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Beyond greenbelts and zoning: A new planning concept for the environment of Asian mega-cities

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Abstract

Asian mega-cities have realized explosive growth in the post-war decades. Such growth, however, resulted in serious environmental problems including air and water pollution and a lack of adequate urban infrastructure. This growth also created a chaotic mixture of urban and rural land use in the fringe of the cities. Western urban planning concepts such as zoning and greenbelt additions have been applied to the cities to encourage controlled urban growth. These landscapes located in the fringe of Asian mega-cities indicate that such attempts have not achieved significant success. Asian cities historically place land use patterns of urban and rural character next to each other. These vernacular landscapes have in the past demonstrated a workable relationship between the urban and rural environments.

It is therefore perceived that a planning concept, which respects the mixture of urban and rural land uses, should be developed and applied to encourage an ordered growth of Asian mega-cities. Farm and wooded landscapes provide key ecological functions, visual amenities and cultural services that help justify the continued relationship of rural and urban land use mixes. A planning concept that respects the vernacular landscape of the past can help provide new stability to the Asian urban environment of the 21st century.

Keywords: Environment; Land use patterns; Asian mega-cities

1. Introduction

The 21st century was to be a prosperous era for Asia. The economic crisis has changed that belief. However, despite the disappointments Asian mega-cities continue to grow to accommodate people flowing in from surrounding rural areas. Hall (1984), using Tokyo as an example, describes major problems caused by the rapid accumulation of people in Asian mega-cities and categorizes them into three groups: housing; basic services; and transportation. The future of the Asian urban environment cannot be realized without sufficient control of these three concerns.

Most Asian mega-cities have attempted to keep growth under control and encourage well-ordered developments by applying urban planning concepts that were originated in western nations. There are several successful experiences in some Asian cities, but in most cases the attempts should be regarded less than successful. This paper will discuss concepts in urban planning that reflect characteristics of Asian

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mega-cities by referring to the history of urbanization and the attempts made that aimed to induce ordered growth.

2. Explosive growth of Asian mega-cities in the 20th century

The explosive growth of population in Asia in the post-war decades is already well documented. According to Institute of Population Problems Ministry of Health and Welfare (1991) the total population of Asian nations was 1.4 billion in 1950, 3.1 billion in 1990, and is estimated to reach 4.7 billion at the year 2020. This number means that almost 58.1% of the total population on the globe will be living in Asian nations at the beginning of the 21st century.

Another feature in the population of Asia is the rapid migration of people from the countryside into the cities. The United Nations reports that the population growth rate in urban areas between 1950 and 1960 in Europe 2.4%, America 3.7%, Africa 4.4%, and Asia 4.5%. The trend on population increases in individual cities is obvious. Fig. 1 illustrates the population growth of London and major Asian cities. The population of London grew to 8 million over the last century, while Tokyo, Shanghai and Seoul grew to 8 million over the last 25 years.

The rapid urban growth of Asian mega-cities has resulted in a number of environmental problems. Cities in Japan including Tokyo, Kawasaki, Yokkaichi and Osaka have experienced serious air and water pollutions, as well as soil contamination, and odor, noise and vibration pollution during 1960s. These 'Seven Major Pollutions' were successfully decreased in the 1970s. However, problems in housing and transportation are still a problem. Overcrowded train systems and poor but costly housings in the Tokyo Metropolis are typical examples (Fig. 2).

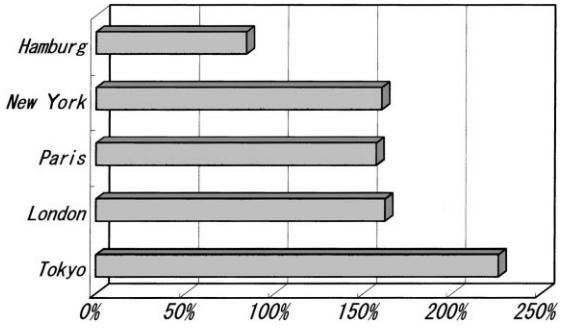

Fig. 2. Congestion ratios of subways in major cities in the world (National Land Agency, 1998).

Environmental problems are identified not only in Japanese cities but are common to most of Asian mega-cities including Bangkok, Thailand. Hayashi et al. (1993) report that urbanization in Bangkok, initiated in early 1970s, has resulted in inadequate transportation systems, poor sewage and drainage systems, and air and water pollution. Today, the traffic in the Bangkok Metropolis is regarded as one of the worst in the world (Kidokoro and Hanh, 1993).

3. Application of western planning concepts

3.1. Greenbelts

When observing contemporary urban landscapes in Asian mega-cities, one may hardly realize that there

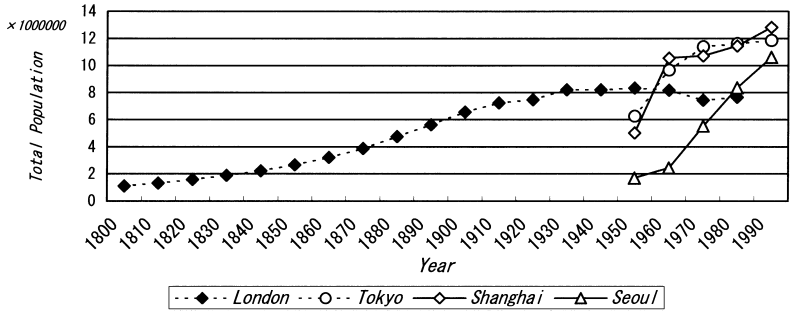

Fig. 1. Population growth in London and major Asian cities.

