.9 %</td>
</tr>
<tr>
<td>Working from home</td>
<td>11,780</td>
<td>4.3 %</td>
<td>4.3 %</td>
</tr>
</tbody>
</table>

**Table 3.2. Statistics of the average travel time to work from Epodunk**

<table>
<thead>
<tr>
<th>Transportation mode:</th>
<th>Travel time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average travel time to workplaces</td>
<td>23 min</td>
</tr>
<tr>
<td>Using public transportation</td>
<td>37 min</td>
</tr>
<tr>
<td>Using other transportation</td>
<td>21 min</td>
</tr>
</tbody>
</table>

**Street design**

The Metro has published ideas on street design in the livable streets program which supports the implementation of 2040 Growth Concept by providing tools to better integrate street design to encourage different modes of transportation. The Boulevard Program from 1998 is focused on redesigning the streets to promote multi purpose use with bicycling paths extended side-walks, public transportation and well planned streets for automobile usage. The goal is to create safe and healthy streets by preventing congestion and encouraging alternative modes of transportation to improve the livability.  

Below is a cross section of a boulevard design from Metro;

![Boulevard design](image)

**Figure: 3.4 Boulevard design**

**3.1.4. Problems**

In fact, nearly 90 % of all transportations are still made by automobiles. In addition, there has been no budget used for expanding and improving roads resulting in more traffic congestion even compared to other North American cities. With the infrastructure in place it’s no guarantee it will be used. A roadway congestion index show that congestion is more likely to occur where there is a higher density of development. The costs of congestion’s are a major issue since the region’s economy is transportation dependent. Despite the development of and improvement of the infrastructure Portland will not be able to

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72 Street Design Policies, Implementing the regional transportation plan, 2001
73 Arnstberg, p.60-61
74 Highway & Motorway Fact Book
75 Arnstberg, p. 61-62
accommodate the projected growth in freight and general traffic with the current system. In turn this will significantly impact the region’s ability to maintain its growth. The potential loss is valued at $844 million annually. By an additional regional investment in transportation a profit of $2 for each dollar spent can be generated.\textsuperscript{76} The problem of applying Goal 5, one of the 14 state goals of planning, urges the balance between economic growth and natural resources. Local governments should “conserve open space and protect natural and historic resources for future generations". The struggle between growth and preservation is prominent with development interests demanding the expansion of UGB and the rising land values are placing open space at premium. The Metro have problems implementing tools to manage and protect green spaces and environmentally sensitive land from development. Since 1990, the development pressure have resulted in construction on sensitive habitats something that will continue unless enough means will be provided to allow for the full implementation of the political tools.\textsuperscript{77}

### 3.2. Curitiba

Curitiba is situated in the South of Brazil in the temperate climate zone.\textsuperscript{78} The cities political borders cover an area of approximately 435 km\textsuperscript{2}.\textsuperscript{79} Curitiba is the capital city of Paraná with a metropolitan region consisting of 25 municipalities holding a population of 2.5 million people. Since post WWII Curitiba has become a center for economic activities mainly due to its central location and regional transportation network. In 1950-1980 Curitiba was the fastest growing Brazilian city with the same poverty and inflation rates as other significant Southern cities in Brazil. At this time most Brazilian cities developed around the automobile by investing in heavy infrastructure. Unlike other cities Curitiba took a different path despite the pressure from rapid growth, inflation and poverty to restructure the city to enable a controlled urban growth.

![Figure 3.5](image.png)

**Figure 3.5.** Curitiba city including the informal settlements and the collection stations for the garbage purchase program (3.2.4.).

\textsuperscript{76} The Cost of Congestion to the Economy of the Portland Region, 2005  
\textsuperscript{77} Stephenson, 1999  
\textsuperscript{78} Rabinovitch and Leitmann, 1993  
\textsuperscript{79} Brazilian Institute of Geographical Statistics, 2006
3.2.1. Institutions and policies

In 1943 the Agache Plan was designed by Alfred as an attempt to manage urban growth in the city. It was a spoke-and-wheel design with the focus of a central business area from which access streets where connected to radial avenues. This design failed to include the rapid expansion of auto-mobiles during the 1950’s. The plan was never fully implemented except from the ideas about radial avenues due to lack of funding. The consequences of the delay of the implementation of the Agache Plan caused the city to expand beyond its physical limits. As a response the Public Administration of Curitiba developed a preliminary urban plan for Curitiba. This was the base from which the Curitiba Master Plan was developed during the influence of Brazilian consulting firms. The Curitiba Research and Urban Planning Institute, IPPUC was established in 1965 to coordinate the implementation of the Master Plan. The main objectives of the Plan were to manage transportation, limit the physical expansion of the central city focus on;

• Changing the radial urban growth trend to a linear through integration of the road network,
• Transportation and land use,
• Decongestion of the central area and preservation of the historic center,
• Demographic control and management,
• Economic support to urban development and Improvement of the infrastructure.

