

## **The Contribution of Residential Planning to Enhance the Sustainability of a High Density City: The Case of Hong Kong**

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### **Abstract**

Residential planning policy influences the spatial distribution of population and associated facilities and the living environment of the people. The planning of residential area in general and housing as a core component in particular contribute towards the local and global sustainability. Since housing is a key constituent of the built environment and itself is multi-faceted in nature exerting impacts on economic, environmental, social and cultural aspects, its development has to be sustainable in the fullest sense of the word if cities intend to strive for sustainable development. In the high density cities, careful attention is needed for residential planning since more people and activities compete for the scarce land resources in such cities. Hong Kong is well known for its high-density and high-rise developments. The paper aims to investigate the contribution of residential planning in enhancing sustainability of Hong Kong as a high density city. At the beginning of the paper, the growth pattern and residential planning of Hong Kong is described in a brief. Then the concept of sustainability and incorporation of the concept in Hong Kong development are discussed. At last, the role of residential planning in enhancing the sustainability of Hong Kong has been critically evaluated. The paper argues that although the principles of residential planning of Hong Kong are contributing to environmental sustainability of the city, the social sustainability has received least attention.

**Keywords:** High density, Hong Kong, residential planning, sustainability.

### **1. INTRODUCTION**

Hong Kong is well known for its high-density and high-rise developments. The scarcity of land and high population growth contribute towards the high density in Hong Kong. Both the commercial, industrial along with residential properties takes the form of high rise building. In Hong Kong, supported by technological advancement, the height of public housing as well as other types of buildings increased from 6- to 7-storeys in the 1950s to 50- to 60-storeys by the 1990s (Yuen, et. al., 2006). Hong Kong's urban form has developed within the constraints of its topography and the shortage of land for development, and has been affected by the high economic and real estate gains through limited land availability. As a result, the compact urban form was the only option for Hong Kong to cater for its growth. Residential development has always been an important issue within the planning system (Rydin, 1992). Residential planning policy influences the spatial distribution of population and associated facilities and the living environment of the people. The planning of residential area in general and housing as a core component in particular contribute towards the local and global sustainability. Hong Kong has been officially committed to sustainable development since late 1990s. The paper aims to investigate the contribution of residential planning in enhancing sustainability of Hong Kong as a high density city. At the very beginning of the paper, the growth pattern and residential planning of Hong Kong has been described in a brief. Then the concept of sustainability and incorporation of the concept in Hong

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Kong development have been discussed. At last, the role of residential planning in enhancing the sustainability of Hong Kong has been critically evaluated.

## **2. GROWTH OF HONG KONG AS HIGH DENSITY CITY**

Hong Kong, occupying an area of 1,104 sq. km is home to population of 6,864,346 people and an overall population density is 6,352 persons per square kilometer in 2006 (Census and Statistics Department, 2007). Hong Kong is among the most densely populated cities in the world. The geography of Hong Kong is hilly; consequently agricultural land or any flat land is scarce. Land usage reflects the tightly packed population in Hong Kong. A significant proportion (about 76.2 per cent) of the total area is agricultural land, country park and water bodies. The built-up areas in the city are mainly located along the narrow coastal areas north and south of the Victoria harbor and the New Towns, which together make up about 23.8 per cent of the total area of Hong Kong. Only seven per cent of the total area (29.4 per cent of the built-up areas) is for residential use. According to mid-2005 figures, there are 2,479,000 permanent quarters, equating to a density of 31,885 quarters per square kilometer. The limited supply of residential land and high development density results in some very high concentrations of population (Zhu, 2009).

Most of the new towns in Hong Kong were built on reclaimed land on river estuaries along the coast. Because of the hilly terrain, land development in Hong Kong was expensive and difficult. Land reclamation is expensive as well, but it is quicker and cheaper than to take over land from the indigenous residents of the New Territories. The higher cost of land development coupled with the scarcity of developable land in Hong Kong compels concentrated high- density and high- rise development in order to accommodate high population and to ensure economic development. However, several researchers opined that the compact urban form of Hong Kong has not emerged by an overall grand plan and design, but rather by the combined effects of a shortage of flat land and the high rate of population growth in the early years (Zaman *et al.*, 2000; Zhang, 2000). Prior to 1973, the urban form of Hong Kong exhibited a uni-centric pattern with peripheral extension; and since then, it has evolved into a multi-nuclear pattern with the development of new towns (Chiu, 2001).

