
Compact City and Developing Countries

Is Compact City Approach Appropriate as an Urban Development Policy
for Cities in Developing Countries?

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1. Background

- One of the most serious problems in the 21st century is no other than the global population growth, and consequent urban expansion, particularly in developing countries.
- **(Fig.2)** In the year 2001, the world population was 61 billion. However, UNFPA predicts that due to a rapid increase in population in the developing countries, the world population will reach 78 billion by the year 2025, and 93 billion by the year 2050.
- Expanding population growth will create many global conflicts in human society, such as environmental degradation, energy problems, and food crisis.
- However, problems arising from this rapid increase in population will be the most serious in the extreme urbanization in developing countries.
- **(Fig.3)** The proportion of urban population to total population in developing countries was 40% in the year 2000, and the urban population was about 2 billion people. However, the statistics of UNDP indicates that it will increase to 50% by the year 2025 and 60% by the year 2050. Thus, the urban population in developing countries will more than double in its size, that is, from 2 to 4.8 billion.

- In another words, this implies that another set of 10 million cities are going to emerge. Jenks and Burgess (2000) predicts that by the year 2025, 26 mega-cities withholding more than 10 million people will emerge, in which 22 of the mega-cities are located in developing countries.
- The living environment of cities in developing countries is not in good condition. The traffic congestion, noise and air pollution are popular. The sanitary condition is serious problem due to lack of tap water and sewerage. The houses are poor in squatter settlements.
- Therefore, unless an appropriate guideline for urban development policy would not be advocated, none of desirable future of cities will be illustrated in developing countries.

2. Compact city as sustainable urban form

- In this regard, the sustainable urban development policy, which makes it possible to achieve maximum quality of urban life with the given resources and energy, should be vitally introduced to cities in developing countries. The quality of urban life, herewith, implies both economic product and living environment.
- **(Fig.4)** In the early 1990s, EU has found an advantage in the compact city approach as a sustainable urban form, which is expected to achieve the above goal. For EU, the compact city approach seemed to be appropriate to achieve the goals of:
 - (1) Saving resources and energy (land use, transportation, pollutant emission, wastes).
 - (2) Revitalization inner city
 to control an infinite expansion to the suburbs of urban area resulted from automobile dependent society.

- Needless-to-say, the careful examination must still be needed in the argument that urban forms has an influence on urban sustainability, although some aspects of resource and energy consumption, such as land and transportation are likely to depend on urban forms.

- **(Fig.5).** The term sustainability is currently quite vague and has not been defined clearly. However, the following is likely to be the common discussion dimension in recent years;
 - (1) To keep a stable economic growth (with restructuring the productive system for saving recourses and energy, (Economic sustainability)
 - (2) To maintain safe and comfortable living environment through zero emission,

(Environmental Sustainability)

(3) To secure social equity in distribution of wealth and social services

(Social Sustainability)

Thus, the sustainable urban forms require to achieve these three aspects.

- **(Fig6)** While, the argument of the compact city has long history. Its origin can go back to fortress cities in the 16's century, aiming at protecting from an attack by a foreign enemy (Breheny M. 2000). The aims of the compact city also vary from an age to age. However, as to its modern definition aiming at automobile independence society, and thus likely to aiming at a sustainable society, we try to rely on Dantzig & Saaty's advocacy (Dantzig & Saaty 1978):

Urban form:	(1) High dense settlements
	(2) Less dependence on automobile (high density)
	(3) Clear boundary from surrounding areas
Spatial characteristics:	(4) Mixed land use
	(5) Diversity of life (mixed-land use)
	(6) Clear identity
Social functions:	(7) Social fairness (high dense settlements)
	(8) Self-sufficiency of daily life
	(9) Independence of government (clear boundary)

- **(Fig.7)** As seen herewith, there is close relationship between compact urban form and the sustainability as follows:

- (1) Reduction of automobile dependence
- (2) Efficient supply of social infrastructure and public service
- (3) Active community relationship by high-dense habitation
- (4) Revitalization of inner city

- This is the reason why EU, the group of developed countries, has paid its attention on the compact city approach as sustainable urban development policy, because they have given a higher priority to saving the resource and energy consumption by reducing automobile use.

