

SUSTAINABLE DEVELOPMENT:
A NEW PERSPECTIVE FOR HOUSING DEVELOPMENT

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Introduction

Housing by nature is multi-faceted. It consumes natural resources and produces impact on the natural environment. It constitutes a major economic activity and impacts on the general economy. It is an important component of social development and quality of life. It is often used by governments to achieve political and economic ends. It is also a cultural attribute, manifesting the aesthetic value and the way of life of man in his particular setting. A holistic perspective is therefore needed if we wish to chart the future of housing development. The sustainable development paradigm offers such a possibility.

Ensued from the concern of the adverse impact of the economic activities of man on the sustainability of the Earth, the sustainable development paradigm has evolved to cover the social and cultural dimensions of human development. What this paradigm offers, therefore, is not only an additional environmental dimension for housing analysis, but an integrative approach with a long-term perspective that carries policy implications.

The aim of this paper is thus to delineate this sustainable housing development framework. The paper discusses the key concerns of the environmental, economic, social and cultural sustainability of housing, and the political forces and policies affecting them. Sustainability indicators and criteria, and issues concerning their use are also discussed. This paper argues that the four strands of sustainability should form the basis of housing strategies and policies and for the monitoring of housing performance. It also argues governments play a very important role in effecting sustainable housing.

Why apply sustainable development concepts to housing

The notion of sustainable development, introduced in 1980 by a publication of 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: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. For example, it is equated with a commitment to living within the limits owing to the 'carrying capacity' of the biosphere, defined as the optimal animal population that a given ecosystem or environment can sustain, and collapse will occur if the capacity is exceeded (Healey and Shaw, 1993; Jacobs, 1999). Another defines it as managing resource use in a way that enables the meeting of aspirations of society over a considerable period of time. Thus, sustainability refers to the ability of the natural environment, or the ecosystem, to accommodate human activities, especially those constituting economic development, in the long term.

The concept of 'development' has also been debated. Munro's deliberation of 'development' (1995) is perhaps the most comprehensive: development should be inclusive of all kinds of activities and processes that increase the capacity of people or the environment to meet human needs and improve the quality of human life. He further cautions that development should not only include the physical development of the living environment, but also of equal importance are health care, social security, education, nature conservation, cultural activities and etc. Therefore 'development is a complex of activities, some with social, some with economic objectives, some based on material resources, some on intellectual resources, all enabling people to reach their full potential and enjoy a good life' (p.28). However, given our past and present speed of development, the capacity of the earth to sustain such growth and consumption rates has to be questioned and cautioned.

It follows that in addition to 'ecological sustainability', the concepts of 'economic sustainability', 'social sustainability', and 'cultural sustainability' have gradually been incorporated as key dimensions of sustainable development. Further, the linkages between these different dimensions of sustainability should be fully taken into account, and that they should not be isolated from one another (Khan, 1995; Goodland and Daly, 1996; Mitlin and Satterthwaite, 1996, Hart, 1999; Williams, *et al*, 2000; Chiu, 2003). A good example of this integrated approach is Hart's (1999) formulation of indicators for sustainable community cities. She argues that economic indicators such as the Gross Domestic Product (GDP) reflect only the amount of economic activity but neglects the effect of that activity on the community's social and environmental health. Thus GDP can go up when overall community health may go down. Thus, instead of using median income as an economic indicator, the number of hours of paid employment at the average wage required to support basic needs should be used; and in lieu of unemployment rate, diversity and vitality of local job base should be used (Hart, 1999, p. 9). Hart's work substantiates the similar views expressed earlier by M.A. Khan (1995): an appropriate sustainable development index should be developed to measure development in the context of an integrative framework of social, environmental and economic sustainability, rather than relying on the conventional method of GDP.

Sustainability thus requires a more integrated view of the world. It is within this perspective that sustainable development can be sought. Likewise, given the multi-faceted nature of housing as discussed in the Introduction, and the fact that it straddles over the environmental, economic, social, and the cultural dimensions, an integrated approach as promised by the sustainable development perspective is useful to provide a more holistic framework for evaluating present housing development and for charting future directions of housing policy.

