FROM GLOBAL CLIMATE CHANGE TO LOW CARBON CITIES
THE TRIPLE BOTTOM LINE REVISIT

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ABSTRACT

The concept of Low Carbon Cities is linked to sustainable development and come about in response to the global climate change. The rough journey of the global community in sealing the international climate change treaty has prompted us to revisit the well-liked approach to sustainable development - the Triple Bottom Line (TBL). The common interpretation of the TBL is based on the process of identifying sustainable goals/practices that count heavily on isolating, excluding and trading-off exercises. Cases in point are isolating and excluding social and economic activities that are not environmental friendly, and trading-off environmentally-friendly activities that are not profitable in economic sense. Such practices have resulted in fragmentary, compromising and tensioned interrelationship among the three bottom lines in the pathway towards sustainable development.

Through revisiting the TBL diagram literally from a three-dimensional lens, the paper offers an alternative interpretation to the TBL. The outcome is a framework for analysing and strategising sustainable development at large and low carbon cities in particular. The vital factors lie on safeguarding the dynamic positive connections of the three bottom lines, aligning their core values (in contrast to the isolating and excluding exercise), amplifying their common interest (instead of trading-off activities), and deploying strategies from planning, renewable technologies, education and policy making to address multiple issues reciprocally.

KEYWORDS

Climate Change, Low Carbon Cities, Triple Bottom Line, Sustainable Development, Energy Consumption, Positive Connection of the Three Bottom Lines.

INTRODUCTION

There is a closed connection between global climate change issues and low carbon cities (LCC), in which the concept of the later is often seen as a logical re-action to the awareness of the former in a top-down manner. In the wake of the global community failing to secure a meaningful treaty to combat climate change to replace the Kyoto Protocol at in 2009, the urban-related professional would ask what will happen to the future of LCC. What are the lessons that LCC development can learn from the global climate change issues? And what can LCC positively influence the formation of a meaningful global climate change treaty? In constructing the answers, it is important to first identify and understand the underlying factors that restraint the effort to combat the global climate change.

THE FORMATION OF GLOBAL CLIMATE CHANGE TREATY

The international negotiation on climate change aims to derive a comprehensive framework to enhance actions on climate change after the Kyoto Protocol lapses in 2012. The negotiations have been progressing along two tracks - under the Kyoto Protocol and under the United Nations Framework Convention on Climate Change (UNFCCC). However, after 2 years of negotiation and the mega Conference of Parties (COP) 15 in Copenhagen in December 2009, the climate change falls short of the expectation to deliver a meaningful climate treaty. There were many sad stories and negative incidents, such as finger-pointing, accusing, walk-out, defining winners and losers, and so on, during and even after the event.

The reason for this fall-out may be traced as far back as the differentiation between sustainable development and climate change issue. A general observation shows that climate change is a subset of sustainable development, focusing only on green house gas emission. As such, the main focus on climate change negotiation is to limit (if

not halt) fossil fuel consumption. The deadlock is caused by the conflicts of interest between energy consumption reduction and economic growth.

On the other hand, sustainable development is a more established concept with much larger scope of coverage compared to that of climate change issue. It is also generally acknowledged that achieving sustainable development can be made through balancing the three bottom lines (TBL) – society, environment and economy.

Superimposing the issues of climate change to the current TBL understanding, there is a clear imbalance among the core aspects in addressing climate change - i.e. overly focus on environmental and economic issues with social issues insufficiently addressed. Zooming further in to the two focus aspects of climate change negotiation, the economic aspect clearly overpowers the environmental concerns, even though addressing climate change has minor implication to economic performances over short-term period (Stern, 2006). At the third level, within the economic aspect, there are distrust and perceived inequality in terms of economic compensation from developed countries (seen as major polluter in the past leading to current global warming) and developing countries (seen as emerging major polluter at the present and future making worse the climate change issues). As Sawa (2009) observed, "the times have changed since the Kyoto Protocol era, when developed countries represented 60% of global emissions. The problems can no longer be resolved without developing countries sharing the burden."