- **(Fig.8)** However the situation in developing countries is totally different from developed countries. In order to achieve sustainability by making city compact, some more conditions listed below is vitally needed.

- (1) Slow growth of population

If the growth of city was rapid, then development for renewing the existing city will not catch up with its growth.

- (2) Preparation of sufficient development expense

The Compact City does not match step-by-step development, as it does not function until whole packages are ready. Therefore it will need quite large

(5) High risk of public transportation system

(6) Lack of planning capability

The success of the compact city policy has to be measured from these point of views.

- In this sense, the compact city approach seems to be significant argument only to cities in developed countries and at least it may not be applicable to existing mega-cities in developing countries, due to lack of planning capacity.
- **(Fig.11)** Considering, however, the case where more mega-cities will appear in developing countries by the year 2025, it might be worth to be applied as a development policy to the future coming new mega-city with the targets of:
 - Infrastructure supply
 - Close urban-rural linkage
 - Social equity
- This lecture, thus, tries to examine what types of urban forms are the most appropriate as a sustainable urban development policy to the cities that will be constructed from now in developing countries.
- The mega-city formation cannot be made by just one step, but through growing process of population concentration, originating from the small core city to large amalgamation. Normally, mega-cities grow by involving rural environment inside of their urban land use. In this sense, we will pay our attention to the appropriate formation of a metropolitan region as a whole, rather than single city form.
- **(BKK Example Fig.12, 13)** BKK metropolitan region

3. Sustainable Urban growth model

- **(Fig.14)** Number of spatial model can be suggested to achieve sustainability (less travel time and thus energy saving) using Compact City structures (node).
 - (1) Central core city structure,
 - (2) Star shape structure,
 - (3) Satellite city structure,
 - (4) Galaxy structure,
 - (5) Linear city structure (Curitiba), and
 - (6) Multi pole structure
- In order to examine what type of city structures are most sustainable, a closed metropolitan region of its population (N), total amount of production (Y) and the level of living environment (L) with entire resource consumption (R) is assumed as a

theoretical model area. The quality of life Q is defined by $Q=Q(Y,L)$. Then, a question to be answered is what urban structure draws the maximum efficiency of Q/R .

- **(Fig.15)** It is assumed that there is a 2000 km² flat land with a 250 thousand farmer population, and people who live in city cores increase by 250 thousand on every one term and the cores grow. By the 7th term, gross population attain 2 million and the possibility of urban form is 15 patterns.**(Fig.16)**

- **(Fig.17)** The question is which of patterns can achieve minimum travel mileage. Here in this model travel mileage can be computed as follows.

Total Travel Mileage = Commuting travel to job places
+Travel to school
+Travel to public services
+Travel to shopping (community and commercial center)
+Travel for distribution

- **(Fig.18)** Result

4. Conclusion

This model is still in progress, and it is definitely needed to include some more measures of urban living environment. This kind of theoretical examination, however, may be of help to provide the useful guideline of sustainable urban development policy.

The compact city approach seems to be significant argument only to cities in developed countries and it may not be applicable to existing mega-cities in developing countries, at present. Rather in developing countries, it might be worth to be applied to a development policy for the future coming mega-cities. Even in that case, however, unlike developed countries, those “sustainable conditions” such as ways to construct social infrastructures most efficiently, activity balance of urban area considering collaboration with surrounding rural areas, and security of social equity, should be taken into account. The success of the Compact City policy will be measured in terms of to what extent these could be achieved.