Another important reason for employing the sustainable development perspective to housing is because of the essential role it plays in enhancing global and local sustainability. Since the publication of the WECD Report in 1987, it has been increasingly recognized that while sustainability is a global issue, its achievement requires and in fact hinges on local actions. In particular, cities have become a focal point as cities are where most economic activities take place, and where employment, education and other services are offered. Simultaneously cities are also main consumers of natural resources and the main producers of pollution and waste. The Agenda 21, a blueprint for achieving sustainable development endorsed by 178 government delegations in the earth summit held in Rio in 1992, called for local authorities to develop sustainable cities, such as constructing efficient and environmentally friendly systems of public transport and non-motorized trip making (De Roo, 2000). It also emphasized the importance of accessibility to adequate shelter and related housing services such as water supply and waste treatment. Recognizing the critical role of cities, the United Nations convened another earth summit in 1996, the Habitat II, with 'adequate housing for all' and 'ecological sustainable development in an urbanizing world' as the overall themes (Elander and Lidskog, 2000).

Thus, the multi-faceted scope of both the sustainable development concept and housing by its nature, and the fact that housing is integral to urban sustainability, have underpinned the validity and the need to evaluate housing development and chart its future development from the sustainable development perspective. The next section thus presents a sustainable development framework for housing.

A sustainable development framework for housing?

Before discussing the framework for sustainable housing development, the tenets of housing development from such a perspective needs to be established. Following the basic concept of sustainable development defined in the 1987 WCED report, sustainable housing development should not only cater for the housing needs of this generation but also of those to come. While the primary concern of sustainable housing is to meet the accommodation needs of the citizens, the environment has to be safeguarded from deteriorating to an extent that it diminishes the ability of future generations to meet their housing needs. Further, sustainable housing should not be merely about meeting basic needs, but should also improve livability (Chiu, 1999). Improved livability does not necessarily mean larger space and more facilities. It may refer to

'.....a shelter which is healthy, safe, affordable and secure, within a neighborhood with provision for piped water, sanitation, drainage, transport, health care, education and child development. Also a home.....protected from environmental hazards, including chemical pollution. Also important are [to meet] needs related to people's choice and control – including homes and neighbors which they value and where their social and cultural priorities are met.....achieving this implies a more equitable distribution of income between nations and, in most, within nations.' (Mitlin and Satterthwaite, 1996, p.31-32.)

The above tenets provide the direction for steering sustainable housing development in general and that for different strands of housing sustainability in particular. Figure 1 shows the key components of the sustainable

development framework and the interconnectedness of the different strands of housing sustainability. While each strand has its own concerns, they have common core elements: socio-cultural pre-conditions conducive to the supply and demand of environmentally sustainable housing and an acceptable quality of housing. In the following, the derivation of each strand from the sustainable development concepts and the concerns of each strand will be delineated.

Environmental sustainability of housing

As discussed, sustainability initially refers to the ability of the natural environment to sustain given the toll of human activities on the ecological system. Thus, environmental sustainability refers to the ability of the ecosystem to maintain or improve its quality, and to reach a long-term stable situation in spite of short-term changes (Nijkamp and Soeteman, 1988). More specifically, the ecological sustainability of a development activity refers to 'activity that acknowledges biophysical limits and the need to maintain essential ecological processes and life-support systems upon which all life depends' (Zovabyi, 1998:157). In economic terms, environmental or ecological sustainability requires maintaining natural capital as both a provider of economic inputs and an absorber of economic outputs, including wastes (Basiago, 1998). In operation terms, the principles of ecological sustainability involve: a) the rates of use of renewable resources not exceeding the rate of regeneration; b) the depletion rates of non-renewable resources not exceeding the rate at which renewable substitutes are invented and invested; c) rates of pollution not exceeding the assimilative capacity of the environment; and d) waste emission not exceeding the assimilative capacity of the local environment (Caldwell, 1998; Zovabyi, 1998:151-2).

To apply these concepts and principles to housing, an ecological dimension has to be added to the production and consumption processes of housing (Bhatti, 1994; Chiu, 2000; Rydin, 1992). The major concerns of such a perspective are the toll of residential activities on the ecological system, and the environmental quality of the housing conditions of the residents, who are constituent members of the ecological system. These processes can be divided into six stages and the possible environmental impacts can be examined in each phase. At the project conception and planning stage, the impact of the choice of the site and the development intensity on the local ecological system and the opportunity to optimise existing infrastructure should be evaluated. At the design stage, the emphases are whether the design minimises future alteration (i.e. whether the design aims for present and long-term use.), whether the project enables energy saving, minimum resource utilization, efficient waste management, the use of environmentally-friendly building materials and construction systems, and encourages simple lifestyles.