Fig. 3. Disordered land use changes in the fringe of Bangkok, Thailand.

have been attempts to apply western planning methods on land use to keep explosive urban expansion under control. Chaotic landscapes identified in the fringe of mega-cities are one of the clearest examples that document the absence of effective controls (Fig. 3). However, Asian mega-cities did, and still do, have physical urban plans including land use and zoning plans. Greenbelt is one of the most commonly applied concepts to Asian mega-cities.

3.1.1. Tokyo

Tokyo installed a comprehensive parks and open space master plan in 1939. The plan included parks and open space in various scales in Greater Tokyo area of 9600 km^2; from urban parks, cemeteries and allotment gardens in the central district to scenic beauty areas and national parks in remote mountains. The plan is regarded as the most ambitious plan in the history of parks and open space plans in Japan (Yokohari et al., 1996).

The plan included a greenbelt on the boundary of the Ward Area of Tokyo (Fig. 4). The Amsterdam Declaration in 1924 by the International Federation of Housing and Planning (IFHP), which identified the need for establishing greenbelts when planning for urban expansion, was the theoretical basis of the installation. The greenbelt, total 136 km^2, consists of farmland and coppice woodland, was planned on a 15 km radius to restrict disordered expansion of densely inhabited urban areas. The belt was associated with radial green corridors planned along river ravines flowing into downtown. Recreational paths such as pedestrian and horse riding trails were planned in these corridors (Minomo, 1992).

Succeeding the 1939 plan, a new open space plan for Tokyo was decided in 1943 to meet the needs of air defense during the World War II. The concept of the plan was to create open areas to stop the spread of fire caused by bombing and provide refuge and escape routes. The focus was to create green corridors. In addition to the greenbelt, an inner circular corridor was planned on a 10 km radius to surround urbanized area at the time by connecting major urban parks planned in the 1939 plan. Radial corridors along river ravines connected outer and inner radial corridors. The double circular and radial fluvial corridors in Tokyo reached 123.5 km (Kimura, 1990, 1992).

The air defense open space plan was terminated and succeeded by the post-war rehabilitation open space plan of 1947. In this plan, the focus was again given to the creation of circular and radial corridors (Mori, 1992). The double-ring circular green corridors, including a greenbelt and a network of radial green corridors along trunk roads, rivers and railroads were planned to connect urban parks.

If the plan was fully implemented, central Tokyo might have been one of the richest green cities in the world with over 200 km^2 of green spaces in the central district. However, as the urban landscape of Tokyo today clearly represents, the plan was poorly implemented. Only a few fluvial corridors were realized,

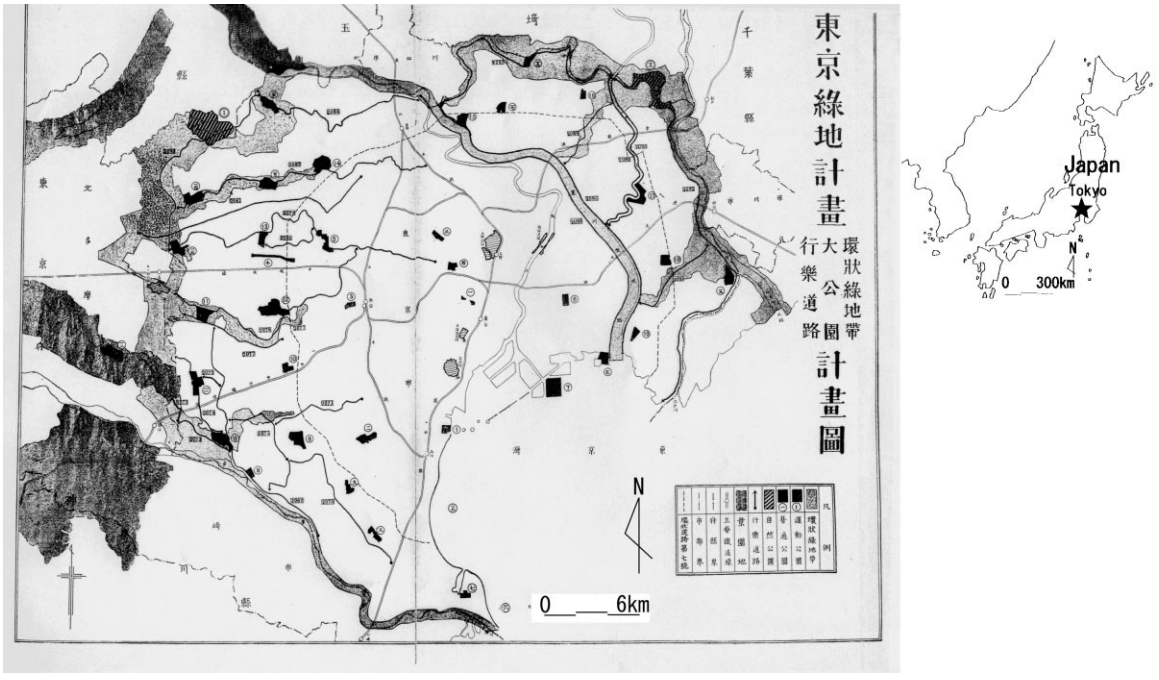

Fig. 4. Greenbelt of Tokyo in the Parks and Open Space Plan 1939. A green corridor, mostly consists of farmland and woodland, located on a 15 km radius.

while the circular green corridor gradually decreased and completely abolished in 1969 (Ishida, 1992). Today, only 4%, 24 km^2, of the Ward Area is ceded as parks and open space.