References

- 1) Kiyonobu KAIDO 2001: Compact City: Seek for the Image of Sustainable Society
- 2) George B. Dantzig& Thomas L. Saaty 1974: Compact City : A Plan for a Livable Urban Environment
- 3) Mike Jenks & Rod Burgess 2001: Compact Cities: Sustainable Urban Forms for Developing Countries

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Fig. 1

Compact City and Developing Countries

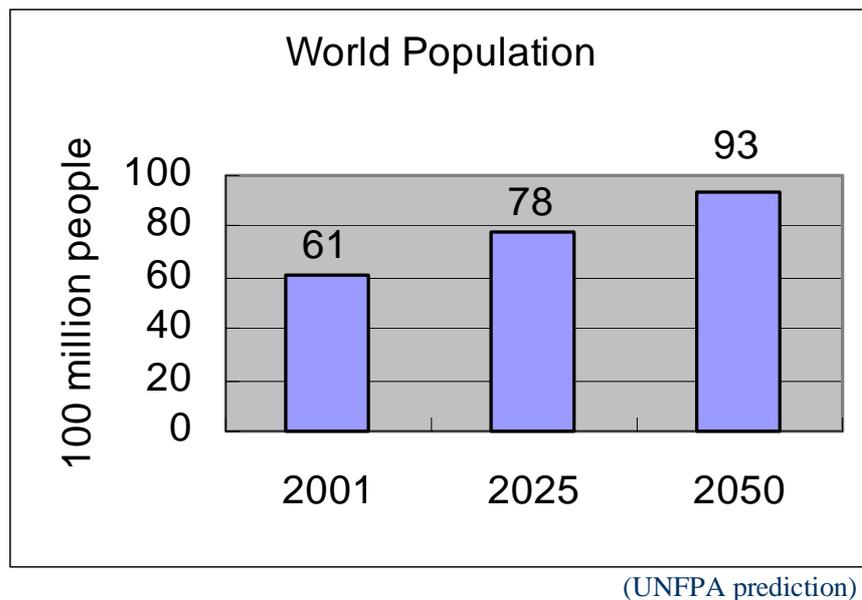
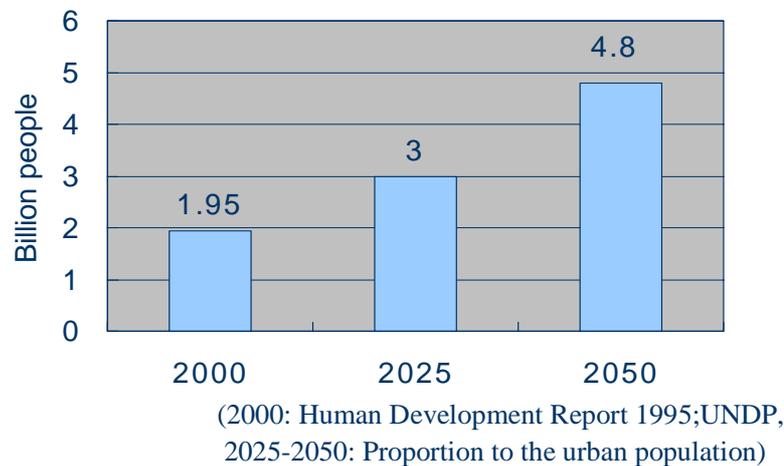


Fig. 2

Urban Population in Developing Countries



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Fig. 3

A current compact city approach

* Discussion in developed countries (mostly in Europe) at the beginning of the 1990s

The main purposes

- Saving resources and energy
(land, travel distance, exhaust gases and wastes)
- Revitalization of inner city

This implies a strong objection to an infinite expansion to the suburbs of urban area resulted from automobile dependent society.

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Fig. 4

Dimension of sustainability

(1) Economic sustainability

Economic activities grow stably by changing its structure to saving resources and energies.

(2) Environmental sustainability

All the city activities work with zero emission to maintain safe and comfortable environment for urban residence.