Planning Department of Hong Kong is responsible for guiding the use and development of land. Outline Zoning Plan (OZP) prepared by Town Planning Board (TPB) shows the land use zones, development parameters and major road systems of an individual planning area. Any new development or redevelopment in the residential areas needs to follow the Schedule of Notes attached to each OZP (HKSAR, 2010). Hong Kong Planning Standards and Guidelines (HKPSG) is a reference manual setting out the criteria for determining the scale, location and site requirements of various land uses and facilities. In residential planning, number of planning guidelines and standards are formulated regarding residential densities, open space, community facilities, environment and conservation which are required to comply with for better living environment and sustainability of Hong Kong.

## **3. CONCEPT OF SUSTAINABLE DEVELOPMENT**

### **3.1 The Concept of Sustainability**

The concept of sustainable development has evolved since the 1980's. The notion of sustainable development, introduced in 1980 by a publication of the International Union for the Conservation of Nature and Natural Resources, *World conservation Strategy*, was a response to the need to balance environmental protection with economic development. It became a slogan after the

publication of the WCED report in 1987. As defined by the Commission, "...sustainable development is the development that meets the need of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987 :43). This definition coins the essential components of the concept in simple terms: that of equity within and between generations and that our ability to meet needs is bounded by the limits of the earth. The concept of sustainable development has been initially debated and interpreted in terms of the limits of the earth to accommodate human activities, thus, 'ecological sustainability' was the early concern of sustainable development. As the concept develops, 'economic sustainability', 'social sustainability', and 'cultural sustainability' have gradually been incorporated as key dimensions of sustainable development (Chiu, 2004a).

### **3.2 The Incorporation of Sustainable Development in Hong Kong Government's Policy Agenda**

The study on Sustainable Development for the 21<sup>st</sup> Century in Hong Kong (SUSDEV 21) is the first comprehensive research study on sustainable development in Hong Kong context conducted by the Planning Department in 1997. The study was conceived in response to the need to take account of environmental and social concerns as well as economic aspects when making decisions about the future of Hong Kong (Shen, et. al., 2011). According to SUSDEV 21, Sustainable Development in Hong Kong is targeted to balance social, economic, environmental and resource needs, both for present and future generations, simultaneously achieving a vibrant economy, social progress and a high quality environment, locally, nationally and internationally, through the efforts of the community and the Government (Planning Department, 2005a).

The paper will focus on the contribution of residential planning in enhancing sustainability of Hong Kong from environmental, economic and social perspectives.

## **4. THE CONTRIBUTION OF RESIDENTIAL PLANNING TO ENHANCE THE SUSTAINABILITY OF HONG KONG AS HIGH DENSITY CITY**

Residential development has always been an important issue within the planning system (Rydin, 1992). The planning of residential area in general and housing as a core component in particular contributes towards the local and global sustainability. Housing by nature is multi-faceted, encompassing, and exerting impacts on, the environmental, economic, social, cultural and political aspects. Further, as housing is a key constituent of the built environment, its development has to be sustainable in the fullest sense of the word if cities intend to strive for sustainable development. Moreover, through better planning of residential areas, there can be substantial change in reducing travel demand and thus alleviating adverse impact on the environment. Hong Kong Planning Standards and Guidelines (HKPSG) act as a tool to regulate the planning and development by providing the locational guidelines for various types of land uses and facilities to help the planning of a development area. The following section will critically evaluate how residential planning contributes towards advancing sustainability in Hong Kong.

### **4.1 Residential Density Planning Policy to Guide Urban Development**

The density planning policy plays a vital role in controlling the urban growth and urban development. Residential density planning is a very effective measure to accommodate the urban population in a predefined density. The development intensity of building and population of concerned area is regulated by density planning. In 1963, the concept of density zoning was introduced in Hong Kong and it is still in use today (Planning Department, 2005b). Table 1 shows

the maximum domestic plot ratios in the metropolitan areas. The main objectives of density zoning are to maximize intensity of people and jobs with close proximity to high- capacity transport systems, and this assists in shaping the Hong Kong's high- density urban form (Zaman, 2000). The density of development in public and private residential areas in Hong Kong is guided by way of plot ratio. The new towns, excluding Tsuen Wan, are also classified into four density zones for residential developments and the maximum plot ratios range from 8 to 0.4.