The implementation of the Curitiba master plan was carried out by IPPUC in two phases;

1. The pre-implementation phase, 1965-1970; during which the different demands from different groups of society on the development of Curitiba where considered. The IPPUC was established as a coordination platform for the implementation of the plan as well as a forum for discussion.


In cooperation with Curitiba Metropolitan Region Coordination (COMECC) they had the responsibility to secure a long-term development of the system. The COMEC is operating under the governor of Paraná focusing on following areas; land use and control, solid waste treatment and public transportation. The public transit system is managed by Urbanization of Curitiba (URBS), a publicly administrated privately funded company which in cooperation with IPPCU has the responsibility for land use development, maintenance and for expanding the system. 

Time line of relevant laws and policies:

• 1965, The Curitiba Master Plan
• 1975, Law 5234 (an amendment of Law 4199) defines the structure of land use through six basic zones; Central, Residential, Industrial, Service, Agriculture and Special. It also defines building parameters for the density development. Law Decree 880 defines uses and densities in each zone according to specified tables based on activity, nature and scale.
• 1979, Law 4773 established the zoning of CIC, Curitiba Industrial City

80Rabinovitch and Leitmann, 1993
81Adielsson and Friberg, 2001
• 1979, Introduction of the social fare

The main land use legislation of Curitiba is to be found in; Legislacao do Uso so Solo, a comprehensive framework containing 66 laws and decrees from 1969-1992. These texts do not regulate all aspects of land use but is rather the fundamental core of which land use policies are based on.

Public participation
Democracy is a relatively recent phenomenon in Brazil and therefore the general form of governance is through a rigid top-bottom perspective with a neglecting public participation in particularly among the poor who are without the basic needs. There is however a grass roots movements of significance in Curitiba, mainly through neighborhood associations working on changing that.

3.2.2. Land-use pattern

URBS founded in 1963, together with Curitiba Research and Urban Planning Institute, IPPUC are the authorities responsible for land-use development, maintenance and extension of the system. A road hierarchy was adopted together with the growth corridors mentioned above. The structure is composed by a triple road system, with two lanes restricted to express buses on the central road. Parallel to these lanes are two local lanes in opposite direction to allow for local traffic to pass through the city. In 1982, the structural axes had expended into five and where completed with feeder lines and inter-district lines. In addition zoning laws where adopted to control the growth around these axes, keeping a high-density development to reduce sprawling. The zoning laws are based on the type of usage; e.g. residential, commercial, industrial, and density of development. The development along the structural axes is permitted to have a floor area six times larger then the plot size. The density decreases with the distance from the public transit system. This has resulted in eased traffic and has made it possible to convert down town streets into pedestrian. The structure of the city is based on a road hierarchy, where each road is assigned a function and importance;

• Priority links that connects to the structural axes,
• Collector streets with commercial activities and
• Connector streets linking the structural streets with the industrial city, CIC.

The key concept is ease, through a well planned network of buses and routes that are inter-linked. There is large bus terminals at the end of each of the five structural axes with express buses for transportation with inter-district and feeder and inter municipal buses. The municipality has through land accusation along the axes developed 17 000 high density low-income housing projects.

Curitiba Industrial City
From the beginning of the 1970s Curitiba began its transition from an agriculture based to an industrial based city. This is when the CIC, Curitiba Industrial City, was established. CIC occupies an area of 40km², located on the western edge of the city to reduce heavy pollutions

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82 Rabinovitch and Leitmann, 1993
83 ibid
84 Adielsson and Friberg, 2001
85 ibid
within the city, and attract industries to one location. Today 400 some industries are located at CIC, which employs 20 % of the cities employees. The land use policy of Curitiba is based on legislatively designated special areas that merit integration with transportation system or require special protection. The areas are geographically bounded by roads, zones within a district, or by a whole district with different characteristics. The policies of green spaces in Curitiba is strongly linked to drainage and flood controls. A guiding principle has been to transform flood prone areas into parks and protect streams at high risk.