3.1.2. Seoul

The greenbelt surrounding Seoul, the capital city of Korea, may be nominated as one of few successful greenbelt experiences in Asian mega-cities. The greenbelt in Seoul consists of farmland and woodland, and is designated on a 15 km radius surrounding densely inhabited areas of the city (Fig. 5).

The plan to install a greenbelt was first proposed in 1963, but was not taken seriously until the end of 1960s when the explosive urban expansion became a major public concern. In 1970, the Urban Planning Act of Korea was enacted. This act was the legal basis for the creation of the Development Restriction Region, commonly known as a greenbelt. The land area totals 1567 km^2, 29% of the National Capital Region.

The Seoul Greenbelt is successful due to strong legal controls in the land use of the designated zone. Tashiro and Ye (1993) point out that the development restriction in the zone is so strict that it should rather be called 'prohibition'. Such strong control has, so far, succeeded in conserving a vast circular green corridor only 15 km away from the center. Tashiro and Ye (1993) also suggest that the migration of people from countryside into major cities was from the national security point of view a major concern, and this concern has enforced the validity of the act. It may therefore be concluded that the martial situation of Korean peninsula has supported the success of the greenbelt.

After a quarter century history of the Seoul greenbelt, we may identify several fundamental problems now emerging. The greenbelt did succeed in restricting the explosive population growth of Seoul, controlling urban sprawls into surrounding rural areas, and conserving natural/semi-natural environments near the densely inhabited district. According to the national questionnaire survey conducted in 1985, more than 85% of Korean citizens support the greenbelt. Yet, it should be noted that the strong legal control on privately owned lands within the greenbelt

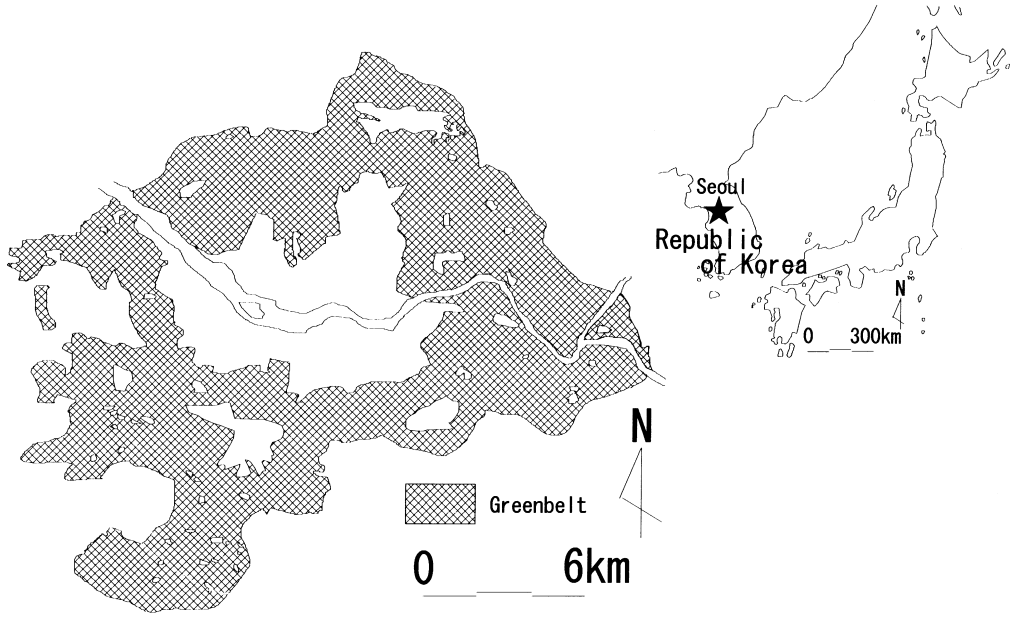

Fig. 5. Greenbelt of Seoul. Massive circular green of 1567 km^2, 29% of the whole region, located on a 15 km radius.

seriously affects the welfare of landowners and farmers. The survey reports that 67% of the citizens living in the greenbelt have negative opinions on the development restriction policy (Tashiro and Ye, 1993). It is also noted that the success of the greenbelt in restricting the growth of Seoul has ironically encouraged urban sprawl in the satellite cities located immediately outside the greenbelt.

The greenbelt in Seoul, so far, may be evaluated as one of few successful greenbelt experiences in Asia. However, it should be noted that the success is backed with the martial control, and that several fundamental problems related to strong control on land use are now starting to emerge. A close examination over time may be needed before giving a final decision on the Seoul greenbelt.

3.1.3. Bangkok

The greenbelts, or more precisely 'green zones', of Bangkok are located on both the eastern and the western outskirts of the city. As illustrated in Fig. 6, unlike those in Tokyo and Seoul, the greenbelt in Bangkok is not a continuous circular greenway that surrounds the core city but is a series of three isolated zones.

A plan to install a greenbelt in Bangkok was first submitted in 1960. The plan, submitted by an American urban planner, was based on a finger plan concept, which allocated a series of development areas along radial transportation corridors. The basic urban development plan was then revised in 1971 by the Thai government. The concept of the finger plan in 1960 was replaced by that of a concentric circles plan, which symbolized the centralization of administrative power of the time. The idea to install a greenbelt was succeeded. The greenbelt, located on a 25 km radius with 700 km^2 of rice paddies, was finally established in 1982 with the Metropolitan Bangkok Regulations serving as its legal basis (Kidokoro, 1997).

What characterizes the greenbelt in Bangkok is that the primary function of the belt is not to restrict urban expansions but to control flooding by maintaining vast green open space. Bangkok is located on the low delta of Chao Phraya River. Rice paddies included in the greenbelt are regarded as reservoirs which store floodwater and safeguard Bangkok. In fact, even dams were constructed between the greenbelt and the core of Bangkok to enhance the function of the greenbelt as reservoirs.