At the construction stage, the concerns are the extent of using environmentally friendly construction materials, minimization of disruption to the local environment such as dust, noise, and traffic; and the minimization of environmental hazard caused by the disposal of construction waste and hazardous materials. At the building stage, environmental concerns are two-fold: the impact of residential activities on the local and global environment, and the environmental quality of the living environment. These concerns pertain to the use of domestic fuel, intensity of air-conditioning, the general comfort and hygiene of homes, e.g. ventilation, lighting,

air quality, cleanliness of the surroundings, and whether the living environment causes any serious or chronic health problems, and whether the residents are aware of and in support of environmental measures installed for the dwelling. These environmental impacts and quality are largely attributed to the planning, design and construction processes of the previous stages. But residents' ways of using the building may alter the intended or unintended environmental impact of the physical layout, whereas the maintenance and management processes and practices directly affect the intended physical life of the building. Thus, at the refurbishment stage, good maintenance may minimize the need to undertake large-scale replacement of building components. The disturbance to the nearby environment, the management of construction waste and the choice of refurbishment material are the major environmental concerns at this stage.

At the final stage of demolition, the emphases are placed on resource conservation and the impact of the demolition process on the local environment. These include whether alternative uses of buildings are considered when their economic building life expires before the physical life; whether buildings of heritage value are preserved; whether environmental hazard caused by the demolition process is minimized; whether redevelopment makes a positive contribution to the quality of the local environment; and whether the recycling of the building components for other projects are considered.

The indicators to be used should assess the environmental impacts in terms of the rate of depletion of land resources, ecological impacts including that on climate, the use of renewable and non-renewable resources (especially building materials), energy efficiency, waste generation and management, and maintenance and management of the completed properties. Indicators on land depletion and ecological impacts are closely related to the space standard and the urban form. These are general development, planning and environmental issues, and the indicators to be used cannot be considered under housing development alone. On the other issues, assessment tools for evaluating the environmental quality and impacts of residential buildings such as the HK-BEAM introduced in Hong Kong for new residential buildings (Centre of Environmental Technology Ltd., 1999) is very useful. HK-BEAM is an *“independent certification scheme to encourage best environmental practice throughout a building's life cycle.....HK-BEAM sets a range of best practice criteria for environmental performance, against which buildings are submitted for assessment on a voluntary basis. The results of the assessment are presented on the HK-BEAM certificate as a rating of Fair, Good, Very Good, or Excellent”* (Edmunds, 1999). The standards used by these types of assessment systems may vary across countries, but the proportion of projects certified by these systems and their ratings comprise useful indicators for assessing the environmental sustainability of future housing developments.

The criteria used by these systems may also be modified and selected to assess the environmental sustainability of the existing housing system. There are two other useful indicators for evaluating the environmental performance in the maintenance and management of multi-storey residential properties during their life span: proportion of residential properties managed by professionally qualified property managers and the number of property projects certified by ISO 14001.

The indicators for the livability of the residential environment suited to the local context (e.g. high-density and

high-rise) may comprise those for the internal and the surrounding conditions. The indicators for the internal housing conditions include space standard, degree of sharing, self-containment, and the extent of households living in inadequately housed households. Ventilation and lighting also directly affect internal housing conditions but data on these two aspects are difficult if not impossible to collect and can therefore be excluded. The other group of indicators assesses the immediate external residential quality including cleanliness in the neighborhood, access to open space and community facilities, air quality, and noise level. Although the provision of open space and community facilities is subject to planning requirements, similar to cleanliness, the accessibility to these facilities needs to be assessed from the residents' perspective. Hence, regular opinion polls will provide useful statistics for these three indicators. Equally, noise tolerance is personal and the statutory limit mainly makes reference to health and safety. Therefore personal views should also be sought in opinion polls. If possible, indicators on air quality of residential areas should be included.

Economic sustainability of housing

Economic sustainability refers to a system of production that satisfies present consumption levels without compromising future needs, given the environmental constraints and costs (Basiago, 1998; Khan 1995). The primary constraint hampering the achievement of economic sustainability is the need to balance economic benefits generated by an activity with the economic costs. It follows that the costs of inputs, extraction and/or processing are crucial. Equally, the availability of inputs and the demand for the product are important for sustaining economic activities. Environmental costs (e.g. the damage to the ecological system due to the use of natural resources or the reduction in the stock of renewable resources as consumption exceeds the speed of replenishment) theoretically need to be accounted as production costs, though difficult to do so, if long term sustainability and equity are to be sought as mandated by the advocacy of sustainable development (Munro, 1995). On the demand side, levels and behaviour of consumption also need to be checked by the capacity of the natural environment to continually meet the ever increasing wants and to absorb wastes so generated. The environmentally sustainable ways of production and consumption are "unlikely to arise unless there are also new ways of thinking and corresponding socio-political changes" (Butterfield, 1994:32). The socio-cultural aspects, as discussed later, are obviously important.

