

Sustainable Community • Healthy Living

John C. Y. Ng

Housing Department, HKSAR

Introduction

Since the outbreak of the severe acute respiratory syndrome (SARS) last year, healthy living has been a hot topic in Hong Kong. Despite this tragic experience, SARS did serve as a catalyst to arouse concern of healthy living environment.

The Housing Department plays an important role in shaping the physical environment and creating communities for nearly half of the population in the territory. Our Environmental Policy established in 1999 requires us to “promote healthy living, green environment and sustainable development” in the provision of public housing and related services⁽¹⁾. Attainment of sustainable housing and healthy living is one of our key initiatives.

Sustainable housing is essentially a sustainable community. This paper gives an overview on the issues involved in the planning and design of sustainable community in public housing. The experience of comprehensive environmental studies and aspects of social sustainability that contribute to social health will be shared.

The pathway towards sustainable housing is a challenge, especially when sustainability in Hong Kong is now in its developing stage and the society is very cost conscious. Experience on our struggle between ‘cost’ and ‘value’ of sustainable design, constraints and challenges encountered will also be discussed.

Sustainable Housing – A Holistic Approach

The essence of sustainability could be summarized as: to meet present social, economical and environmental needs but not at the expense of future generations.

Sustainable housing requires a holistic approach that encompasses all three aspects of sustainability. New initiatives to enhance sustainability have been implemented by Housing Department at all fronts and throughout the life cycle of our housing estates. Commitment and contribution of all interested parties are absolutely essential.

In housing planning and design, we adopt an all embracing approach to enhance key elements of sustainable housing. We have committed to carry out comprehensive environmental assessment studies at early design stages together with HK-BEAM assessment and certification for a number of projects. We have commissioned environmental consultants and formed strategic partnerships with academic institutions to carry out scientific environmental studies and assist in staff training and development.

For our specification, the consultancy study on Life Cycle Assessment (LCA) and Life Cycle Costing (LCC) of building materials and components which we commissioned in 2002

will entered into the final stage soon. We are critically reviewing the use of timber from sustainable sources, the wider use of water saving sanitary fittings, and the wider use of recycled aggregate. We further increased the PFA replacement percentage from 25% to 35% and allowed the use of PFA concrete in the superstructure.

In the procurement process, we engage our business partners through our Environmental Procurement Policy. We have incorporated Environmental Management Plans in our contract requirements and refined the listing requirements and tender evaluation system to take into account environmental performance. We have also adopted the LCC approach in the procurement of lifts and escalators to enhance long term saving in electricity consumption.

On site, we have conducted trial schemes using hydraulic crushers and are working on the use of selective demolition. We piloted the Hydraulic Pile Jacking method and have been encouraging our contractors to reduce environmental impact through requirement for waste management plans in our contracts and incentives such as preferential tendering eligibility and ascension to the Premier League.

We improve environments of existing estates by planting trees, enhanced landscaping and providing green treatment to existing slopes. We piloted the use of advanced technology like the environmental biotechnology (BEL) system to improve air quality of our markets.

We promote community participation and environmental awareness of our tenants through educational activities and environmental campaigns like Estate Tree Planting Day. We encourage recyclable waste recovery through publicity campaigns and provision of waste separation bins. Our staffs are “green ambassadors” who put across green messages to the residents.

Healthy Living – The Other Side of the Same Coin

After the SARS outbreak, healthy building design and healthy living have become a priority concern of the government, society, doctors and professions of the building industry. Healthy building design issues like natural ventilation, bathroom exhaust, re-entrant design and healthy drainage system have become of prime importance. These health related matters coincide with many of the key sustainable housing planning and design issues, particularly those related to environmental sustainability. A task ahead is to supplement the many sustainability parameters which we have been working on with reinforced healthy building design considerations that are essential to prevent the possible spread of communicable disease and induce conditions promoting health.