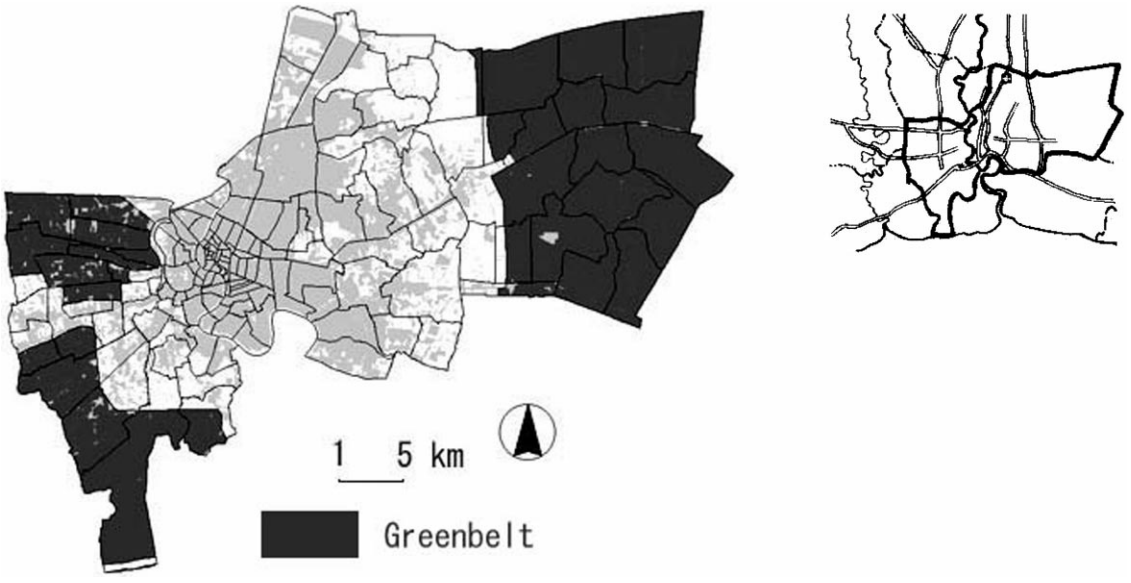

Fig. 6. Greenbelt of Bangkok. Three protected zones, mostly consist of rice paddies, designated primarily for flood control.

While many mega-cities in Far-east Asia such as Tokyo and Seoul are reaching their limit of the growth, mega-cities in South-east Asia including Bangkok are still growing. The population of Bangkok, which used to be 3.1 million in 1970, has reached 5.7 million in 1998 and it is still increasing. Because of this ongoing population growth citizens need more housings, therefore densely populated areas of Bangkok are expanding sharply. Kidokoro (1997) reports that the area, which recorded the highest population growth rate, has shifted from the zone between 5 and 10 km radiuses in 1970s to the zone between 10 and 20 km radiuses in 1980s.

Today, the greenbelt, established on a 25 km radius, is still maintaining vast green open space. However, this is not due to successful regulatory measures but simply because the urban sprawl has not reached the area yet. Continuous and careful monitoring of urban growth in and out of the greenbelt is important for the future of the Bangkok greenbelt.

3.2. Zoning

One common observation of urban fringe areas in Asian mega-cities is the presence of micro-scaled mixture of urban and rural land uses. Such mixture has been regarded by modern urban planning as a symbol of chaotic land use, as it may result both in incomplete urban infrastructure and inefficient agriculture. Zoning was introduced to Asian mega-cities to bring order into urban developments and thus clearly separate urban areas from surrounding rural areas.

Greenbelts are established to promote the creation of well-ordered urban areas by restricting urban expansion into surrounding rural areas. Zoning aims to create well-ordered urban areas by promoting urban developments. The approaches of ‘restriction’ and ‘promotion’ have been introduced to control chaotic urban expansion of Asian mega-cities.

3.2.1. City planning and zoning act of Japan

1960s was a time when Japanese economy grew rapidly. The gross national product (GNP) was ranked second place globally. Economical success, however, brought about serious pollution problems and uncontrolled human settlements. In 1965, more than 63% of the total population of Japan was living in cities, while almost one-third of local municipalities, 1100 out of 3300, were underpopulated. People kept flowing into cities from countryside during 1960s.

Such rapid and massive migration of people into cities resulted in uncontrolled land use in the suburbs. Japan’s City Planning and Zoning Act was enacted in

1968 by the national government to control the situation, by having traditional European cities, where urban areas are sharply separated from surrounding rural areas by a clear boundary line, as a target image of the act. Two types of areas were promoted in the planning district; urbanization-promotion areas and urbanization-control areas. Urbanization-promotion areas are zones that include existing urban areas, and areas that should be urbanized within ≈10 years time. Urbanization-control areas are areas that include rural areas without urban developments, except for public facilities including hospitals and schools.

30 years have past. The act, to some extent, did succeed in encouraging the creation of well-ordered urban areas. However, pressure by landowners was brought to bear on many local governments and thus vast urbanization promotion areas were designated. Consequently, a number of segmented farmland patches, which had to be turned into urban areas within 10 years from the designation, still remain in urbanization-promotion areas. The act, which aimed to introduce well-ordered urban areas, ironically encouraged uncontrolled urban developments in urbanization-promoted areas.