Applying the above concepts to housing, there are two pre-requisites for housing to be economically sustainable. First, the benefits to housing providers and producers must at least be equal to the costs of housing production given the housing demand levels; and second, the production and consumption processes are within the environmental capacity to provide and absorb, given the mitigation technology. The first has always underpinned the operation of the housing sector. It refers to the financial viability of private housing projects, or the socio-political gains against financial costs for subsidized housing projects. It also pertains to the ability of housing consumers to afford an acceptable quality of housing. The second is a new issue and it refers to, on one hand, the identification of the environmental gains and costs of housing activities; and on the other, the avoidance of long-term adverse impact on the sustainability of the natural environment. In this regard, the development of technology, building materials and housing designs to mitigate environmental impact of housing activities, and their implication for financial viability of housing projects, are important. More

environmentally-friendly consumption behaviour, which is driven by affordability, value and habits is also crucial.

Indicators can be used to monitor and evaluate some, though not all, aspects of this strand of sustainability. On financial viability, indicators to be used are, e.g. the share of real estate developers' margin in gross domestic fixed capital formation, and share of housing subsidies in public expenditure and GDP/GNP. Affordability indicators may include price-to-income ratio, rent-to-income ratio, mortgage repayment-to-income ratio and downpayment-to-income ratio. On environmental impact, similar indicators as proposed for environmental sustainability can be used. Ideally, environmental costs and gains of economic activities in monetary terms should be ascertained to help make more environmentally informed investment and consumption decisions. These decisions are, of course, affected by the socio-cultural values and norms, as discussed in the following sections.

Social sustainability of housing

Unlike ecological and economic sustainability, there are more diverse views on what the concept of social sustainability embraces. One interpretation equates social sustainability with ecological sustainability, and hence analogous to ecological limits, there are social constraints limiting development, and these are set by social norms (Munro, 1995; Mitlin and Satterthwaite, 1996, p.25; Chiu, 2003). Another interpretation refers to the social preconditions for sustainable development. More precisely they are the social conditions necessary to support ecological sustainability (Mitlin and Satterthwaite, 1996, p.25; Borrini-Feyerabend, 1997; Chiu, 2003). Thus to achieve ecological sustainability which is at the heart of sustainable development, the social structure, social values and norms must be changed so that they are conducive to the sustainability of the environment. Such an interpretation is environment-oriented.

In contrast, the third interpretation is people-oriented, and it is a more popular definition. It refers to maintaining or improving the well-being of people in this and future generations (Borrini-Feyerabend, 1997; Pugh, 1996; Townroe, 1996 (in Pugh, 1996), Chiu, 2003). The emphases are social cohesion and integrity, social stability and improvement in the quality of life. Thus to be socially sustainable, there needs to be equitable distribution and consumption of resources and assets, harmonious social relations and acceptable quality of life. Hence this interpretation of social sustainability echoes with the principles of sustainable development defined by WCED, i.e. equity and social justice for this and future generations.

While the first interpretation points to the need to change attitude and values if ecological sustainability is to be sought, the environment-focus and the people-focus of the second and third interpretation respectively can be combined to form a more comprehensive concept of social sustainability. This bi-focal emphasis also applies to the social aspect of sustainable housing development or the social sustainability of housing. Thus, following from the tenets of sustainable housing and the concepts of social sustainability, the social dimension of sustainable housing pertains to: *a) the social preconditions conducive to the production and consumption of environmentally sustainable housing; b) equitable distribution and consumption of housing resources and assets;*

c) harmonious social relations within the housing system; and d) an acceptable quality of housing and living environment (Table 1).

Social Preconditions

The above four aspects traverse a wide spectrum of social issues. The first aspect, pertaining to social preconditions conducive to environmentally sustainable housing, involves values, habits, rules, and life style, environmental consciousness, regulations and etc. The consciousness and the willingness to live in an environmentally sustainable way will affect housing producers and related government organisations in many ways, for example, the choice of housing sites (e.g. greenfield or brownfield sites), the land use planning principles and intensity, the use of environmentally friendly design, building materials and construction methods, the attention to the liveability of the property and the impact of the design on the physical quality of life of residents (Chiu, 2003).