In brief, at the heart of these climate change negotiation issues lies disconnection, and TBL offers a hint to a meaningful approach to address the deadlock. The next section aims to further unveil this hint by taking a critical view to the interpretation and implementation of TBL.

BEYOND THE TWO-DIMENSIONAL INTERPRETATION TO THE TBL

The concept of Triple Bottom Line (TBL) links to the definition of sustainable development by the Brundtland Commission of the United Nations in 1987, and was introduced by John Elkington (1994) to expand the conventional business report (that focused only on financial term) to include social and environmental performances. TBL refers to people-planet-profit, popularly termed as society-environment-economy, as three realms of sustainable development. It has been ratified by the United Nations in 2007 and applied as criteria for businesses and organisations, including the public sector, to measure and report their performances and full cost accounting. Thanks to its widely practical application and backed by governments, TBL has become mainstream, the most dominant catchphrase, and even been applied as tool to address sustainable development by a wide range of professionals, including businessmen, policy makers, educators, architects, engineers, property developers, investors and many more.

The common interpretation of TBL can be seen literarily from its popular diagram in Figure 1, in which sustainability - the triple overlapping area of the three realms (economic, social and environmental) - is just a small portion located at the peripheral of each realm. This implies that the process of identifying sustainable goals/practices has to count heavily on isolating, excluding and trading-off exercises. Cases in point are isolating and excluding social and economic activities that are not environmental friendly, and trading-off environmentally-friendly activities that are not profitable in economic sense. Such practices have resulted in fragmentary, compromising and tensioned interrelationship among the three TBL realms, as the core values and objectives of each realm are challenged and clearly seen as unsustainable ones. This obviously coincides with the core reasons leading to the undesirable outcomes from the climate meeting at Copenhagen 2009. At this juncture, there is an urgent need to understand how we should interpret and implement the TBL to put sustainable development, climate change mitigation and sustainable built environment back to the right orbit.
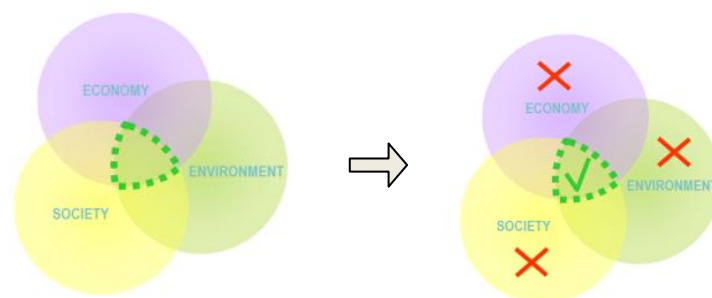

Figure 1: The implication of the 2-dimensional interpretation of TBL.

Viewing the TBL diagram, literally from a three-dimensional lens, reveals an alternative perspective. The first step is to make the third dimension of the TBL visible. From this angle, the tasks are obviously not about to selectively identify the overlapping bits and pieces, of social, economic and environmental realms, leading to trading-off actions. The tasks are rather to align the core objectives of each of the three realms so that all the three address sustainable development (represented by the dotted green line) at their cores. Here lies the fundamental difference between the two interpretations of the TBL.