3.2.2. Town planning act of Thailand

The town planning Act of Thailand was enacted in 1975, succeeding the Town and Country Planning Act. The 1975 act was the first legislative measure that introduced zoning concept to Thailand. Designation of General Plans and Specific Plans were specified by the act. However, it was not until 1992 that the first general plan of Bangkok was established. A specific plan, which has stronger controls on land use, has never been established. Moreover, the controls specified by the act are quite lax. Land use categories are the only issues under supervision. The floor area ratio is substantially uncontrolled.

4. Uncertain urban edges

Although many measures have been passed to control urban expansions and uncontrolled land use mixtures, landscapes with uncontrolled urban developments and segmented farmland patches still dominate the area. Even in Japan, where explosive expansion of urban areas is no longer observed, uncontrolled mixture of urban and rural land uses still dominates Japanese urban fringe areas. In growing Asian mega-cities including Bangkok, Jakarta, and Manila, such chaos may multiply even quicker than what it did in the past.

4.1. Cities with farmland

However, such mixture of urban and rural land uses is identified not only in contemporary Asian mega-cities but also in their history. Kyoto, one of the oldest cities in Japan, was established in the 8th century with a grid road system introduced from China, yet a number of blocks in the city remained as agricultural lands throughout feudal eras. Edo, former Tokyo, was also a city with rich green acreage. Edo was founded at the beginning of the 17th century on a marshy delta of several rivers flowing into Tokyo Bay. When the population started to increase in the 18th century a number of major land reclamation and landfill operations took place to meet demand for land. Fig. 7 is a part of the map of Edo published in the early 19th century. The area illustrated in the figure, a neighborhood ≈4 km east of Edo Castle, is a typical residential area with warriors' residences and citizens' housings.

What should be noticed in this map is a series of paddy fields patches scattered in the residential area. These are not the remains of farmland that used to dominate the area, as the area was mostly under the sea before the land reclamation operation for urbanization took place. It is therefore assumed that these segmented paddy fields were 'planned' to be there, so as to play certain roles in the neighborhood. As the land elevation was at or near sea level, the neighborhood could have easily been flooded by storm surges. The agricultural fields that provided rice to Edo citizens, are assumed to have played a role as reservoirs that prevented the occurrence of floods.

Various types of green open space were also found inside Edo. Robert Fortune, an English botanist who visited Edo in the 19th century, reported in his book "Yedo and Peking: A narrative of a journey to the capitals of Japan and China" (1863) that Edo at the time was a green city. In the book he reports pots of bonsai, gardens, nurseries, vegetable gardens, paddy fields and woods along escarpments were all found inside the city of Edo. As the result of such abundance of green open space inside the city, the boundary of the

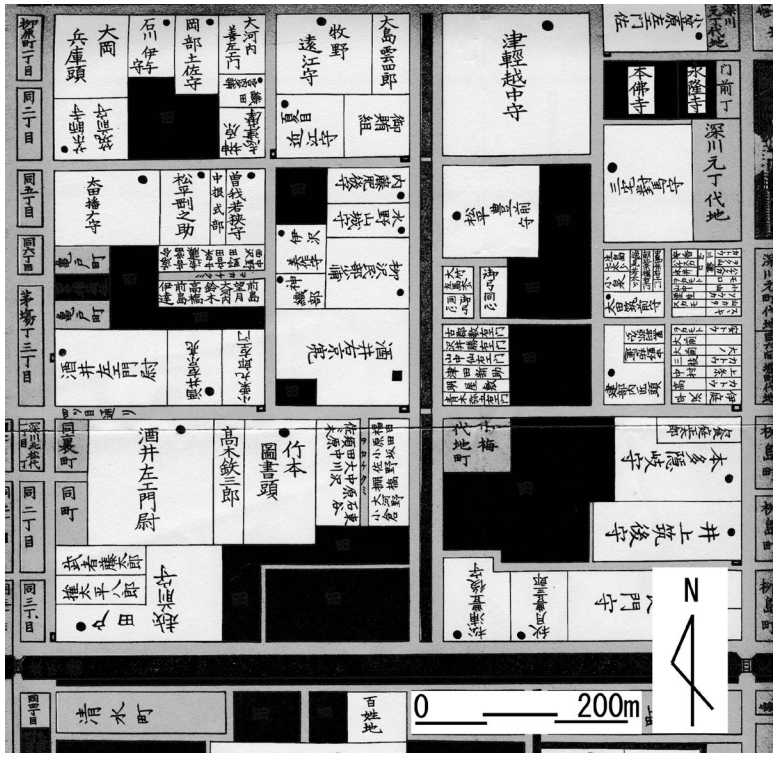

Fig. 7. Typical residential neighborhood of Edo, former Tokyo, in the 19th century. Isolated patches of paddy fields, hatched in black, surrounded by residences and housings, are found.

city was quite uncertain. The presumed open space map of Edo (Fig. 8) by Tabata (1999) and landscape paintings of Edo in the 19th century (Fig. 9) clearly illustrate such uncertainness of the boundary.

4.2. Rural areas that accepted uncontrolled urban developments

When urban areas started to sprawl into surrounding rural areas, agriculture in rural areas was indeed seriously affected. However, unlike in the West, agricultural lands in the suburbs of Asian mega-cities, to some extent, did survive even though they became segmented and surrounded by urban developments.

The area illustrated in Fig. 10, 20 km west of central Tokyo, is a typical example of rural areas in Japan that were invaded by urban developments but maintained a series of isolated farmland patches. A grid road system, first introduced when the area was reclaimed for agriculture, was suitable not only for agriculture but for installing urban infrastructure. Roads were, and still are, narrow, mostly <4 m wide, but can accommodate transportation systems and networks of water, electric and gas supply without fundamental changes. The absence of a traditional planning concept to separate urban developments from surrounding rural areas also allowed for the integration of urban developments. What is interesting in such areas is that landowners, mostly farmers of the area, gradually released their land for urban developments but have continued agriculture in the area. Some landowners kept their farmland merely as real estate. However, there were landowners who maintained segmented farmland patches active although they were surrounded by urban developments.

