

**EVALUATION SYSTEM OF POLICY MEASURE ALTERNATIVES  
FOR A METROPOLIS BASED ON TRANUS  
FROM THE VIEW POINT OF SUSTAINABILITY**

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**Abstract:** A concept of sustainability has become a paradigm in urban development and there is also a belief that the sustainability could be achieved by compact development. Although there are many representation of compactness such as high density city, a mixed-used city, or transit oriented development, most of the discussions are only descriptive. This paper presents a quantitative analysis scheme that takes into accounts long range of time over generations of the residents. This approach of analysis has made the sustainability and compact city be discussed more clearly and effectively. The analysis is based on the empirical result of TRANUS Sapporo model. The simulation framework of decreased population in the later year is assumed based on the real population trend in Japan. It is found that the city will be sprawled if no appropriate policy measure is taken, but the city will become more compact and sustainable when combinations of appropriate policy measures are taken. The sustainability is evaluated from several aspects: as land-use, transportation, environmental, and, most importantly, financial viewpoints which consider the development cost.

**Keywords:** Sustainability, Compact City, Development Cost, TRANUS

## 1. INTRODUCTION

First of all, it is worth mentioning that the former version of this paper was included in the non-reviewed section of the proceeding of the 8<sup>th</sup> Conference in Computer in Urban Planning and Urban Management (Miyamoto, K., *et.al.*, 2003). The idea of sustainable city is a new paradigm for urban development in the world. The principle of sustainability is known as the development that meets the needs of the present without compromising the ability of the future generation to meet their own needs'. Furthermore, there has been growing support in the recent years, mainly in the industrialized countries since the idea of a compact city is one of the popular alternatives for urban form facing the sustainability paradigm (Jenks, et al., 1996; De Roo and Miller, 2000). This concept has emerged primarily in response to the

acknowledged need to find more sustainable models for towns and cities in the world. On the other hand, there are also various definitions for the compact city, although it is generally regarded as a high density and mixed-used city with an efficient public transportation system that encourages walking and cycling (Burton, 2002; Newman and Kenworthy, 1999; Breheny, 1997). However, both sustainable city and compact city have been mostly discussed qualitatively; but rarely discussed quantitatively. The present study has objectives to produce an analysis scheme for a city where the policy alternatives can be discussed quantitatively from the viewpoint of compactness and sustainability over generations of the residents as shown in Figure 1.

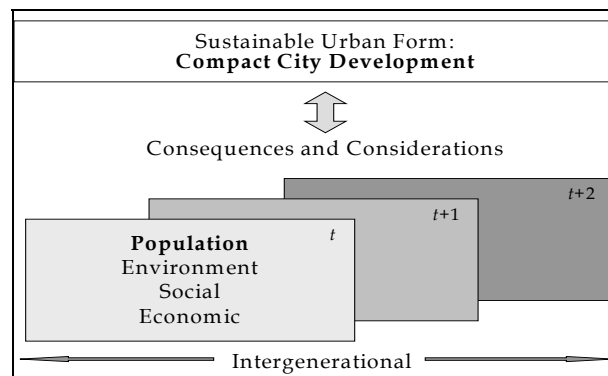


Figure 1 Compact City Development and Intergenerational Consideration

## 2. SUSTAINABLE AND COMPACT CITY

In this section the state of the art of 'Compact City' literatures is briefly summarized. It is now widely accepted, particularly in urban development, that the most important in the urban planning is a sustainability concept. It plays an important role in shaping and raising the quality of urban living conditions. Despite important recent progress in measuring urban environment quality and performance, we know little about what makes a city sustainable. We only keep that plans should address the economic, environmental and social health of the city and this task can only be accomplished by approaching each of these issues at different scales (see for example Marcotullio, 2001). Alberti (1996) has stated that there is no consensus on how to define sustainability, nor is there consensus on city size, form, and spatial of activities best facilitate the rational allocation of natural resources and minimize environmental impacts.

The search to make realization of urban form and sustainability is currently one of the most interesting tasks on the planning fields. The way that cities should be developed in the future, and the effect of their form can have on resource depletion and social and economic sustainability are central of these tasks (Jenks, et.al., 1996). One common answer seems to be used planning systems to achieve environment improvement, and in turn, use the planning systems to achieve greater urban compaction (Breheny, 1996). The arguments that compact city can be as a representative urban form to describe a sustainable urban form, have been commonly accepted that a degree of compactness, in any several forms, reduces demand for car travel. However, the indications are that the success, desirability, and achievability of compact city are equivocal (Thomas and Cousins, 1996).