(3) Social sustainability

Social equity is achieved by equal distribution of wealth and social services.

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Fig. 5

The First definition of a compact city

*Dantzig and Saaty (1978)

- | | |
|-----------------------|--|
| Form of space | (1) High-dense settlements |
| | (2) Less dependence of automobile
(<- high density) |
| | (3) Clear boundary from surrounding area |
| Space characteristics | (4) Mixed land use |
| | (5) Diversity of life (<- complex land use) |
| | (6) Clear identity |
| Function | (7) Social fairness (<- high dense settlements) |
| | (8) Self-sufficiency of daily life |
| | (9) Independency of governance (<- clear boundary) |

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Fig. 6

Can compact city approach achieve the sustainability ?

* There is close relationship between compact urban form and the sustainability

- (1) Reduction of automobile dependence
- (2) Efficient supply of social infrastructure and public service
- (3) Active community relationship by high-dense habitation
- (4) Revitalization of inner city

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Fig. 7

Application of compact city policy to developing countries

- (1) Rapid population growth
- (2) Lack of powerful leadership

=> Is it possible in developing country?

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Fig. 8

Urbanization in developing countries

* Population

1975 - 2025

	Proportion of City population (%)	City population
Developed countries	69.8 -> 84	730 millions -> 1 billion
Developing countries	26.7 -> 57.1	2 billions -> 4 billions

2015 prediction by UNCHS

22 of 26 mega-cities with over 10 million population
will be in developing countries.

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Fig. 9

Urban Problems in developing countries

- (1) Lack of the social infrastructure caused by the population (growth exceeding economic growth
- (2) Increase of squatter
- (3) Land speculation
- (4) Difficulty of urban redevelopment through demolition squatters
- (5) High risk of public transportation system
- (6) Lack of planning capability

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Fig. 10

The purpose of a compact city policy in developing countries

- Infrastructure supply
- Close urban-rural linkage
- Social equity

=> A compact city policy has to be applied as urban
development strategy to control urban expansion
caused by a rapid population growth

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Fig. 11

Bangkok

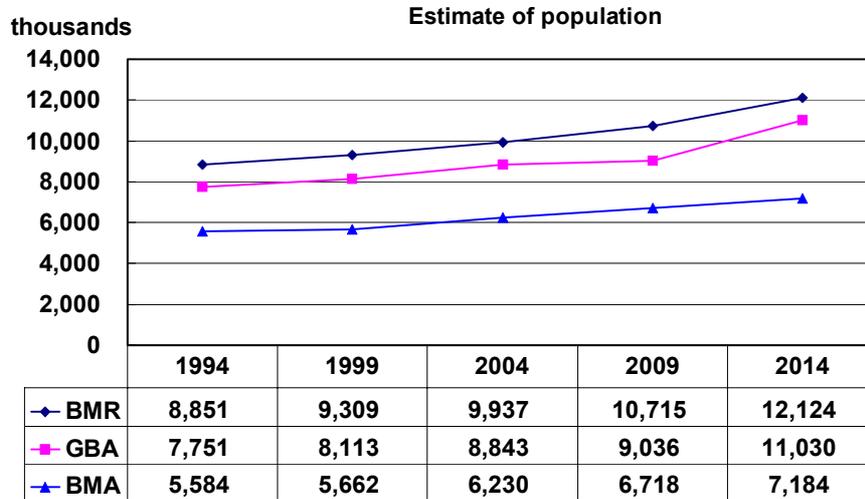
Bangkok Metropolitan Region consists of
1 capital city and 5 surrounding prefectures



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Fig. 12

Result of Bangkok model



The calculation result suggests such urban sprawl phenomena; population of Bangkok area will grow large and large caused by social movement. The center of the metropolis, BMA will be continuously increasing, but much more large explosion will arise on around of BMA, especially the 3 prefecture.