The second step is to understand the implications of the alternative interpretation. As illustrated in Figure 2, the attempt to align the core objectives creates pressures along the connecting line among the three realms, particularly the connection of social and environmental realms, and the connection of environmental and economic realms. The third step is to safeguard the positive connectivity, which is an emerging issue that has not been received sufficient attention and actions, as it was not clearly surfaced in the conventional two-dimensional interpretation of TBL.
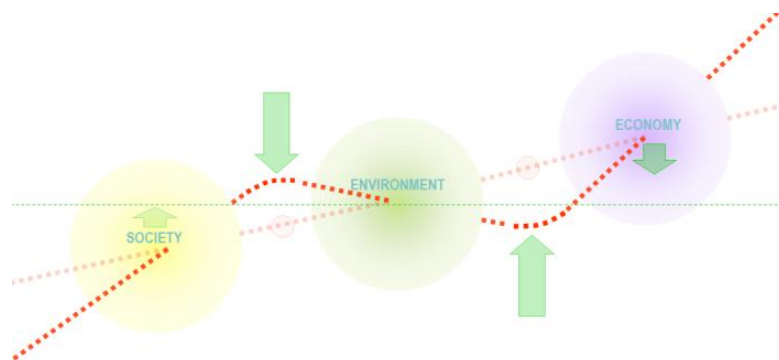

Figure 2: The three-dimensional interpretation of TBL.

The three-dimensional interpretation of TBL, as elaborated in Figure 2, addresses the core principles in a generic approach to sustainable development. It offers better understanding to the issues related to the setbacks in the formation of climate change treaty, the reasons of which are better framed, contextualized, and arranged in clear framework, ready for remedy and intervention actions. The next section will examine how this new understand is translated to a framework for low carbon cities discourse and development – the natural following on response of urban development to the global climate change.

LOW CARBON CITIES FROM THE LENSE OF TRIPLE BOTTOM LINES

Align the Core Objectives

In a similar relation between global climate change and sustainable development, the concept of LCC has been emerged as a side development or subset of sustainable urban development. However, if focusing only on carbon emission, low energy performances and climate change adaptation, the development of LCC as theory and practice will become lopsided and face the setbacks similar to those of the climate change treaty formation.