**Table 1: Maximum domestic plot ratios in Metroplan area**

Density Zone	Type of Area	Location	Maximum Domestic Plot Ratio
R1	(1) Existing Development Area: i. well served by high capacity public transport systems ii. often incorporate commercial space on the lower one to three floors	Hong Kong Island	8/9/10 (i)
		Kowloon & New Kowloon	7.5
		Tsuen Wan, Kwai Chung & Tsing Yi	8
	(2) New Development Area and Comprehensive Development Area		6.5
R2	i. less well served by high capacity public transport systems		5
R3	i. with very limited public transport capacity ii. subject to environmental constraints		3

Note: (i) Maximum domestic plot ratio of 8, 9 and 10 depends on Site Classification.

Source: Planning Department, 2005b

Through the integrated land use, transport, environmental and infrastructural planning, residential developments of different densities can be planned to achieve the most efficient and functional disposition and economies of scale in terms of social, transport and infrastructural provisions while meeting environmental objectives.

## **4.2 Residential Planning Contributing towards Environmental Sustainability**

### **4.2.1 Conservation of Countryside through High Density Development**

During 1970s, the rapid encroachment of urban development on limited rural land, and the lack of infrastructure and viable economy in the new towns, forced the planners to rethink about the dispersed urban development policy taken during 1947 and spurred towards high- rise and high-density compaction approach (Zhang, 2000). As Housing and residential areas are the largest consumers of urban space, high-rise and high-density urban development can save land, and help provide more open and green space, buffered by rural areas (Bookchin, 1986; Rudlin and Falk, 1999). In case of Hong Kong, the compact urban form is advantageous for the environment as it left almost 70 % of Hong Kong's territories green (Zaman, 2000).

#### **4.2.2 Better Public Transport System**

All the new towns in Hong Kong are connected with the main urban centre by highways and mass transit railways, either underground or at grade. Commuting between the new towns and the city centre is mainly by public transport, which is usual means of travelling in Hong Kong. Owing to the high density of the new towns, mass public transport is necessary to move the huge number of commuters. There is a wide range of public passenger transport modes operating in Hong Kong, including buses, the underground train system, heavy and light railways, minibuses, ferries, trams and taxis. With a vast number of customers and the permission given to railway companies to develop properties at the railway stations, public- transport operators in Hong Kong are not only self-funding but in fact profitable (Chiu, 2001). Moreover, through better planning of residential areas, there can be substantial change in reducing travel demand and thus alleviating adverse impact on the environment. Planning of denser residential areas near the public transport nodes contributes towards the operation of efficient public transport operation which in turn contributes towards less energy consumption.

#### **4.2.3 Addition of Environmental Considerations for Residential Development**

Housing is key constituent of the built environment and the prime output produced by residential planning. To strive for urban sustainability, the development of housing has to be sustainable in the fullest sense of the word and this should be enhanced while residential planning. The Housing by nature is multi-faceted, encompassing, and exerting impacts on, the environmental, economic, social, cultural and political aspects. Perceived from the perspective of environmental sustainability, housing development, thus, is a process that involves the transformation of natural resources, via labour power, into liveable spaces. The housing units produced in turn provide shelter, use and reproduce energy, and deliver waste to the wider community (Bhatti, 1994; Chiu, 2000; Rydin, 1992). From this perspective, housing has significant implications for the pursuit of urban sustainability as housing is one of the most important components of the built environment (Zhu, 2009). Chiu (2004a) argues that to apply the environmental concepts and principles to residential development, an ecological dimension has to be added to the production and consumption processes of housing.

The first important steps to enhance environmental sustainability through residential planning was by adding an ecological dimension to the project planning stage which was the inclusion of the Environment Chapter in the Hong Kong Planning Standards and Guidelines (HKPSG) in 1985 and also, since the same year, the requirement that all major housing development projects (not less than 2000 units) have to undertake an environmental impact assessment study (Chiu, 2004a). Based on the above guidelines and directives, the Planning Department and the Environmental Protection Department scrutinize all land-use plans and applications for housing and other developments.

Environmental Impact Assessment Ordinance in 1997 was enacted aiming to avoid, minimize and control adverse environmental impacts of designated projects by using the EIA process and an environmental permit system. The public can also be involved at the early stages of project planning and design to express their concerns and opinions in the EIA reports prior to the approval. However, the EIAO has no impact on the environmental quality of the existing housing stocks. As a matter of fact, about 58% of the existing housing stock was produced prior to 1985 when environmental consciousness was weak. Hence a majority of the current housing stock was not given adequate, or even any, environmental consideration when it was planned; not to

mention, before 1985, the construction of flyovers and trunk road right next to the residential blocks or even just outside the windows of some of the housing units (Chiu, 2004a). The HKPSG gives guidance to the planners and its provisions are not statutorily obligatory.