Table 3.3. Demographic pattern 1940-2006, Brazilian Institute of Geography and Statistics

<table>
<thead>
<tr>
<th>Year</th>
<th>Curitiba</th>
<th>Yearly Increase %</th>
<th>Metro Region</th>
<th>Yearly Increase %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1940</td>
<td>140,656</td>
<td>N/A</td>
<td>202,956</td>
<td>69.30</td>
</tr>
<tr>
<td>1960</td>
<td>361,309</td>
<td>10.0</td>
<td>510,539</td>
<td>70.77</td>
</tr>
<tr>
<td>1980</td>
<td>1,024,975</td>
<td>6.8</td>
<td>1,440,626</td>
<td>71.15</td>
</tr>
<tr>
<td>1990</td>
<td>1,608,151</td>
<td>5.7</td>
<td>2,250,959</td>
<td>71.44</td>
</tr>
<tr>
<td>2006</td>
<td>1,788,559</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

3.2.3. Public transportation system

In 1974 the mass transportation system began operating through Urbanization of Curitiba, URBS. The choice of transportation mode was the affordable solution, a bus system. By using buses the existing infrastructure could be used.

Table 3.4. Cost estimation of different modes of transportation

<table>
<thead>
<tr>
<th>Mode of Transportation</th>
<th>Cost Estimation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground metro system</td>
<td>90-100 million US$ / km</td>
</tr>
<tr>
<td>Light railway</td>
<td>20 million US$ / km</td>
</tr>
<tr>
<td>Curitiba's direct route bus way</td>
<td>0.2 million US$ / km</td>
</tr>
</tbody>
</table>

The services provided by URBS are Express buses, Inter-district buses and conventional (feeder) buses.

Figure 3.6. Curitiba Bus system, GFDL

86 Rabinovitch and Leitmann, 1993
The direct bus system was introduced in the express bus routes in 1991 to further improve the efficiency. It has fewer stops with tubular stations to reduce boarding and unloading time which has increased the efficiency with about 3, 2 times compared to conventional bus systems. In 1992 bi-articulated buses were introduced on the line with a capacity of 270 passengers. The cost of public transportation is about 10 % of the income and the fares within Curitiba has one set price regardless of the distance traveled. This was introduced in 1979 to make the system affordable. There is also a policy where citizens should not have more than 400 m from a transit station.

Table 3.5. Commuting statistics

<table>
<thead>
<tr>
<th>Commuting with public transportation</th>
<th>75 % (1.3 million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct route bus commuters that used automobile before</td>
<td>28 %</td>
</tr>
<tr>
<td>Decrease in fuel consumption:</td>
<td>25 %</td>
</tr>
</tbody>
</table>

The capacity of the integrated transport network;
- 340 routes,
- 1.9 million journeys a day,
- The entire network covers 1 100 km of roads with 60 km dedicated to buses.

3.2.4. Problems

The socioeconomic situation with 4.9 % of the population classified by the Curitiba Social Development Secretariat as being in absolute poverty and 28 % as priority in need of attention. Curitiba has introduced two social aide programs; garbage that is not garbage and the garbage purchase program where garbage can be exchanged for food at collection stations. An essential part of sustainable development is public participation something that is a recent phenomenon in Curitiba even though the city is distinguishing itself as being a city of the people.

The transportation in Curitiba is developed in the municipality of Curitiba and not in the surrounding municipalities where most poor people live. As a result the system has been criticized for being developed for the middle class. Since the introduction of the transportation system there has been a population increased dramatically in the metropolitan area to a point where the public transportation is saturated. The owner ship and usage of private automobiles have increased resulting in increased congestion patterns. Another factor that affects the automobile market in Curitiba is the relocation of the national automobile industry to Curitiba Industrial City. The transportation system in Curitiba is viewed as a green solution. However, only few attempts to improve the technology have been made through the experiment with fuels. The URBS has used a mix of soy oil and ethanol with diesel but the improvements are only about 5-10 %. Although the technology in alternative fuels are well developed in Curitiba and constitutes of a large share of the produced automobiles.  

88 Rabinovitch and Leitmann, 1993
89 The City of Curitiba
90 Adielsson and Friberg, 2001
4. Analysis

The following table 4.1 should be viewed as a background to the analysis of the UN HABITAT II article 151 in section 4.2. I have also divided the analysis in two parts as the studied paragraphs are overlapping.