For housing consumers, values and norms which are protective of the environment include reductions in energy consumption, optimal use of green design and measures in-built to the property. The most important are nonetheless those which support thrift, and which give preference and are willing to spend more to acquire housing which is built on environmentally friendly principles and which use green building materials. The culture of maxima which enshrines consumerism and materialism has caused many to continuously seek for bigger homes, ignoring the toll of residential activities on the natural environment. We seldom ask ourselves whether we need all the space in our homes, and how often the different rooms are used (e.g. the lounge rooms in Western houses) and whether we need the sizes of the rooms as they are. Due to past conventions and local climatic and topographic reasons, different communities would have different size standards which provide homes of comfortable quality. But when we 'trade up' to bigger homes, our consideration is often given to financial issues, the social status or image that the residential choice may impart, and sometimes to necessities. Rarely do we factor in environmental concerns. The latter would include sizes of homes which are within the environmental capacity to provide for this and future generations, environmental costs of unnecessary residential activities, and whether the property is designed on environmental principles and built with green materials. Furthermore, are we willing to buy homes which are built of recycled material and are we willing to pay more for homes which are environmentally friendly?

Equity distribution and consumption

This aspect pertains to housing equity and housing standards, affordability, role of the government in housing, and housing subsidy policies (Chiu, 2003). Equity is often equated with justice or fairness, and is occasionally confused with equality. In assessing whether distributional policies such as housing policies are equitable, attention is often given to the distribution of benefits and disbenefits: who benefits and who loses, and by how much. To assess whether distribution is fair and just, two operational concepts are often used: horizontal equity – equal treatment of people in equal positions; and vertical equity – unequal treatment of people in unequal positions (Chiu, 2002a; Headey, 1978; Lampman, 1977; and Le Grand, 1991). In housing policies, the concern

of horizontal equity is whether families of the same income range receive the same amount of subsidies or other forms of assistance to solve the housing affordability or/and accessibility problems. The concern of vertical inequity is whether the intensity of subsidies and assistance is decided in accordance with the severity of the affordability and accessibility problems faced by the recipient households.

The sustainable development perspective reinforces a primary equity concept in housing. That is, in a fair society, the basic housing needs of every household must be met, each enjoying at least a fundamental standard of accommodation as defined by the society. This new perspective also adds new elements to housing equity. As argued by Badshah (1996), equitable development should not just be about justice and fairness, it should also enable the poor to make choices themselves, and that there should be the potential for improving the quality of life, while not jeopardising the opportunities of others to do so. Translating these into housing policies, Chiu (2002a) argues that equitable housing policies should maximise choices in housing services if so desired by home purchasers, enhance housing mobility and avoid housing programs which, while benefiting some sections of the population, adversely affect the opportunities of others to obtain desirable and affordable housing.

Harmonious social relations

This aspect is concerned with the landlord and tenant relationships, the relationship between the have and the have-nots, the influence of the stakeholders in the housing arena particularly that on housing price and rental, possibly involving the empowerment of the less privileged. The major concerns are to resolve conflicts of interests and the building up of social capital in the housing arena. There are many ways to accomplish these, hinging upon the social settings and the social fabric.

Quality of housing and the living environment

These two components refer to the internal housing conditions and the immediate environment, as discussed under environmental sustainability. The social dimension of housing conditions may include additional components such as neighbourliness, social mix, life style affected by housing design (e.g. whether the design enables a more environmentally-friendly style) and community sense.

Although many of the components of the social sustainability in housing are intangible, some can be measured by quantitative indicators. Neighbourliness and social mix index can be compiled. The former can be based on, for instance, number and nature of contacts with neighbours and the activity levels of residents' organizations as solicited from regular household surveys. The latter can be derived from census data about socio-economic characteristics, for instance. Indicators assessing the equity of housing distribution and consumption, may include affordability indicators as previously discussed, accessibility to the housing market measured by the downpayment-to-income ratio, the extent of homelessness and squatter settlement, the length of the waiting list for public rental housing and the extensiveness and intensity of government subsidy in housing measured by, for instance, proportion of households receiving subsidy and discounts relative to market price (Chiu, 2003).