The same phenomenon is identified in the suburbs of Bangkok. The area included in Fig. 11, ≈15 km north of central Bangkok, has experienced the intrusion of urban developments mostly within the last 20 years. Arrays of newly developed housing complexes,

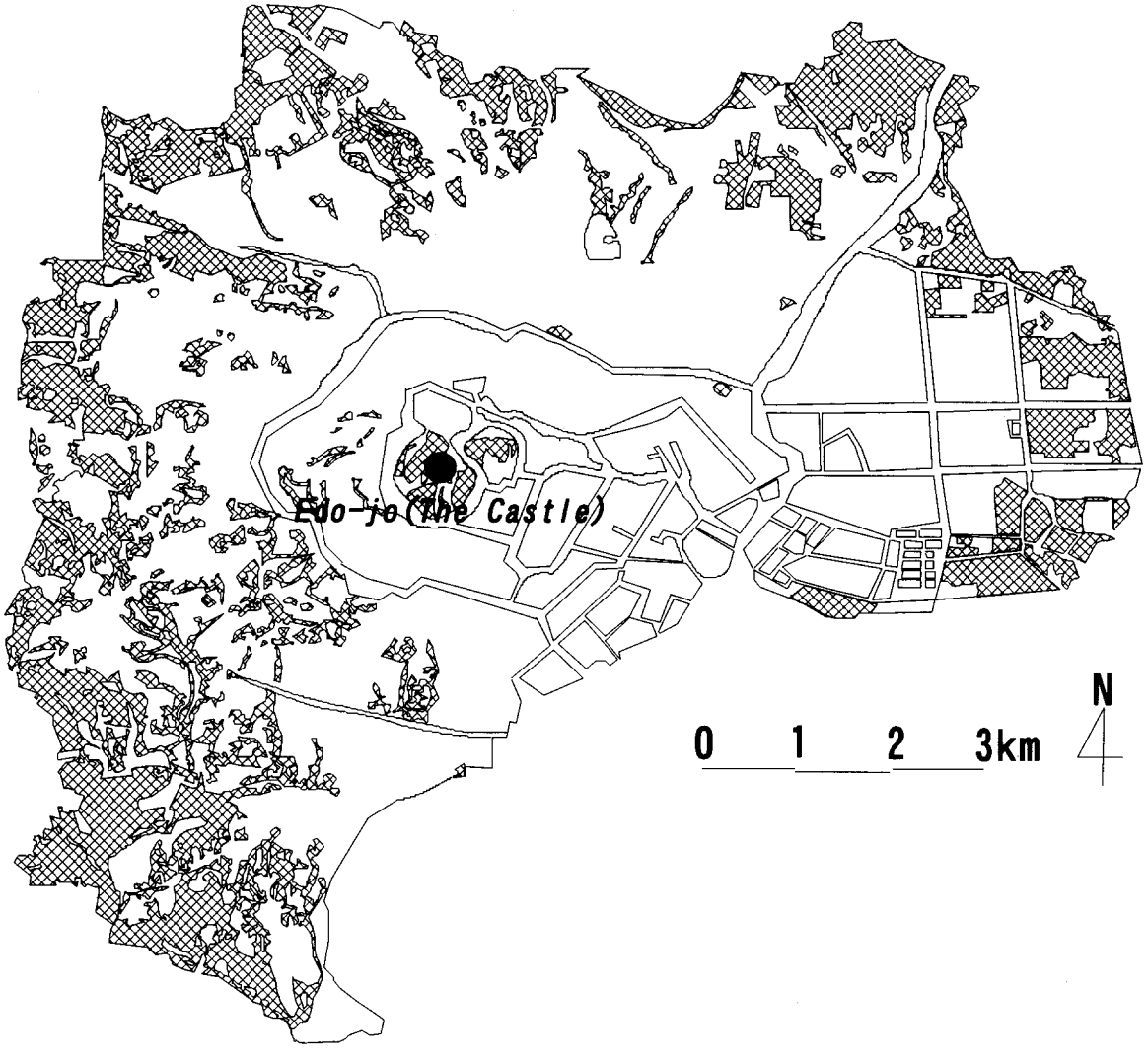

Fig. 8. Presumed open space map of Edo (re-illustrated from Tabata, 1999). Mixture of urban land use and green open space patches (hatched), mostly consist of farmland and coppice woodland, may be clearly identified.

called 'Muban', have been installed but the original road pattern, which was introduced to the area when land consolidation operations took place, is still maintained (Watanabe, 1991).

Farmers in the fringe of Asian mega-cities did release a part of their land to obtain capital, allowed urban developments to change their lives, and became laborers at factories or offices in their neighborhood. But they still did remain farmers and maintained their remaining green patches as active farmland.

5. Controlled mixture of urban and rural landscapes: a new ecological planning concept for the future of Asian mega-cities

History shows and current trends support that the mixture of urban and rural land uses in the fringe of Asian mega-cities forms a true vernacular landscape. McGee (1991) defines areas in Indonesia with such land use mixture as Desakota, an Indonesian term that expresses the mixture of country (=desa) and city

Fig. 9. Landscape of Edo in the 19th century (Saito, 1984). The scene of residences with a glorious garden surrounded by paddy fields.