## 2.1 Compact City and Smart Growth

Recent issues in worldwide urban planning strategy approach, mainly the idea of concentration activities in central city, as proposed both by compact city strategy and smart growth strategy receive greater supports to real actions, mainly in Europe and the US. The philosophy of both strategy are quite the same, that is based on assumptions and also greater facts that low density residential development in general, and large lot home sites in particular, are frequently held up as the epitome of inefficient, costly and wasteful for urban land use. Low density, dispersed development is often portrayed as harming the environment. In particular, the argument is made that this pattern of growth spreads air pollution as a result of more commuters and increased automobile trips. The anti-sprawl growth as well as the supporter of concentration growth's arguments are often heard to the effect that land use policies should limit growth to areas served by mass transit, and to encourage higher density developments within the areas so as to make public transit more economically viable. With greater public transit use, air pollution generated by cars would be reduced. Table 3.1. provides the comparison in detail between these two strategies, compact city and smart growth strategy.

Table 1 Comparison of the Concepts of Compact City and Smart Growth

Aspects	Compact City Strategy	Smart Growth Strategy
Country	Europe Australia Japan?	America Canada
Policy	Government regulation Top-down approach Local government initiative	Community based Bottom-up approach Nation wide movement
Core	Compactness	Anti-Sprawl
Definition	An urban policy strategy in line with sustainable urban development efforts that a process to perform higher density urbanization, mixed use development in central area, towards benefits in all dimensions of urban life	A movement to stop any dispersed development outside of compact urban and village centers along highways and in rural countryside that caused uneconomic of services and doubtful social value
Objectives	A concentrating positive growth and activities in appropriate areas, all at once avoid negative impacts on natural resources, and getting more benefits on social/economic factors by a compactness development process.	A desired pattern urban development that designate boundaries areas and create economic incentives for development to take place within an appropriate area together with a strong comprehensive plan, with broad public input for the best way of a community or region
Principles/ Attributes	Higher density Mixed use Process (concentration etc.) Urban scale (economics, structure) Transport efficiency (environment dimension) Social dimension	Accessibility and existence of community Sense of place Housing and building opportunities Mix land use Transportation environmentally choice Effective development
Issues	Social equity Traffic congestion and pollution Quality of life and lower standard of living Prospects of delivering compaction Worsening community position Reduction in privacy Reduction in present amenity space Perceived lack of greenery, open spaces High price of housing Appropriate land use	Loss of sense of space (genius loci) Land consumption and threat to farmland Costs to local government The dependence on the automobile Inner city: social impacts Health impacts Environmental impacts Design
Scope concern	Economic Social Environment Policy	Community quality of life Economic Environment Health

		Housing Transportation Design
Causal factors	Land use planning Regional planning/cooperation Highway building Housing policies Competition for tax revenue Sub-urbanization	Zoning policies Regional planning Highway building Housing policies Competition for tax revenue Lifestyle choice
Benefits	Support equity in some respects Reducing the need for travel by facilitating shorter journeys as well as car dependence and inducing greater supply and use of public transport. Opportunities for emission-efficient modes of transport and pollution problems Accessibility to goods and services is more equitably distributed by higher density settlements Deliver other environmental benefits, such as reductions in loss of open land and valuable habitats. A milieu for enhanced business and trading activities	Managing growth effectively (cooperation). Decreased public expenditures Open an isolation from the heart of the community Decreased auto usage and commuting time Urban rural development synergy Rational extension of urban service Help to preserve rural lands outside the city Generate center of city and its activities Eliminate competition for retail development and the loss of associated tax revenues. Provides both flexibility and certainty to the planning process.
Actual efforts	New policy implementation Process of intensification-concentration Transportation strategy Higher densification Land use control/planning trends	Sense of place creation Growth concentration Preservation of open space and farmland Transportation strategy Regional cooperation Demographic trends
Note	Tough debatable strategy and need for further more uncontentious evidences, compact city claimed its advantages, include: conservation of the countryside; less need to travel by car, thus reduced fuel emissions; support for public transport and walking and cycling; better access to services and facilities; more efficient utility and infrastructure provision; and revitalization in inner city.	In general, smart growth invests time, attention, and resources in restoring community and vitality to center cities and older suburbs. New smart growth is more town-centered, is transit and pedestrian oriented, and has a greater mix of housing, commercial and retail uses. It also preserves open space and many other environmental amenities. But there is no "one-size-fits-all" solution.

Both the compact city and the smart growth strategy are designed to prevent the urban growth from the negative effects of growth which is believed to be happened if there exists a sprawl growth pattern throughout the city. This pattern is influenced by suburbanization which is characterized by such low density population in the suburb area and automatically increasing automobile dependencies (Newman and Kenworthy, 1999).

## 2.2 Scope of the Compact City Study

The compact city studies have been dominated by urban planning study, including urban/built environmental design, and urban geography respectively area. It is based on literature, journal, and manuscript on related major which has high frequency to take compact city concept into their consideration. This finding supports an argument in Jenks et.al (1996) that compact city becomes a great magnitude to architects, planners, and urban designers to discuss and debate this vision. However, the compact city study in the urban economics still has a little attention. Figure 2 summarizes the presentation situation of the compact city study.

