Let's take energy consumption and socio-economic trends in Singapore public housing as a case for discussion number 1. As a background, public housing houses more than 85% of Singapore population. Public housing has changed from merely targeting very-low-income households in the 1960s and 1970s to including middle-income households starting from the 1980s. This constitutes the ascending trend of affluence of households in public housing since the 1960s. As resident profile becomes more affluent, resident aspirations change and consumptions increase. This happens in two aspects – owning of household appliances and energy consumption. On the other hand, technical professionals from environmental realm believes that building energy efficiency design, such as thermal comfort, good natural ventilation and daylighting provision, are the main factors determining energy consumption performance of a building. When correlating the trend of energy consumption to the trend of household affluence, thermal comfort, natural ventilations and daylighting factor of public housing prototypes designed over the years (Figure 3), there appears a clear correlation between the trend of energy consumption to that of household affluence. This correlation is beyond the controls from the environmental realm.
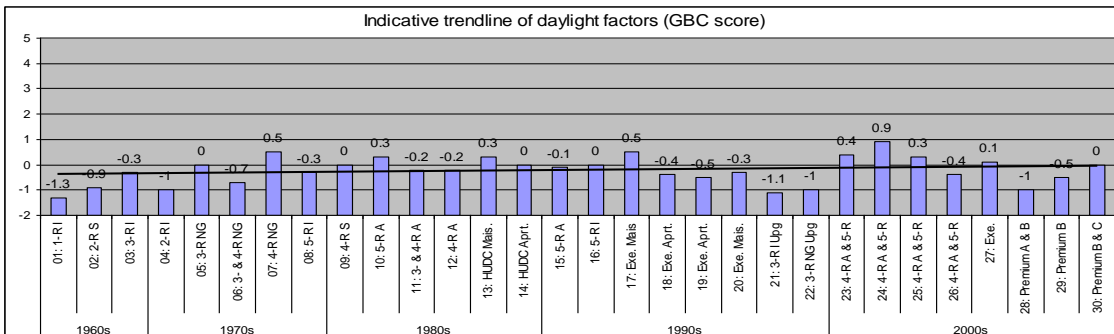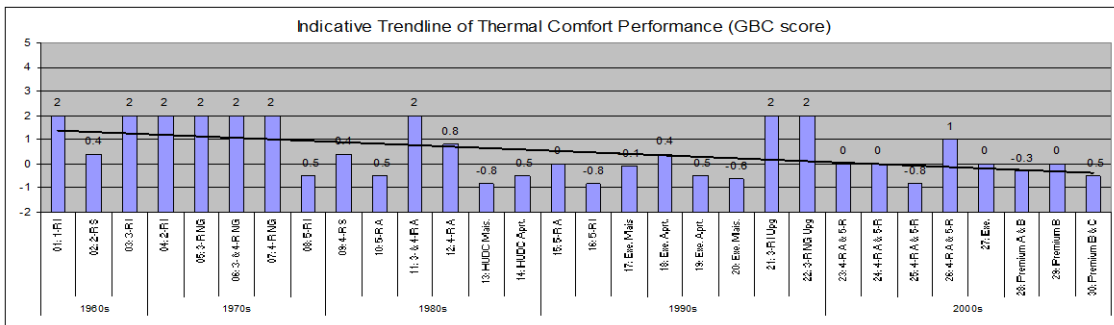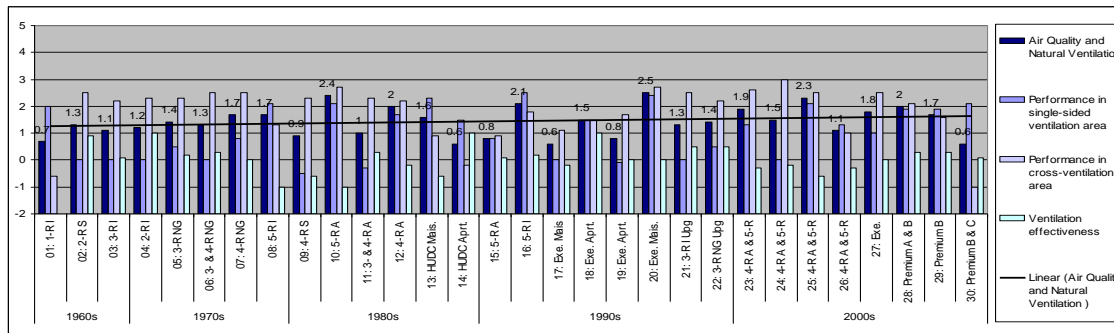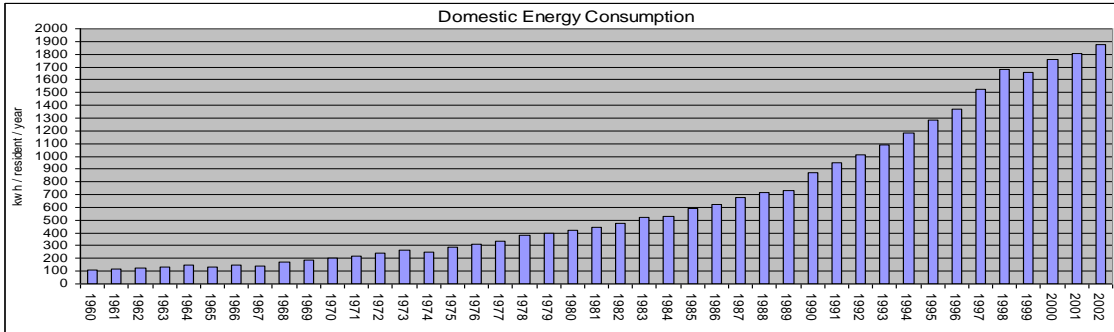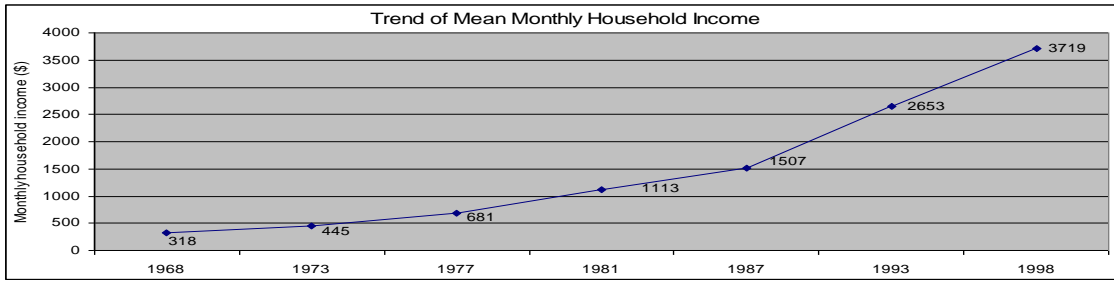
Figure 3: Juxtaposing the trend of mean monthly public housing household income, Domestic energy consumption, Indicative natural ventilation performance trend, Indicative thermal performance trend, and Indicative of daylighting performance trend (Source: Cam, 2005)