(=kota). The Landscape of Desakota is not the visual expression of a transitional stage of urbanization but is a vernacular landscape that characterizes Asian cities (Fig. 12). Desakota is the result of sustainable social systems in the fringe of Asian mega-cities (Takeuchi, 1998).

An unbalanced mixture of urban and rural landscapes must be controlled. However, the application of western urban planning concepts represented by greenbelts and zoning may not be the best solution in the Asian context. Controlled mixture of urban and rural landscapes should be nominated as one of target concepts that reflect the characteristics of Asian cities.

Contemporary restoration of the relationships between urban and rural landscapes is perceived to be a valid approach. Asihara and Lynne (1992) explains that the spatial order identified in Japanese cities is not obvious as those in European cities, and thus names it as the 'hidden' order. Functional relationships, which may bring order to the mixture of urban and rural landscapes, are also invisible and thus may not be obvious. However, we should understand that such uncertainty on the surface is the identity of Asian cities.

The 21st century is projected to be the century of the environment. The future of human beings is dependent on the actions we will take on behalf of the environment at the beginning of the next century. Responding to such concern on the environment, the new concept for Asian mega-cities, 'controlled mixture of urban and rural landscapes' should be considered as a workable concept for the future.

Vegetated open spaces in urban fringe areas, including agricultural lands, are known to have many ecological functions (Yokohari et al., 1994). They may provide habitats for wildlife, become recreational spaces such as allotment gardens and aesthetically pleasuring gardens, and maintain comfortable living environment. From the time of Olmsted the effect of greenspace on the visual quality of urban areas has been understood as most important to people's health. Yokohari et al. (1997) report that paddy fields remaining in urban fringe areas have a significant effect on controlling summer heat for surrounding residential

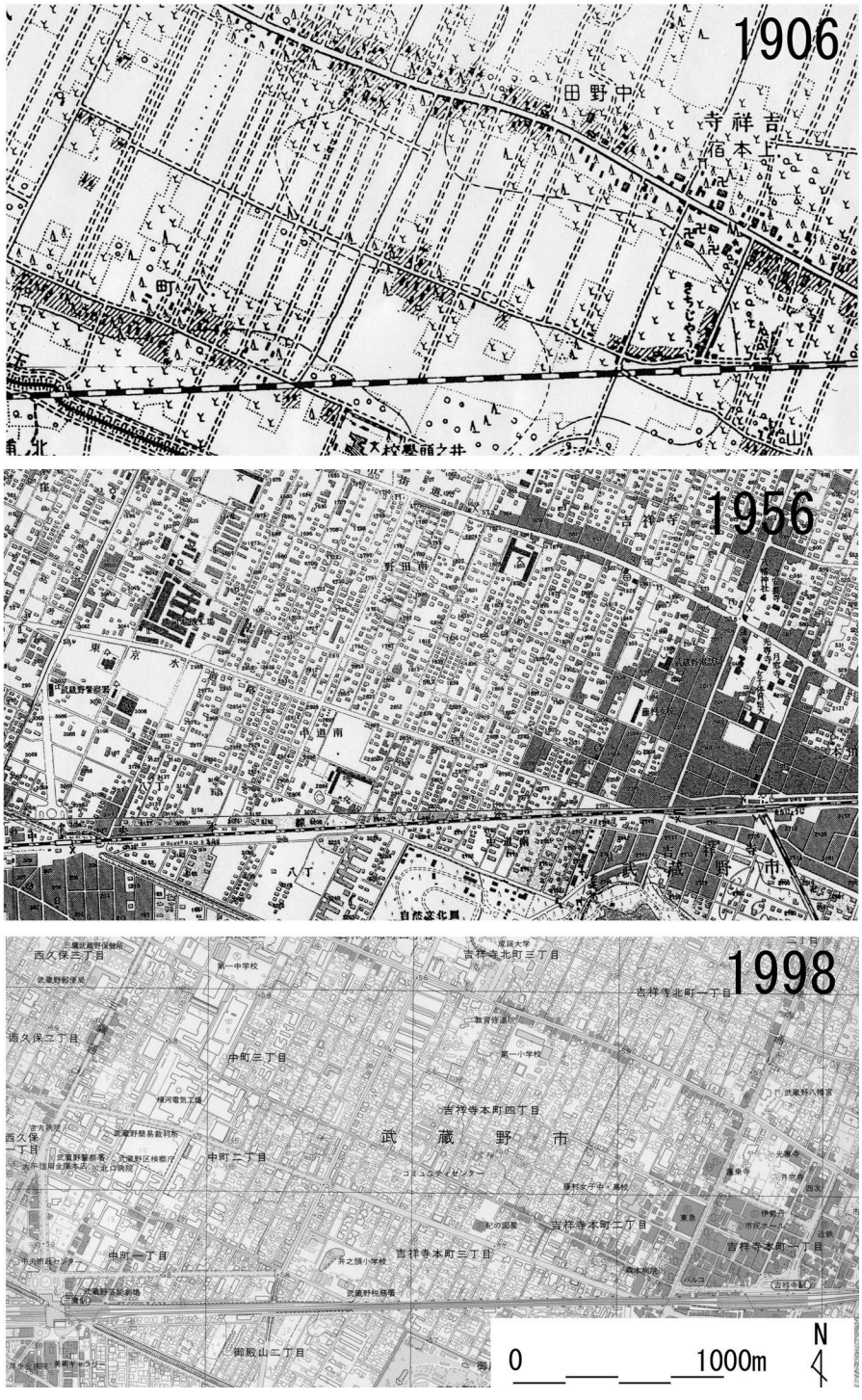

Fig. 10. Land use changes in the fringe of Tokyo: The original grid road systems in the area, Kichijoji and Mitaka city, 20 km west of the central Tokyo, accepted micro-scaled urban developments but maintained agriculture.