The EIAO has been criticized for over-reliance on technological fix, narrow focus on technical issues and incapability of handling cumulative impacts in safeguarding the environment. Furthermore, the EIA does not cover all residential estates, if served by public sewers, with fewer than 2000 units and not located in sensitive locations, need not to carry out EIA (Kerry, 2001).

#### **4.2.4 Conservation of Energy by Building Design**

Through innovative design and selective use of materials energy consumption by residential development can be substantially reduced. Various guidelines and practice notes provide measures in designing the residential developments. The HKPSG, Joint Practice Note and the PN of the Environmental Protection Department and Planning Department have introduced practical measures to achieve environmentally friendly designs. Chapter 9 of the HKPSG suggests some design concepts for different land uses to reduce the pollution. To improve ventilation, buildings can create an artificial confinement, which can inhibit pollutant dispersion. Space between buildings should be maximized in designing the land use patterns. The disposition of open spaces and building areas should be such that the ventilation corridors passing through urban centers can be minimized to facilitate dispersion of air pollutants.

There is no specific guideline for the energy conservation in Hong Kong. Moreover, Hong Kong does not have any requirements or regulations on the energy issues under the Laws of Hong Kong over the energy-efficient designs, particularly for the residential developments (Chiu, 1998). The Building (Energy efficient) Regulation (Cap 123M) only applies to the commercial buildings and the hotel developments.

The government's guidance in green housing design is minimal, although the public housing providers, HKHA and HKHS, have been active in experimenting with green designs, the use of environment-friendly building materials and waste management (Chiu, 2004a). Several energy saving measures have been adopted by the HKHA. Energy-saving lamps have been used widely in the housing estates for over 15 years and energy-efficient floodlights have been used in the car parks since 1995. Automatic timer controller systems have been used in the communal areas of housing estates to prevent waste of energy. Development of a Construction Waste Index to assess waste generation in the construction sites and use of Overall Thermal Transfer Value in all commercial buildings are some initiatives by the HKHA (HKHA, 2006). A recent achievement is, nonetheless, the wider provision of green features resultant from government's GFA exemption (Chiu, 2004a). The HKHA has set 41 environmental targets for the year 2005/06 ranging from waste management, awareness & participation, energy efficiency, landscaping and greening, water, air, noise and hazardous materials. The use of sea water for toilet flushing in Hong Kong, instead of potable water, is a distinct environment-friendly practice, reducing about 30% of the domestic potable water use (Ng & Wong, 1997). Hong Kong is heavily dependent on mechanical air conditioning for cooling. No significant attempt has been made to include solar shading and thermal insulation design for cooling the residential units.

The high density and high-rise development in Hong Kong nevertheless sacrifices other aspects of livability; privacy and cooling by natural ventilation (Chiu, 2004a). Design standards for minimal future alteration and minimum resource utilization are needed to be incorporated in the sustainable development guidelines.

#### **4.2.5 Sustainability arising from Construction, Use of Building and Refurbishment**

Environment-friendly construction practices, use of recyclable building materials and management of construction waste during the refurbishment period need proper attention from sustainability point of view. Disturbance to the nearby environment is also need to be reduced. But no evidence for consideration of above mentioned aspects is found in any of the public or private housing projects in Hong Kong. Moreover, no government regulation is found regarding the matter. The environmental problems incurred during refurbishment would be subject to controls as for the construction project (Chiu, 2004a).

From the above discussion it can be said that by incorporating environmental consideration in early stage of planning of residential areas and during the design, construction and use of building contribute towards enhancing sustainability of Hong Kong. But any standard is yet to establish to measure the sustainability. Housing built before 1985 is relatively less environment friendly than those constructed after 1985. The sizeable blocks built before 1985 need to be assessed to measure the environmental quality and necessary works should be done to for remedy of possible environmental hazards if there is any. People are becoming more concerned about the environmental sustainability. The statistics of Building Environmental Assessment Method (BEAM) shows that as of July 2003, they provided recognition for improved building performance to nearly 80 landmark properties in Hong Kong, comprising over 3.6 million square meters of office space and 30,000 residential units. These account for more than 25% of commercial space, and approximately 10 % of dwellings whereas in 2002 there were only 3 such projects (HK-BEAM, 2004).