Cultural sustainability of housing

Culture is a broad concept and its definition should, as drawn from the literature on culture, cover three major dimensions (Schusky and Culbert, 1973; Thaman, 2002). The first is its aesthetic and artistic dimension. This covers fine arts, music, popular culture, performing arts, and so on. The second aspect refers to the cultivation of mind and spirit. It includes knowledge, belief, religion and ideologies. The third dimension is the anthropological perspective: the way of life; and it pertains to the social aspect of human behavior. It is the totality of the socio-cultural convention inherent in a specific society. It includes morals, values, laws, codes, customs, traditions, heritage, life styles and the ways we socialize. The above three dimensions overlap and influence one another in various ways. Culture also has its own attributes: it is accumulative over generations and it is diverse, giving identity to a place over different time periods. An important interpretation of culture pertinent to the sustainable development perspective is that “culture is the means by which man adapts to his environment and secures things that he needs for his survival” (Schusky and Culbert, 1973:45). Therefore, the culture of a place is also inseparable from the natural environment and it certainly has a role to play in the pursuit of environmental sustainability of a place.

The concept of cultural sustainability is not as well established as that of social sustainability, and it is often subsumed under social sustainability because of its social dimension (see, e.g. Munro, 1995). Nevertheless, Hardoy *et al* (1992) has concisely pointed out two important interpretations of cultural sustainability. The first refers to the contribution of shared values, perceptions and attitudes to the achievement of sustainable development. The second interpretation refers to the sustainability of a culture itself, and in this case, culture is regarded as a critical component of development. Thus culture should evolve with socio-economic developments over time, and its evolution process should be recognised through conservation of the cultural heritage (Chiu, 2002b).

Obviously cultural sustainability overlaps with social sustainability in terms of the socio-cultural limits to and pre-conditions for sustainable development. Both the cultural and social dimensions of a society have strong influence on and are indeed parts of the value, norms, customs and life style of a community. Therefore social and cultural sustainability are often considered together. However, both the social and cultural sustainability have their respective distinctive areas of concern: the social well being of the people for the former, and the continuation of the culture for the latter. Some of the manifestations of the social and cultural dimensions are also different. Those of the social dimension may not be tangible: social cohesion, social stability/instability, social inequality/equality, social equity/inequity (i.e. fairness and justice), social conflict, social exclusion/inclusion and so on. Those of culture may be more tangible: arts, music, performing arts, literature and religion.

Such overlaps and distinctions can also be found in the social and cultural sustainability of housing (Chiu, 2002b): social preconditions conducive to the production and consumption of environmentally sustainable housing and an acceptable quality of housing conditions. A distinctive feature of cultural sustainability is nonetheless the preservation of housing heritage. Housing has a physical form and the form reflects how the

inhabitants adapt to the natural habitat; and changes in housing form demonstrate how the adaptation evolves with time and technology advancement. The physical form of housing is therefore not only a reflection of but also a component of culture itself. The internal housing design, as discussed, is an outcome of the socio-cultural values, customs and practices. External housing forms and the housing structure are results of the availability of building resources, the climatic conditions, the construction capability of the inhabitants and the aesthetics of specific communities over specific periods of time. Housing forms therefore reflect the many and varied environment-man relationships and the interactions between man and nature. They give identity to a culture especially in the earlier periods when man relied more directly on natural resources and was bounded more by natural constraints, and when construction technology did not allow the wide spread of uniform modernist building designs.

Housing forms of different stages therefore speak of the changes of a culture and the cultural identity of a place. It represents the aesthetic and the artistic dimensions of culture, as well as the 'way of life' of a people. Since the seventies, there has been growing concern on the preservation of historical buildings for reasons of aesthetic value and heritage conservation. This trend was intensified because, as Howard (2000) contended, with the progress of globalisation, the desire to strengthen national, provincial or local distinctiveness has heightened. Visible evidence of the past culture can contribute pedagogically and educationally to the cultural identity and the collective memory of a people or a place (Tiesdell, 1996). It also locates a contemporary society in its traditional context and gives a sense of cultural continuity. The conservation of residential buildings for aesthetic and heritage values therefore enhances the continuation of a culture. The design of residential buildings based on contemporary local cultural and aesthetic values mixed with those of the past enriches and sustains the cultural identity of a place.