Fig. 13

Variety of urban pattern

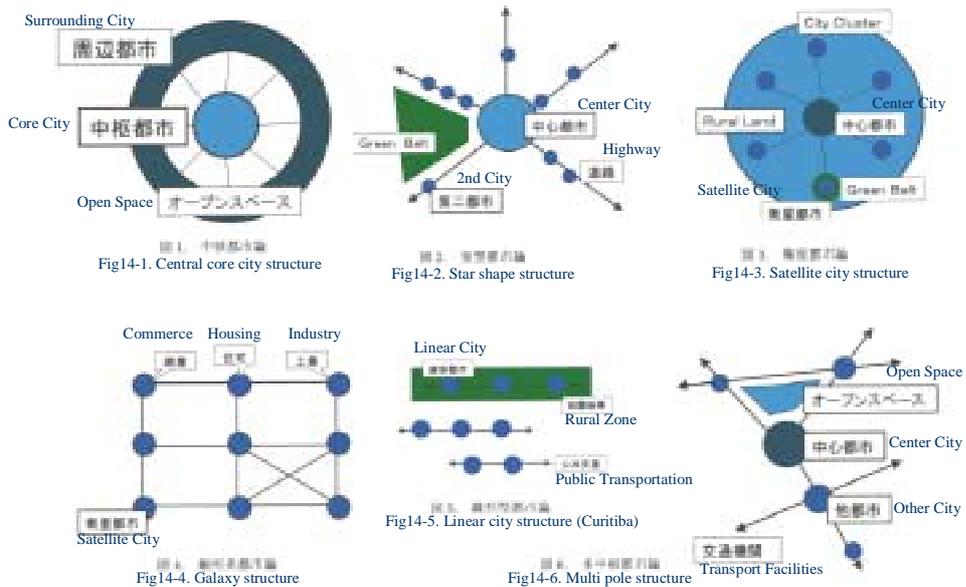
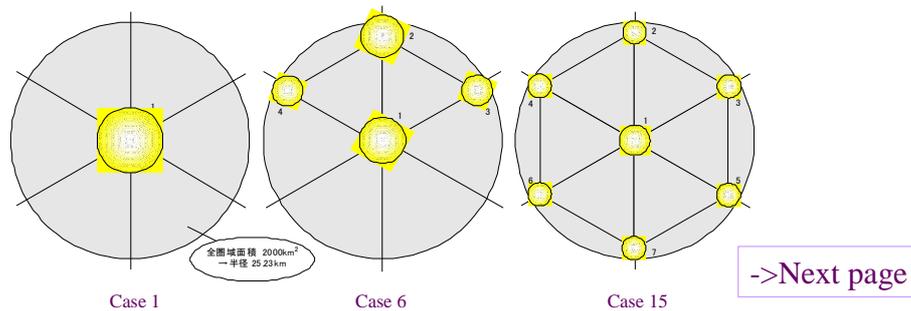


Fig. 14

City growth model

It is assumed that there is a closed urban system of its population (N), the amount of the production activities (Y) and the level of urban environment (L) which produced from whole resource consumption (R). The quality of urban activities Q is defined by $Q = Q(Y, L)$. And it is considered what urban structure draws the maximum efficiency of Q/R on this model.