There is obviously a clear direct and influential inter-relationship between trend of energy consumption and those of social and economic realms. As such, the core environmental objectives of being low carbon – i.e. eliminating unnecessary energy demand, being less dependent on fossil fuel, increasing carbon sink – should not be viewed in isolation. Their intra-relationship with other environmental objectives – i.e. protecting the natural ecosystem, land use efficiency, water efficiency, good air quality, and efficient use of material resources – has to be established and understood in a larger context of core social and economic objectives in sustainable development.
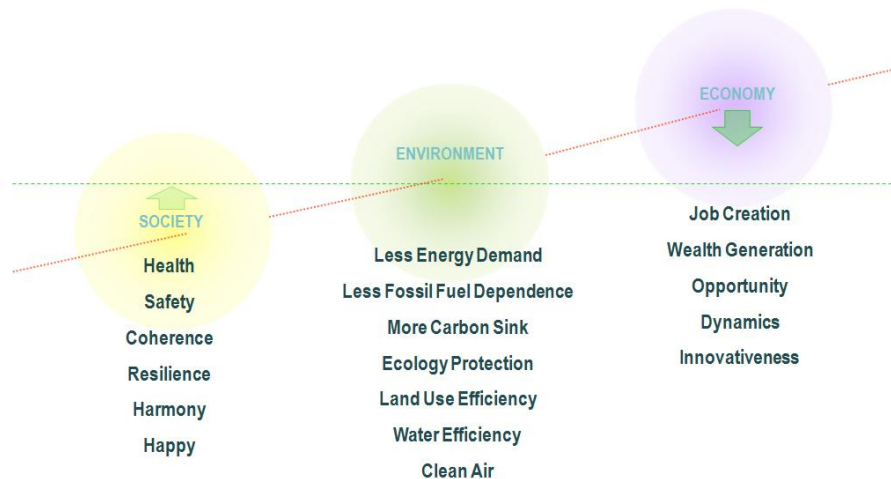

Figure 4: Core objectives of Low Carbon Cities.

Identify the pressures in connectivity

When aligning the core social objectives to sustainable development, the pressures along its connection with the environmental objectives lie on the demand for lifestyle changes and change in social patterns. Resident mobility is an example of pressure created along the social-environmental connection, and is taken as the case for discussion number 2. Excessive residential mobility has implication to environmental and sustainable issues, by means of resulting in social instability and wasting environmental resources. Firstly, the social instability from resident mobility is resulted from the imbalanced demographical settings. For example, the migration of younger people group to newer urban areas with attractions of newer facilities and modern lifestyle leaves the older and less wealthy people groups trapped in the older urban area. Such a demographical setting starts the process of degrading and making derelict the older urban area, resulting in being social unsustainable. Furthermore, resident mobility has also impact on the community ties and resident sense of belongings to a particular place, which once lost, make residents care less about their surrounding and the environment. Secondly, resident mobility leads to wasting environmental resources. This happens at two levels. At dwelling unit level, activities associate with housing renovation and personalization are the causes. At urban level, resident mobility on the one hand makes redundant the infrastructure and public facilities (e.g. schools, commercial facilities, parks and other community service facilities) that have already planed and developed for a certain population and demographical setting; on the other hand raises new demands for infrastructure and public facilities in both the old and new urban areas (e.g. more healthcare facilities are needed for the older urban setting with aged population; and more education and entertainment facilities to cater for the younger population in newer urban area).