#### **4.3 Enhancing Social Sustainability through Residential Planning**

Bramley et. al. (2009) noted that whilst the sustainable development agenda emphasizes the importance of 'social' aspects of sustainability, there has been little agreement as to what this consists of. Burton (2000) argues social equity as a core of the notion of social sustainability within urban context. However, Chiu (2004b) argues that social sustainability should involve reductions in social discontinuity and conflicts and the strengthening of social cohesion and social stability. This section tries to identify the impact of residential planning in achieving social equity in facilities and opportunities of Hong Kong.

- ***Access to facilities and open spaces***

A wide range of community facilities are provided following the number and land requirements as specified according to the HKPSG. Because of the high density urban form, the community facilities remain accessible by different groups of society. However, in case of open space only 1 sq.m./person of local open space is provided according to HKPSG (Planning Department, 2005c) which is a very small ratio.

- ***Better accessibility to Public transport***

Because of the better integration of land use and transport planning can reduce travel demands; public transport has become accessible and affordable to the inhabitants. It is generally accepted that public transport works better in compact cities owing to the tendency for a larger population to live within easy access of a stopping-point (Goodchild, 1994). Lau et al. (2003) argues that the accessibility of low-income people in Hong Kong is promoted by complementary effects among different public transport modes. Public

transport service dominates urban commuting in Hong Kong and it accounted for over 75 per cent of all work trips in 2001.

- ***Reduced Domestic Living Space***

Reduced domestic space has been generated because of the high density residential environment in Hong Kong. A study by Chiu (2003) shows that the highest space standard is in private housing of the Hong Kong Island, reaching 18.3 sq m per person. The lowest 8.5 is found in the public rental housing of the New Territories. The overall average was 13.1 sq m. These statistics demonstrate the degree of inequality in housing both geographically and across housing types. For the public rental housing sector, the HKHA sets an allocation standard which currently is 5.5-7 sq m per person. The SUSDEV21 study, a consultancy study commissioned by the HKSAR Government to help develop a sustainable development strategy for Hong Kong, points out that some households, whilst residing in housing that meets the definition of adequate housing, may not have enough space within their living quarters to achieve a satisfactory living environment.

- ***Lower Levels of Social Segregation***

It is widely argued that, in the compact city, communities are likely to be more mixed and that low-income groups are less likely to suffer from the added disadvantages of being spatially segregated (Burton, 2000). Because of the high density, mixed use development of residential commercial and retail activities and operational public transport network lower level of social segregation is observed in Hong Kong.

In the planning of public housing site specific design principle has been adopted very recently. The adoption of site-specific designs allows the optimal use of a site's unique location and features to meet residents' needs. Coupled with Universal Design principles as well as barrier-free access, the public housing estates are designed to provide "socio-spatial equity" for everyone. In simpler terms, the estates are designed to provide a safe, inclusive and accessible environment for everyone within the community (Hong Kong Housing Authority, 2010). Through residential planning, standards for space requirements for different facilities have been determined (by HKPSG) which in turn enhances the accessibility to the facilities. But, the expressions of the HKPSG about the facilities regarding social relations, equal opportunities, social well being and social stability are too implicit to draw planners' attention (Wah, 2005).

#### **4.4 Economic Sustainability through Residential Planning**

Apart from meeting accommodation need of the population, the housing sector comprises an important sector in the economy of Hong Kong. It accounts for about one-fifth of the Gross Domestic product (GDP) and 40% of the loan portfolio of the financial institutions; it is significant generator of employment; and investment and speculation in housing are most popular forms of investment among the developers and average citizens (Chiu, 2000). To make Hong Kong economically sustainable through residential planning, the housing sector needs to be economically viable both to the consumers and producers as well.

### **5. CONCLUSION**

From the critical discussion on contribution of residential planning in enhancing sustainability of Hong Kong, it can be said that, residential density planning has played an important role in shaping the compact urban form of Hong Kong which facilitates the saving of land resource and

efficient operation of public transportation in Hong Kong. The incorporation of environmental considerations in HKPSG is assisting to promote environmental sustainability of Hong Kong. Although existing planning frameworks have incorporated the environmental considerations into the residential planning process, a comprehensive framework is essential to make the environmental legislations statutorily obligatory are integrated into the early planning process. Social sustainability has received least attention in the residential planning process. Provision of community facilities and recreational space are guided by HKPSG. However, planning and design of residential areas should consider social dimensions of the community as well to make Hong Kong socially more sustainable.

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