Areas of public concern mostly related to physical aspects of healthy living. In a holistic sense, however, healthy living involves not just physical health but also mental and social well-being. The World Health Organization (WHO) defines health as,

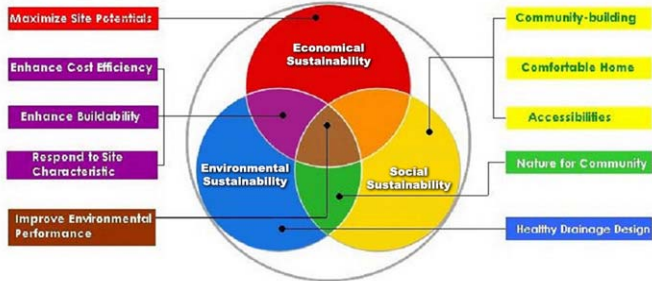
‘a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity’.⁽²⁾

Housing provides the scenario for family life, recreation, and social interaction. A healthy living environment does more than merely limit the occurrence and spread of physical diseases and infections, but also promotes mental and social well being of the residents.

“Sustainable development has been recognized as a key principle for the development of environmental health”.⁽³⁾ On the other hand “health contributes to integrating the social, economic and environmental dimensions of sustainable development”⁽⁴⁾. Sustainable community and healthy living are two sides of the same coin. They are inseparable and could be viewed and addressed together.

A strategic framework that encompasses both of them will contribute to the holistic approach in the planning and design process and facilitate discussion and enhance common understandings of the many issues involved. Such understanding is an important means to broaden commitment and to give impetus to creating sustainable communities and healthy living.

Keys Elements of Sustainable Housing



Key elements of sustainable housing

Sustainable housing balances economical, social and environmental needs. Key elements of all three aspects of sustainability are considered in our housing planning and design process. For economical sustainability, we optimize site potentials, respond to site characteristics, further improve buildability and structural efficiency, and enhance cost effectiveness. For

environmental sustainability, we improve natural ventilation and daylighting, pollution dispersion, healthy drainage design, thermal comfort, wind environments, soft landscaping, and energy efficiency of our building services systems. In the realm of social sustainability, we enhance community building, home comfort, nature for community and accessibility.

These sustainable elements are considered as early as possible in the design process from master layout to specification stage. Valuable opportunities for enhancing a sustainable community will be reduced at a late design stage because of inevitable time and cost implications of major design changes.

The key issues of economic sustainability should already be familiar to building professions. This paper will focus on issues related to environmental and social sustainability and gives an account of how these elements are considered in different stages of design in some of our projects.

Environmental Sustainability

Environmental sustainability of a community is essential for healthy living. Wind, light and sun are important elements of nature which can enhance environmental qualities. Sustainable housing must respond to the local climate and natural environment. Key issues considered in our projects are environmental performances and healthy drainage design.

Environmental performance

Good environmental performance enhances physical and mental health as well sustainability of the community. Improved natural ventilation and daylight also achieve energy saving by reducing the reliance on air conditioning and artificial lighting and benefit economic sustainability.

In a housing context, environmental performance is related to wind environment, natural ventilation, solar heat gain, thermal comfort and daylight. It concerns both indoor environmental qualities and external community spaces. We use computer simulation techniques like CFD and comprehensive environmental performance assessment schemes like HKBEAM for comprehensive assessment of environment performances of our planning and design proposal and in the formulation of improvement strategies.

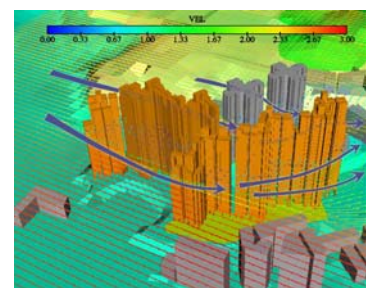
Wind Environment

Wind environment is a major environmental performance aspect. The first important task is to identify the prevailing wind direction. Wind rose data from weather stations is applicable for sites near to the stations and are unobstructed. Wind direction for a particular site may differ from the wind rose data substantially if there are obstructions from surrounding buildings and topography. In such cases, we carried out wind tunnel test to obtain more accurate wind data by establishing the boundary wind conditions for subsequent CFD simulation of local effect of buildings and topography.