When aligning the core economic objective to sustainable development, the pressures along its connection with the environmental objectives lie on the implication to growth. There has been much debate on sustainable development and growth, including the discouragement of growth. However, such direction is not an option. The reason, in the words of Abha Joshi-Ghani - Manager of Urban Development, World Bank, is that "with more than half of their GDP coming from cities, the economic future of most developing countries will be determined by the productivity of these burgeoning urban populations. There is also an increasing recognition of the benefits of urbanization on poverty reduction. Moreover, cities can help provide a lifestyle that combines a high quality of life with the least amount of resource consumption. Cities, with their compact form, are much more efficient in delivering services such as water, sanitation, and shelter. It's also not really possible to discourage the growth of cities." (The World Bank, 2009) While growth is an undeniable factor in LCC, it must

be noted the difference between the conventional and emerging definition of growth defined by the economists. Conventionally, growth is defined narrowed around productivity measured by GDP. According to the World Bank, "while productivity is certainly a fundamental attribute of economic cities, it is not the only one, and often the short term and excessive pursuit of productivity or profit displaces fundamental social and cultural considerations, and might undermine longer term economic resilience. In some cases, productivity overshadows our basic value systems, and exposes us to substantial risk — as evidenced in the causes and consequences of the current global economic crisis." (Suzuki et al, 2009). The emerging perspective about growth is about creating "value and opportunities for citizens, businesses, and society by efficiently utilizing all tangible and intangible assets, and enabling productive, inclusive, and sustainable economic activity" (Suzuki et al, 2009).

Safeguard the positive connectivity

A review of literature and good practices around the world shows that there are no lack of strategies to obtain objectives of each realm of TBL for LCC. What are lacked and needed to be paid more attentions to are the strategies to address the connection among the TBL realms, in particular the social-environmental and environmental-economic connections. Such strategies can be formed through physical planning, promoting renewable technologies, and deploying educational campaigns and appropriate policies. Integrate these 4 groups of to address the pressure along the TBL realms' connection, together with the strategies from individual TBL real, forms a framework useful for LCC discourse and practice.

Case for Discussion 1 – residential energy consumption

As analysed earlier in the case for discussion number 1, Singapore public housing residential energy consumption and social affluence are closely correlated. The measurements solely from building science and technologies – such as enhancing environment performances of thermal comfort, natural ventilation, daylighting, etc. – are useful to some extents but not significant enough to address the high energy consumption issue. Increase in energy consumption has very little to do with address the environmental realm of housing, not because of the ineffectiveness of the design but because of lacking users' participation. Including strategies to address the pressure along the connection between social and environmental realms can reap more effective result. Following are some findings from a detailed study of public housing in Singapore.

In the evolution of public housing development, there have been attempts to engage energy efficiency from social and economic realms. Alongside with the physical development of public housing, there have been many educational campaigns, social incentive, and economic incentive related to energy consumption.
   - The initiation of promoting the use of green labeled household appliances, including air conditioners, by Singapore Environment Council;
   - Energy tips in household consumptions newsletters by the energy provider; and
   - Education to promote social awareness.