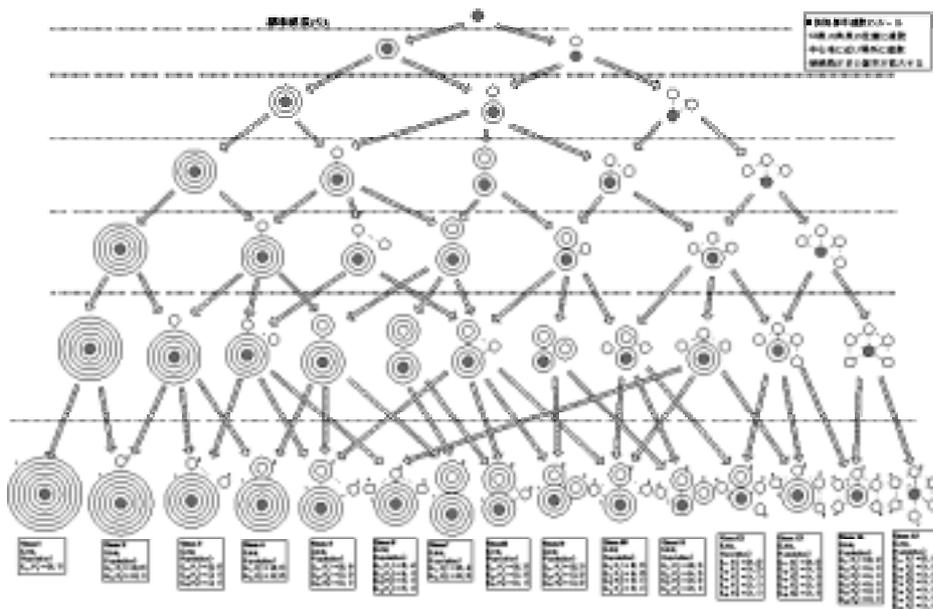
Think about a 2000 km² spreading flat land with a 250 thousand farmer population, and people who live in city cores increase by 250 thousand on every one term and the cores grow. At the 7th term, gross population attain 2 million and the possibilities of urban form are 15 patterns.



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Fig. 15

Variation of urban forms by population growth



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Fig. 16

Computation of travel time

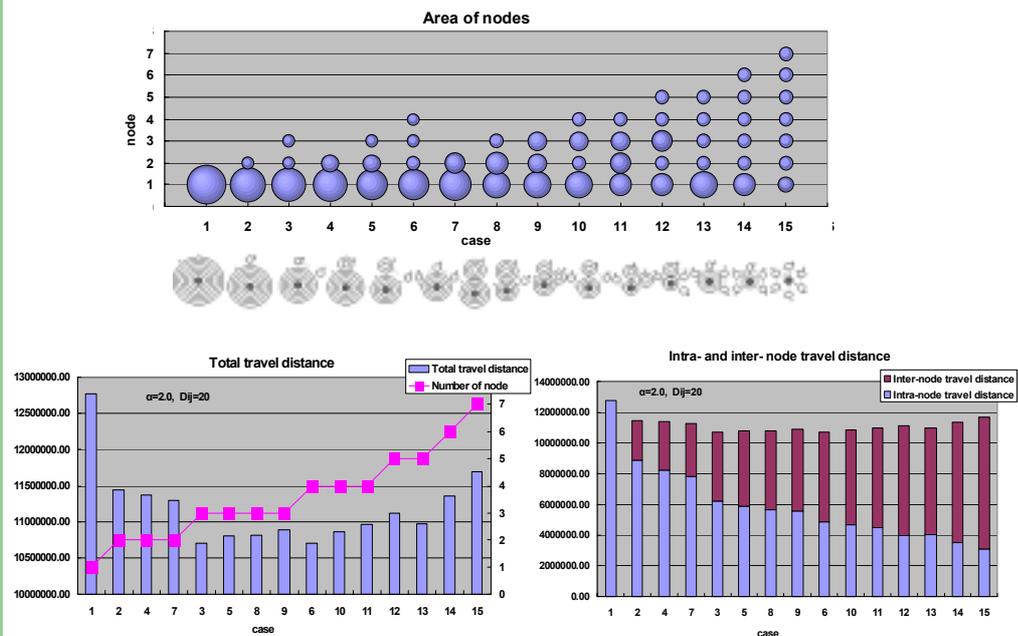
Total Travel Mileage

- = Commuting travel to job places
- + Travel to school
- + Travel to public services
- + Travel to shopping
(community and commercial center)
- + Travel for distribution

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Fig. 17

Results



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Fig. 18