4.1. Table

Table 4.1. Compiling table of variables

<table>
<thead>
<tr>
<th>Variable:</th>
<th>Curitiba:</th>
<th>Portland:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes of transportation</td>
<td>Bus</td>
<td>Bus, Light rail</td>
</tr>
<tr>
<td>Rate of utility</td>
<td>75 %</td>
<td>12.3 %</td>
</tr>
<tr>
<td>Rate of automobile usage</td>
<td>&lt; 25 %</td>
<td>75.7 %</td>
</tr>
<tr>
<td>CO₂-reduction plan</td>
<td>N/A</td>
<td>Adopted in 1992</td>
</tr>
<tr>
<td>Population density</td>
<td>4 159.4/ km²</td>
<td>1, 533/ km²</td>
</tr>
</tbody>
</table>

4.2. Analysis

a) Support an integrated transport policy approach that explores the full array of technical and management options and pays due attention to the needs of all population groups, especially those whose mobility is constrained because of disability, age, poverty, or any other factor.

b) Coordinate land-use and transport planning in order to encourage spatial settlement patterns that facilitate access to such basic necessities as workplaces, schools, health care, places of worship, goods and other services, and leisure, thereby reducing the need to travel.

c) Encourage the use of an optimal combination of modes of transport, including walking, cycling and private and public means of transportation, through appropriate pricing, spatial settlement policies and regulatory measures.

Portland

The policies on integrated land-use and transportation systems have been implemented during the influence of public participation and a political engagement to improve urban planning. The transit services offered by Tri-Met are the MAX light rail and a bus system. The map indicates a well distributed system although there is no information on the efficiency of the system. Along the transportation infrastructure dense mixed-housing development has been developed. The utility rate of the public transit system is 12.3 % with most commuting made by private owned automobiles. In the downtown area there is a zone where public transportation is free. There were no prices found on the fares. The city of Portland admits to the fact that the current system is not enough to accommodate the necessary needs to continuing growth. Trends also show that dense mixed-use developments in relation to transportation systems have increased traffic congestion. There have been some incentives to encourage other modes of transportation such as walking and bicycling through the boulevard design.
**Curitiba**
The political engagement to improve urban planning dates back to the 1940's when the first plan was developed. Since then the elected mayor of Curitiba has been engaged in the implementation of the Curitiba Master Plan, a long and well planned process indicated by the twenty year time span of the implementation phases. Curitiba is structured around five axes with complementing zoning laws to maintain a dense development around the axes. This has been the major contribution to the efficient use of integrated land-use and transportation resulting in a 75 % usage rate of public transit. With the increased population growth since the plan was implemented the transportation system has today reach a point of saturation. There is also an increased usage of automobiles contributing to traffic congestion at rush hours. Even with the recent improvements made by introducing the direct route bus system and bi-articulated uses it is not enough to accommodate the demand. There was no information found on other transportation modes. The development of the transportation system is restricted to the municipality of Curitiba affecting the poorest people living in the surrounding municipalities with a limited access to transportation. There is however a social fare with one set price on the transit system regardless of the distance traveled.

d) Promote and implement distinctive measures that discourage the increase of private motorized traffic and reduce congestion which is damaging environmentally, economically, and socially, and to human health and safety, through pricing, traffic regulation, parking, and land-use planning, and traffic abatement methods, and by providing or encouraging effective alternative transport methods, particularly to the most congested areas.

e) Provide or promote an effective, affordable, physically accessible and environmentally sound public transport and communication system, giving priority to collective means of transport with adequate carrying capacity and frequency that support basic needs and the main traffic flows.

f) Promote, regulate and enforce quiet, use-efficient and low-polluting technologies, including fuel-efficient engine and emission controls and fuel with a low level of polluting emissions and impact on the atmosphere and other alternative forms of energy.

**Portland**
The city has developed an infrastructure with integrated dense mixed-used housing in relation to transit systems. Even with the infrastructure in place the trend as indicated by the national Traffic Congestion Index show increased traffic congestion in relation to dense mixed-use development. The usage of private owned automobiles is problematic, with a lack of incentives to encourage alternative transportation modes and reduce the automobile usage. A common problem in Portland is the fact that the growth of the region is dependent on the transportation sector. There is also a risk that the cost of traffic congestion could limit the growth potential. This is also a problem for the CO\textsubscript{2}-reduction plan. There was no information found on the efficiency of the transportation system or the technology used.

**Curitiba**
The solutions with the establishment of Curitiba’s bus system are recognized as a green solution. It was also the most affordable option of transportation mode according to table 3.4. The technological improvements have been limited and the changes made with the fuel contribute with an improvement of 5-10 %. Brazil has the technology in place to develop more efficient solutions as a major share of the produced automobiles are adjusted to alternative fuels. There is no current incentive to reduce automobile usage and no information has been found on planned CO\textsubscript{2}-reductions. The traffic congestion pattern has increased
steadily at rush hours particularly since the 1990's in relation to the increase of private owned automobiles. The study also shows that with the introduction of the direct route bus system 28% of the automobile commuters change to the direct bus system.