Energy management in Singapore public housing estates has also incorporated residents' everyday activity patterns in the control of night lighting in housing public areas. Firstly, the installation of photoelectric switching lighting control for exterior lighting has been implemented since 2000 to automatically switch on and off lighting in public areas, e.g. garden, void-deck, lift lobby, staircase and common corridors. (HDB, 2000). This application on one hand safeguards the sufficient lighting level needed for resident activities at dusk and dawn, on the other hand prevents the unnecessary energy loss due to early switching on lights at dusk and late switching off lights at dawn. Secondly, the system of corridor lighting consisting of two lamps and dual circuits to allow one of the two lamps in each light to be automatically switched off after midnight was introduced. Midnight is selected as it is a time when most residents are sleeping. The reduction of lighting level at this time not only is energy saving, but also prevents over-lit and light invasion to the bedrooms with windows facing corridors. Through the incorporation of understanding in resident everyday activity patterns to estate's energy management, the benefits occur in both energy efficiency performance and comfort level for the residents.

Unlike the often-accusing residents for their non-cooperation with energy efficiency design, the positive contributions from resident every day activities should also be recognised, which can then be the inputs to the planning and design of physical housing environment to facilitate and promote such positive activities (Cam, 2004). It is observed that there is a preference from many residents to green the common corridors and other common areas, such as lift lobbies, staircase landings and even centralised refuse chute areas, even though these areas are not designed for this purpose. The provision of greenery at these areas contributes to energy efficiency for the housing through several indirectly channels:

- Contributing in cooling surrounding space through protecting part of the concrete surface from sunlight to reduce heat absorbance. This can help to reduce heat gain in residential flats.
- Reducing glare so that windows can be opened without being disturbed by such problem. This allows natural ventilation to occur, and soft daylighting to penetrate to the flats.
- Creating aesthetic and comfortable greenery view so that residents can enjoy from their windows. This facilitates natural ventilation and daylighting through window opening.
- Providing a buffer screen so that visual privacy is maintained when windows or doors are opened for natural ventilation.

As evidenced at this point, the discussion on residential energy consumption has extended its scope to include the quality of living environment, which is also a factor to address resident mobility. If coming about excessively, resident mobility impacts negatively to low carbon objective, as in the case for discussion number 2.

Case for Discussion 2 – Resident Mobility

> Few people are dedicated enough to want to live in buildings just conceived as single-theme energy-efficiency diagrams. Buildings designed for performance above pleasure tend not to work. Occupants 'improve' them. (Day, 2002)

It is through this improvement in the dwelling process that leads to the experience of home, which also is 'the territorial core', 'a preferred space and a fixed point of reference' for daily activities.' (Lawrence, 1987 referencing Porteous, 1976). It is understood that the contributions from resident everyday activities, especially in the adaptive uses of the physical environment, which often was not planned for. Here lies the case for safeguarding the connectivity among energy consumption, resident daily activities, and resident mobility in the progress towards low carbon cities. Below are some findings from a field study to identify resident intervening to the built environment that leads to the development of sense of belonging.

Firstly, it is observed that there exists a desire from many residents to be closer to nature by using extensive plants to mimic a garden space in front of the flats where the opportunities arise (Figure 5). Another example is illustrated in Figure 6, showing how the arrangement of taller plants planned on the right of the main door to gain more privacy from the lift lobby on the left.

Figure 5: The mimic garden/courtyard at the common corridor and staircase landing by residents (Cam, 2005).

Figure 6: The mimic garden/courtyard in front of flats by residents (Cam, 2005).

These little gardens can functions as providing visual privacy for the flat entrances, leading to sense of belonging. Furthermore, plants in the gardens have positive influence to thermal comfort and thus reduce energy consumption, and offset CO_2 through photosynthesis albeit the amount is small.

Secondly, the use of bicycle (rather than car) is often found in lower-income resident group. This is an encouraging fact, as bicycle is a transportation mean that does not consume fuel and produces pollutions as cars does. However, design of housing estate in the early years did not take this into considerations, which resulted in resident using corridors or staircase landings for placing bicycles (Figure 7). In fact, such social behaviour informed the planning and design, leading to new public housing equipped with bicycle racks and even good cycling trails.

Figure 7: The present of bicycle at staircase handrail, common corridor, and void-deck.