Perhaps indicators are not very useful to estimate cultural sustainability. However, to reflect the cultural traits in housing, we could assess the preservation of heritage and the use of indigenous architectural design or the integration of local culture in housing design by the number of recorded preserved residential projects. The higher the number, the more sustainable is housing development culturally. However, it is difficult to assess the influence of local culture in housing design. Further exploration on this issue is needed.

An integrated and long-term framework?

Figure 1 provides an overview of the distinctive and common features of the above four strands of sustainability in housing. It proposes that the economic, social and cultural aspects of housing are to develop within the context of environmental sustainability. That is, housing development should be environmentally sustainable in that the environmental impact of the economic, social and cultural activities associated with housing is within the capacity of the ecological system to carry, and that the living environment is safe and conducive to the healthy living of the inhabitants. While each of the economic, social and cultural dimensions has its own specific concerns to foster the sustainability of housing development, the common core constitutes the socio-cultural preconditions conducive to the supply and demand of environmentally sustainable housing and an acceptable quality of housing. There are also common concerns between the sustainability strands, though the emphasis

would be different. For instance, the social dimension of the affordability issues focuses on the implications of affordability on the ability of the population to improve housing conditions, whereas the economic dimension concerns with the implication on demand level and therefore financial sustainability of housing projects. Similarly, green technology may alter the aesthetics of buildings and daily habits of residents and it also affects the financial viability of projects.

Applying the above framework, housing issues can be considered in a more holistic and long-term perspective. Economic and social considerations of housing projects and policies are not new, but simultaneous consideration of the environmental and cultural implications with a long-term perspective are, in most cases, uncommon. If we are committed to global sustainability, an evaluative framework akin to that proposed in this paper is imperative. However, it has to be noted that the four strands of sustainability cannot be maximized simultaneously in all situations. Trade-offs, such as the relief of housing shortage problems requiring the use of virgin land for housing development, are constantly involved. To make appropriate choice over the trade-offs is complex and contentious. A better understanding of the trade-offs involved is nonetheless fundamentally important in providing a knowledge base for the choice.

The assessment of the sustainability of housing is, however, not an easy task. The indicators require consistent, reliable and regularly available data, and these requirements are not always fulfilled. Further, quantitative indicators such as those used in this paper are obviously not applicable to constituents which cannot be quantified, e.g. values, life style, landlord and tenant relationships, and the influences of the stakeholders in the housing system. Qualitative assessments are of course as important as, if not more than, quantitative evaluation, as demonstrated by Chiu's (2002a) study on the equity and sustainability issues of recent housing development in Hong Kong. Qualitative analyses often yield deeper insights although more subjective and interpretative elements may be involved.

Benchmarks or normative sustainable standards are also difficult if not impossible to be set for some of the constituents which do not involve health and safety, e.g. the relationship between the haves and the have-nots, space standards, and acceptable profit margin of development projects and space standards. These constituents do not pertain to health and safety and they involve complex issues. The standards certainly vary across different communities and the prescription of normative standards is impossible and inappropriate. Thus to achieve sustainable development, consensus building for these value-loaded issues is crucial.

Housing strategies, policies and the role of the government

Housing strategies and policies directly and indirectly determines the sustainability of housing development. Housing policies are primarily designed to advance objectives in improving housing conditions, and to achieve macro political, economic and social objectives. The implementation of these policies, either in the form of provision of housing subsidies, or the government to act as regulator or enabler in the private housing market, affects the use and the re-distribution of housing resources. Though the market is governed by the invisible hand, government intervention, such as land use zoning, tax policies or anti-speculation measures, often affects market

operation, though the direction and extent of the influence may not be as intended. Even in a *laissez faire* housing system, while leaving housing provision and consumption to the market, the government ultimately still bears the responsibility to ensure that every citizen has adequate shelter. It has to intervene if the market fails to cater for all segments of the population. Thus, although the proposed sustainable development framework does not evaluate government policies *per se*, it evaluates policy outcomes – in a more holistic manner.