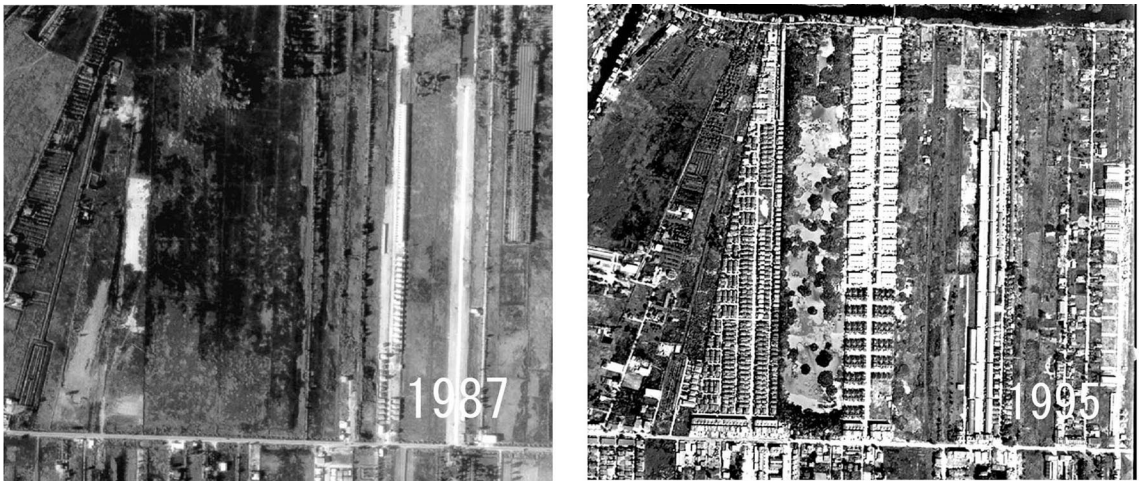

Fig. 11. Land use changes in the fringe of Bangkok: Muban developments. Arrays of linear housing complexes are developed by following the original rectangular land use pattern of the area.

areas. Kato et al. (1997) report the ecological functions provided by farmland and woodland yield water retention capability, landslide prevention capability and air pollution control. This suggests the need for a conservation strategy for farmland and woodland based on the ecological functions they afford.

Growing social concern for safe food is another issue that should be recognized. Modern agricultural technologies rely on the excessive use of agricultural chemicals including pesticides, insecticides and chemical fertilizers. These practices produced significant growth in agricultural production but, at the same time, caused serious pollution. Farmland located in urban fringe areas may provide safe and fresh food to consumers in the neighborhood by conducting organic and ecological farming. There may also be possibilities for consumers, urban citizens, to support such farming not only by buying products but providing labor as 'Sunday' farmers.

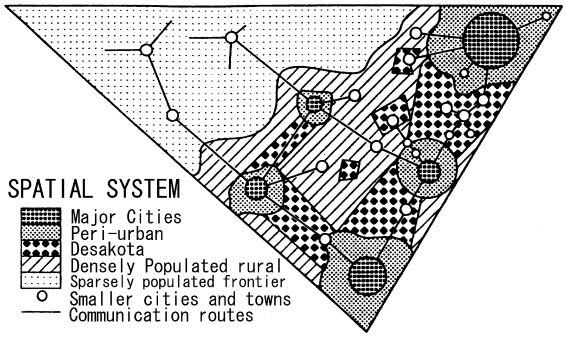

Fig. 12. Conceptual diagram of land use patterns in Asian megacities (McGee, 1991).

Segmented farmland patches that remain in urban fringe areas provide many services including water retention capability, micro-climate control, conservation of visual quality, and the supply of safe, fresh food. Citizens in urban areas surrounding those farmland patches support them both by means of subsidies and labor provision. Such services are perceived to be the key issues for the restoration of successful relationships between urban and rural landscapes.

Ebenezer Howard proposed a garden city concept in his book 'Garden Cities of To-morrow' (1902). His concept was based on the idea of utilizing surrounding rural areas to restrict urban growth, and control residential, commercial, and industrial zones in the city with a population no larger than 30,000. His plan, in this sense, was based on the state-of-the-art urban planning concept at the time in UK. Yet, his plan was not only a physical plan but a social plan that aimed to realize a self-sufficient community free from disadvantages of major cities.

At the end of the century, by having vernacular Asian landscapes in mind, we must develop a new planning concept truly applicable to Asian cities, which supports the integration of urban and rural

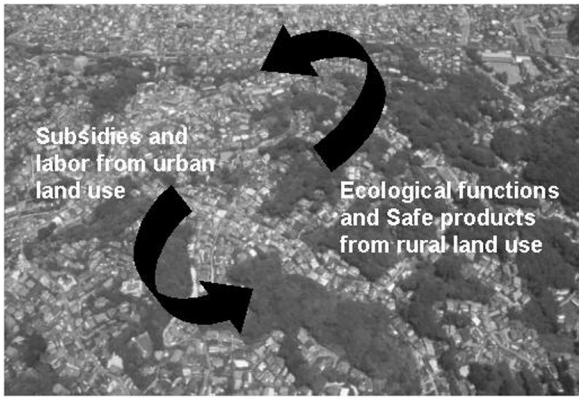

Fig. 13. Contemporary functional relationships between urban and rural areas.

landscapes (Fig. 13). The reestablishment of newly conceived urban and rural landscapes, 'garden city system concept', is deemed to be the key for realizing an Asian urban environment in the 21st century.

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