In a project in Ngau Tau Kok, we discovered that the prevailing wind is from the east and southwest instead of from southeast shown in the wind rose due to the effect of surrounding buildings and topography. In another project, the prevailing wind is largely shielded by the surrounding topography and future developments and the site is in a wind shadow with a comparatively low wind speed.

With accurate information of prevailing wind directions, master layout and blocks design are prepared to enhance the overall wind environment of the developments. Wind environment of both the site and its neighbourhood are considered. A good wind environment improves natural ventilation of building and communal spaces. It disperses pollutants and heat from household and enhances healthy living.

Wind environment are enhanced by careful spacing between adjacent blocks and increased permeability of buildings with window openings in corridors and lift lobbies. In a project in Ngau Tau Kok where closely spaced slab blocks are adopted for other site considerations, wind environment is improved by creating a wind corridor and by adopting cross ventilated re-entrant space to increase permeability. In another project, wind environment of a nearby school is improved by careful orientation of the blocks. The wind flow at the façade of the school fronting the site is increased from 1 to 1.5m/s.



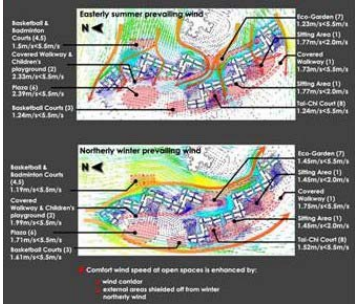
Development shielded from northerly winter winds

Good wind environment also enhances wind and thermal comfort and usability of communal open spaces. Comfort wind speed at open spaces is studied at various design stages and at different levels of details. In master layout stage, the wind environment of open spaces is

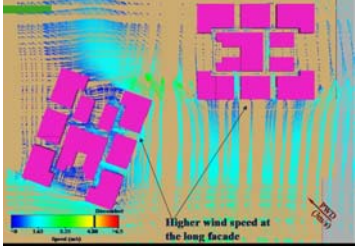
improved by disposition of blocks. In one of our projects, the blocks are located to block off cold winter winds from the central community space while a wind corridor is created to bring in summer breezes to enhance comfort level.

At scheme design and detailed design stages, we identify localized downdrafts and funnel effects and devise measures to mitigate excessive wind speed. In a recent detailed design, devices like courtyard space and wind catchers are adopted to increase the wind speed of an open shopping arcade to improve its comfort level.

We also plan our open spaces according to the wind speeds. For example, seating areas are located where wind speed is not more than 2 m/s and is comfortable for passive activity. Active recreational areas like ballcourts are located where there is a higher wind speed to enhance thermal comfort.



Wind speed study



Orientating main façade toward prevailing wind

Natural Ventilation

Orientating building blocks and major façades towards prevailing wind direction greatly improves natural ventilation. A building has the best ventilation performance when its long face is fronting the wind. Sometimes it is not possible to have all building facing the wind. In one of our projects, a block at one end of the linear site blocks the wind from the southwest and all remaining blocks are in wind shadow. In that case, wing walls are used to enhance natural ventilation of the flats.

Permeability of buildings improves natural ventilation. Permeability is increased by window openings in corridors, lift lobby and by adopting cross ventilated re-entrant. With increased permeability, stagnant wind zone and natural ventilation for flats in the downwind side of the building are much improved.

During scheme design and detailed design stage, study of the ventilation performance of individual space is carried out, particularly the re-entrant space. A cross ventilated re-entrant design substantially improves natural ventilation and reduces pollution concentration. Bathroom exhausts directed away from the re-entrant are effectively dispersed. The arrangement avoids the possible spread of communicable disease to adjacent flats. Drying racks are carefully located in recessed areas away from kitchen exhausts but still exposed to sunlight. This is the most favourite location in a tenant survey.