All in all, these examples of resident modifications and uses of spaces, although may not be preferred from designing and estate management point of view (because they are by large not anticipated in the design intension), indicates that the dwelling process has started and promised sense of belonging, which potentially reduces the wastage and increase carbon-intensive development as resulted from unnecessary resident mobility that is usually profit driven from property transaction.

International Actions

Safeguarding the connection between environmental and economic realm have gradually been recognised at the global level in the drive towards low carbon development. Among the relevant international initiatives related to LCC is the Eco^2 Cities Program. The Program is an initiative from the World Bank, who believes that an eco-city can generate wealth and be an engine for economic growth. It is a excellent initiative to release the pressure along the environmental-economic connection. The programme provides a platform to support cities in developing countries to achieve both ecological and economic sustainability concurrently. It operates based on 4 principles: (1) City-based approach to suit local context, (2) Expanded platform for collaborative design and decision making, (3) One system approach to integrate planning, designing and managing city, and (4) Investment framework taking sustainable development into account.

Information and Communication Technology is also self aware of its power to be a strategic tool to align the objectives of the three individual triple bottom lines. In its signature annual report on global information technology, World Economic Forum and INSEAD (2010) states that ICT can enable business models that "influence human behavior, which will play a critical role in how we work, live and play in a low-carbon economy. ICT companies can leverage their ability in smart information management and create new services that positively influence human behavior to combat the climate challenge, while benefiting companies, society, and the government in a triple win-win-win ecosystem, or the economic opportunity triangle." (Dutta et al, 2010)

The United Nations Environment Programme establishes the Sustainable Buildings and Climate Initiative (UNEP-SBCI), which recognises the vast potential of the building sector to address the current global warming issue. UNEP-SBCI has been leading the mission to priortise building sector in the new international climate change treaty. One outcome of this endeavour is making the potential GHG emission reductions from buildings to be fully recognised and tradable under carbon trading system to create financial mechanism to boost green building development (Cam, forthcoming). The rationale highlighted by UNEP-SBCI (2009) is that "Building

sector accounts for more than 40% of the global energy use and 1/3 of global greenhouse gas emission worldwide. The trend of energy use in building is growing rapidly in both developing and developed countries. For developing countries, encouraging energy efficient buildings is fundamental to achieving sustainable development goals not only because of the reduced life-cycle costs of buildings and required energy infrastructure, but also because of the potential for creating green jobs while improving the environment and public health." One again, addressing the connection between environmental and economic realms is placed at the heart of the initiative, and the objective is to identify the win-win-win situation.

CONCLUSIONS

Despite the setbacks in the formation of a meaningful global climate change treaty, LCC development as theory and practice is thriving and evolving positively. The main driving force is that the communities – professionals, legislators, decision makers, academe and public at large – recognise the values of LCC leading to better society, more environmental friendly and resilient economy supported by solid fundamental. The climate change treaty setbacks do not suppress the aspiration of cities to develop with a low carbon base. It is even heartened to learn that several LCC related initiatives, such as UNEP-SBCI, have potential to develop a form of sectoral approach to influence the formation of future global climate change treaty.

Although it is too ambitious for any attempt to scale up the LCC approach, as informed from the new TBL perspective, for application at global climate change level, there are meaningful lessons extracted from LCC to be share. These include the critical factors in forming the meaningful climate change treaty. They are:
- safeguarding the dynamic positive connections of the three bottom lines,
- aligning their core values (in contrast to the isolating and excluding exercise),
- focusing on the common interest (instead of trading-off activities leading to compromising, lopsided and tensions among nations and communities globally), and
- deploying strategies from various social, economic, planning, renewable technologies, education and policy making to address multiple issues, especially any pressures building up along the connection among social, environmental and economic realms, in a reciprocal manner.

Note: Views and opinions expressed in the paper are solely the author's and do not represent the perspective(s) of the organizations that the author is associated with.

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