5. Discussion

A key aspect in both cases has been the political engagement and processes which have contributed to the integration of policies regulating an integrated land-use and transportation system. Both cities have been strongly influenced by elected mayors. In Portland the political process has a tradition of public participation while in Curitiba the top-bottom perspective remain as a challenge for achieving sustainability as democracy is a relatively recent phenomenon due to the recent history of Brazil. The planning of Curitiba has a more holistic approach with well integrated strategies and defined goals. In contrast the planning and development of Portland seem to be more of a compartmental approach, even with the establishment of the sustainability office. In Portland the main challenge is the contradiction of a transportation dependent growth and the high costs of traffic congestion which could jeopardize future growth. The city of Portland promotes itself as being on the front of sustainability when in fact there are many improvements to be made within the transportation system alone;

- Incentives to encourage the usage of public transportation,
- Incentives to reduce private automobile usage,
- Improve transportation sector

The importance of dense development in relation to public transportation systems is clear in the Curitiba case, something other cities could learn from. This could be explained by the efficient zoning laws in relation to a well developed public transportation system. In Curitiba the 75% of the population utilizes the public transportation system in contrast to Portland where only about 12, 3% commute by public transportation. The time for commuting by public transit is longer then by automobile in Portland, which could affect the high usage of private automobiles. Trends also show that traffic congestion increases in Portland with the development of public transit and dense mixed-use developments. This could be a response to an inadequate transportation system and lack of incentives to use it. In Curitiba the public transportation system has reached a point of saturation where the current system can’t be developed further. The private automobile ownership has also increased causing traffic congestions in parts of the city. A fast growing economy and the relocation of the national automobile industry to CIC could affect this increase. The socio-economic issues also remain as a major challenge to Curitiba where 32,9% of the population lives in poverty. In turn this generates informal settlements and a social and cultural stress. Some of the improvements needed in Curitiba are;

- Increase public participation,
- Improve the carrying capacity of the transportation
- Improve the technology to reduce green house gas emissions,
- Incentives to reduce the usage of private owned automobiles.
- Poverty reduction

In brief, the overall problematic in the cities evolves around the infrastructure. In Curitiba the transportation system is not sufficient for the demand while in Portland there is a supply but the rate of usage is too low.
6. Conclusion

The concept of sustainable development is often criticized for being an oxymoron that can be interpreted in a multitude of ways to a point where the intention of the concept is lost. A problematic is also the discussion on sustainable development and its meaning which tends to paralyze the actions. There is currently no city that has been able to fully adopt the concept of sustainable development. The problematic to tackle problems from a holistic perspective is undermined by factors related to growth. This study focus on an integrated land-use and transportation system, one aspect of many that could be improved in the work towards a sustainable urban development. The study finds that in both cities strategies have been implemented to improve the transportation and integrate land-use through dense mixed-housing developments near the transportation systems. However, as the case of Portland indicates, having an infrastructure in place is no guarantee for an improvement there has to be incentives to encourage the usage of public transit. In contrast Curitiba has a high usage rate of public transit to a point where the system is saturated. An overall problematic in both cities is the increased usage of private automobiles. This is a result of improve living standards and the conflicting interests of sustainable urban planning practices and the interests of growth. In the case of Curitiba there is a local interest to support the national automobile industry which has been relocated to CIC. In Portland the growth potential is dependent on transportation at the same time strategies to reduce CO\textsubscript{2}-emissions has been adopted. The current transportation system is insufficient which has brought increased costs as a consequence of traffic congestions. Many other aspects need improvements in both Curitiba and Portland. The major challenge for Curitiba is the lack of public participation which is essential for achieving sustainability. Other technological advancements to reduce green house gas emissions could be improved. In Portland the challenge is to find solutions to the transportation dependence and find incentives for using public transportation.

To summarize, the study finds that to enable translation of sustainable development into practice the most important aspect has proved to be a long term political engagement with well planned implementation phases. The case of Curitiba symbolizes that it is possible for a third world city to improve urban planning with limited means. Although Curitiba and Portland are not fully following the universal guide lines in article 151 both cities have made improvements according to the article, where more can be done. The rebuilding of cities to improve sustainability should have greater foci especially with the earth’s population being predominantly urban and the issues it generates. This study focused on two medium- sized cities. Another type of unsustainable development is the growing mega cities, particularly in the less developed world. A major challenge for the future will be to manage the growth of these mega cities.
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