There will be little or no wind in about 12% of the year in Hong Kong. We have considered the pollution dispersion at re-entrant in a no wind situation in one of our projects and studied the feasibility of installing exhaust fans which can be switched on to assist pollution dispersion of the re-entrant space.

At detailed design, we identify areas of deficiency where performance falls below our benchmark and adopt improvement measures like wing walls or increased window areas to selected locations rather than blanket application to all flats. This will result in significant cost saving.

Solar Heat Gain

An important consideration is orientation of the blocks and flats. In high density housing, sometimes it is impractical to have no flats facing east or west, especially where there are views in these directions. In such cases, we reduce solar heat gain by orientating the main façade away from direct east or direct west and by shading of adjacent blocks, wings or facades. White or light colours for external walls is used to reflect and reduce solar heat gain.

Flats with performance below benchmarks are identified and mitigation measures like reduction in window areas or installation of localized horizontal for vertical sun shading devices are adopted without affecting daylight provision of other flats with no solar heat gain problems. Again, cost saving is achieved by avoiding blanket application of mitigation measures.

Thermal Comfort

Thermal comfort is particularly important in public housing because some tenants may not be able to bear the high air-conditioning cost in summer. Thermal comfort in hot humid climate like Hong Kong is enhanced by increasing natural ventilation and minimizing solar heat gain. Increased thermal comfort will reduce the reliance on air conditioning and save electricity cost. A saving of up to 24% electricity consumption can be achieved in some of our projects.

Thermal comfort of communal spaces is considered early in the design process. Shading of open spaces from summer sun is provided as far as possible either by shading from blocks, by shelters or by the planting of trees. Activities of open spaces are planned accordingly to their thermal comfort and wind speed. For example, areas designed for morning exercise are located at areas with shading from the summer morning sun.

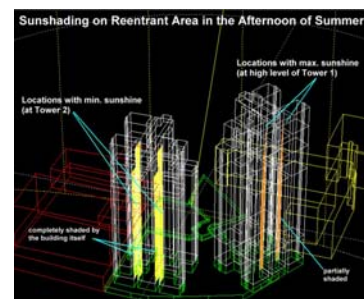
Daylight

Daylight has psychological effects and increases the comfort level of space. Daylight provision of individual flats is improved by orientation with minimum overlooking. The introduction of window opening to common corridors and lift lobby improves daylight provision and hygienic condition to these communal areas. It also contributes to saving of artificial lighting energy. A saving of up to 12.5% of the electricity consumption can be achieved in some for our projects.

In one particular design, we improve the condition of re-entrant space by careful orientation so as to maximize the penetration of sunlight. As a result, sunlight penetration into the re-entrant at an average of 29% of the daytime is achieved. Individual units with less satisfactory performance are identified and improvement measures like increased window areas are adopted on need basis.



Daylight enhanced by window openings



Sunlight penetration and shading

Comprehensive Consideration

We consider the various environmental performances not just individually, but also collectively in a holistic manner. Overall environmental performance of master layout options are compared using weighted scoring for on individual performance aspects. The optimal option balancing different performance requirements could be identified by looking at the composite scoring.

Healthy Drainage Design

Healthy drainage design is of prime importance. We have carried out immediate and comprehensive inspection and repair of the existing drainage systems of our estates. For new projects, we have commissioned academic institutions to carry out a design audit for drainage design of our standard harmony blocks. One focus is the water loss to the trap of floor drains. Mock-up tests in one of our projects in Tin Shui Wai to test out various common traps options were carried out to ensure there will be no water back flow.

Design for maintainability is also our concern. Re-entrant design is reviewed to allow easy inspection of the drainage pipes and maintenance access from the common corridors. We have commissioned a specialist consultant to advise on the drainage design of one of our non-standard projects and to prepare guidelines on design, installation and maintenance to achieve a healthy drainage system throughout the life cycle of the buildings.