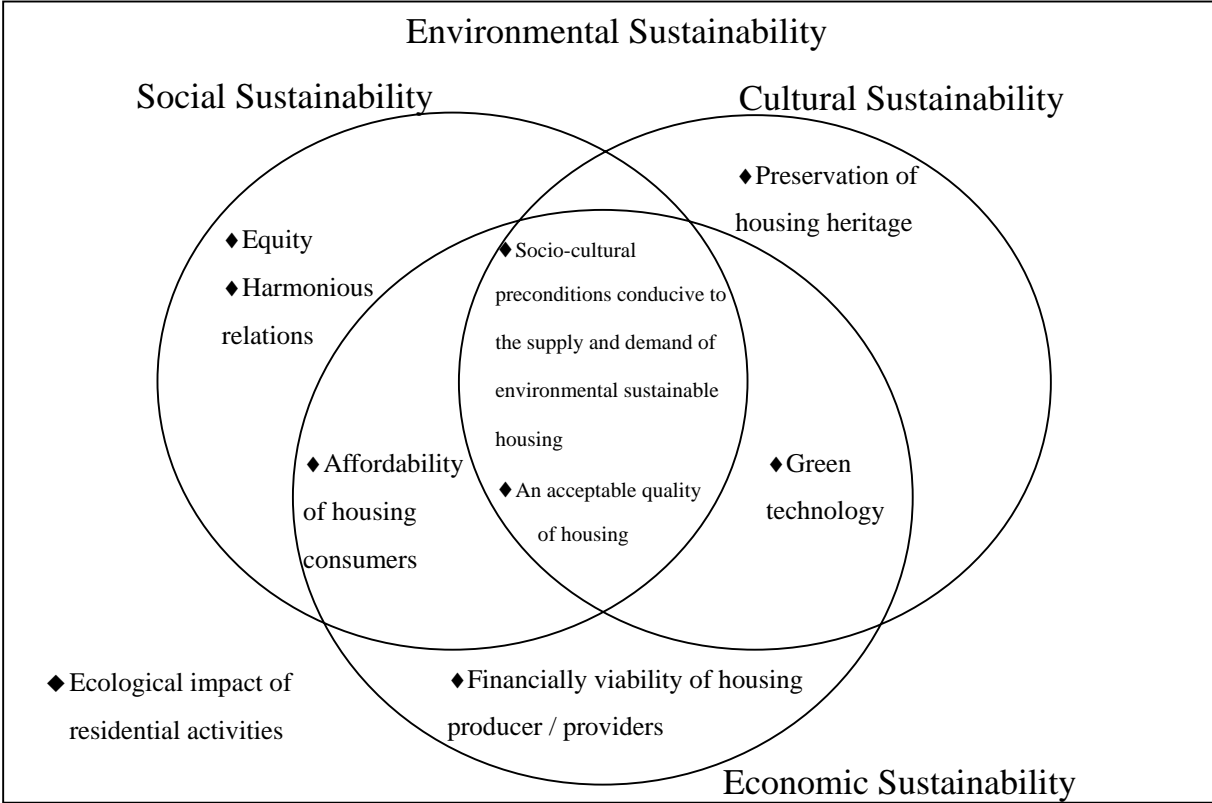
Apart from the need for the government to re-establish its policy objectives in the light of sustainable development tenets, the government also plays an important role in shaping green values, attitudes and norms in housing production and consumption. Legislation, laws, regulations and codes are reflections of social and cultural values and are norms of a society, but they require efforts and commitments from the governments to formulate and to enforce them. The statutory requirement on large residential development projects to conduct environmental impact assessment or town planning regulations prohibiting the construction of housing in conservation areas are some of the examples.

Likewise, the government may provide subsidies or incentives to encourage green housing production and consumption. For instance, in 2001 and 2002, the Hong Kong government announced the exemption of green and innovative features from gross floor calculation or site coverage. These features include, among others, balconies, sky gardens, acoustic fins, noise barriers, sunshades and reflectors. These incentives were well received by developers. This type of government moves are not only effective in enhancing environmental consciousness, but also facilitate the supply of environmentally friendly buildings. As well, it is important that governments support and spread the knowledge, values and rationality that contribute to sustainable housing development.

Conclusions

This paper has proposed a sustainability framework to evaluate the performance of the housing sector. It has argued that given the embracing nature of the sustainable development concept and the multi-faceted nature and function of housing, and the role of cities in achieving global sustainability, housing performance in cities should be evaluated by a sustainability model. The proposed model attempts to be comprehensive, drawing the different facets of housing into one coherent theme: the ability of the housing sector to continually provide adequate and better accommodation to all, and that the ability of the housing sector to contribute to the economic, social and cultural well being of a place, given the limits of the Earth. Apart from the ecological dimension, the other dimensions do not pose new concerns in housing. What is new is the integration of these dimensions into a holistic and long term perspective. If we are serious about advancing sustainable development, such a perspective for housing is indispensable to chart the future of housing.

Table 1 Sustainability of housing



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