Social Sustainability

Social sustainability enhances the social well being of people. The four key elements considered in our housing planning and design are community building, comfortable home, nature for community and accessibility. These elements are interrelated and collectively contribute to the physical, mental and social realm of healthy living.

Community Building

Community building comprises of 4 ingredients, namely, identity, social interaction, community participation and support, and heritage preservation.

Identity enhances sense of belonging. It promotes the feeling that one belongs to and is proud of the community. Identity of our estate is formed by the master layout, building and landscape design. Identity does not necessary mean expensive architectural features, finishes or extensive signage. Master layout with building and spatial design that is coherent with the characteristics of the site and its surroundings carry with it distinctive identity and character. Soft landscape design that echoes local greenery and landscape features also gives identity to the community without much additional cost.



Identity enhances sense of belonging

Social interaction promotes social cohesion and social inclusion and is essential for social well being. In our landscape design, comfortable communal spaces are designed to encourage people to gather, chat and interact. Different types of spaces are created for different levels of interaction and social encounters.

Community participation involves the residents and allows them to contribute and shape their own community. We look for opportunities for residents to express creativity and to contribute in ways that satisfy social and mental needs. Areas designated for wall mural design and painting with tenants' participation is one of the efforts. Provision of central gathering place for large scale community activities is another. By encouraging community activities, we enhance community participation and bonding of the residents. Community support and social cohesion are also built up in the neighbourhood.

An excellent example of large scale community activity is the yearly celebration of Yue Lan Festival (Ghost Festival) at the ballcourts of Lower Ngau Tau Kok Estate. Bamboo structures are erected for Chinese opera performance and public auctions. It is a large-scale cultural event organized by the local residents. It invites heavy participation and gives distinct identity to the local community.

Heritage of a site and its neighbourhood is enhanced through preservation of local characters like existing trees, landscape and cultural features. A vivid example is Ma Hang Village. The project preserves the exceptional topographical features, mature trees, cultural features including temples, fung shui, and the waterfront together with the reconstruction of Murray House. In another redevelopment project where the old neighbourhood has strong heritage characteristics, we propose to preserve selected elements with heritage value like metal gates, old shop signs, etc. for display in the redevelopment estate. Memories of old neighbourhood is also enhanced by simple means like paving pattern marking the footprint of demolished housing blocks.

A Comfortable Home

A comfortable home contributes to the physical and mental health of the residents. It is achieved by enhancing thermal comfort, usability of space and facilitating household activities like cloth drying. Flexibility of tenants to partition their home according to their own needs is enhanced by structural free internal layout.

Nature for Community

Integrating nature with the community provides fresh air, tranquility and visual amenity. It enhances physical and social well being. In many of our projects, surrounding greenery is extended into the development both physically and visually through careful planning and sensitive landscape design. Ecological characteristics of the site are respected and reinforced.



Urban spaces to enhance community interaction



Place for community activities and heritage preservation

Accessibility

We provide the people of a community with effective and convenient access to transportation, shopping and other community facilities. This is to assure that they can secure adequate support from the community. Accessibility also increases mobility particularly of the elderly people and encourage activities like morning exercises and social interaction which benefit both the physical and social aspects of the community as a whole.



Link to adjacent greenery, transportation and facilities

The Challenges

The pathway for sustainable community is yet to be treaded out. The aspiration of the society and the framework for sustainable developments in Hong Kong are still at budding stage. The current economic situation may deter the move as developers and buyers may be more unwilling to pay extra cost for the environment. The SARS outbreak, despite its tragic nature, raises public concern and injects new impetus for the move towards sustainable and healthy community.

Concerted Effort from All

The SARS outbreak demonstrated the need for concerted effort on all fronts of the society and the industry as a whole to build and maintain a healthy living environment.

The industry is largely market driven and buyers' aspiration is inevitably important driving force of the industry. Public aspiration has to be nurtured by joint effort of the government and the industry. The development of HKBEAM and the Healthy Building Index and the setting up of the Professional Green Building Council are encouraging efforts of the industry to promote sustainable developments. Further drive forces are required. A wider acknowledgement of corporate social responsibility to contributing a more sustainable environment is an essential impetus. The foresight that sustainable initiatives will add market value and bring benefits is another.

The government plays an important facilitating role. The establishment of the Council of Sustainable Development by the Chief Executive is an important step to foster efforts at all fronts. The Joint Practice Notes give incentives for the private sectors. Other authorities could contribute by reviewing statutory and administrative controls on building development to facilitate sustainable development. Housing Department, as a major public housing provider, takes on the responsibility to promote aspirations for sustainable housing, by setting examples and by engaging all our stakeholders.

Cost and Value

Sustainable initiatives may involve a higher capital cost despite having lower life cycle cost and greater environmental and social value. The next generation will have to pay back what we are unwilling to pay for a sustainable community today. Under the current financial

situation, a lower capital cost might be the priority for many, if not majority of the industry. The moment has come to demand the vision and wisdom for wider adoption of sustainable initiatives.

Recently, we have to critically review various sustainable initiatives originally proposed in some of our projects in order to achieve major cost saving and to balance the cost and value of sustainable initiatives. Building heights, openings at lower floors to enhance natural ventilation of adjacent landscape areas, building layout and re-entrant design and anything involving additional cost are being critically reviewed.

Return to Basics

How could we meet the cost challenge? I think one promising direction is to return to the basics and the fundamentals.

We have adopted a functional and cost effective approach. Planning provisions are critically reviewed to look at the basic needs. Designs are scrutinized to ensure that they are functional and cost effective. With all this effort, cost saving of up to 35% is achieved in our projects.

We start to reconsider which sustainable issues are fundamental and essential in achieving sustainable housing and healthy living. Those issues like renewable energy that have no immediate and major impact on environmental health and sustainability of the local community are assigned a lower priority. Yet, future adoption is still possible and pilot projects should be encouraged as this will contribute to wider adoption in future and lower initial cost in the long run.

There are issues like natural ventilation and daylight that are fundamental and essential to achieve a sustainable and health living and every effort is made to strike the difficult balance between a lower cost and a higher value. In some cases we may achieve this balance by innovative design that gives increased performance levels as well as increased cost effectiveness. In other cases where a higher cost is inevitable and where there is irreversible environmental and health impact, decisions have to be made whether we are prepared to pay a bit more now or leave it for tomorrow.

A fresh and complete review of current provision and design assumption will open up a new opportunity to achieve the balance of cost and value. Sustainable initiatives and many existing design assumptions may be incompatible as the latter are often based on old criteria and requirements. The result of partial integration of old and new is often reduced cost effectiveness. To achieve full integration, we have to start from the basics and rethink each and every design assumption in the planning and design process.

One example is the re-entrant design. Our previous effort has concentrated on measures to improve natural ventilation and enhance pollution dispersion. Now we have to ask the basic question on whether re-entrants are necessary at all. We are now studying layout options that reduce re-entrant spaces but at the same time achieve improved environmental performances. Such layout will be more compact and cost less. We are also studying a basic plan shape that is structurally more efficient and will reduce cost significantly.

Conclusion

Sustainable community and healthy living are two sides of the same coin. They are to be achieved by a holistic approach. Challenges are great but can be met by commitment and concerted effort and by a paradigmatic shift to look at value as well as cost.

SARS outbreak has raised the public aspiration for healthy living, not just in the physical sense, but also in the mental and social sense. Many people have started to enjoy experiencing nature again and to breathe the freshness of the rural air. People stayed at home at night and rediscovered the joy of being together with other family members. They discover the value of the basics. The move towards a sustainable community is a rediscover of nature and the basics. We need everybody to support this change. By concerted effort of the government, the industry, and all stakeholders, Hong Kong will become a sustainable and healthy place to live in.

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