friends of the earth 地球之友

發展中國家水平的《建築物能源效益守則》

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(2009/12/4 新聞稿) 政府今日就強制建築物能源效益守則 (下簡稱《守則》)刊憲。香港地球之友剛完成的《香港建築節能立場書》初稿顯示，《守則》中有關照明節能的標準，竟落後於中國和印度，只屬發展中國家的水平。

香港地球之友指出，本港建築物的節能幅度，可高達 31.9%。政府所提《守則》建議，只屬基本起步。本會質疑，「政府如果以爲趁下周舉行哥本哈根會議前推出《守則》，算是回應全球氣候變化議題，那根本是塊誤導市民的遮醜布，再一次顯示政府無心負起國際公民社會的環保責任。」

本會研究發現，《守則》建議的照明耗能標準 – 不論是規管「辦公室」、「餐廳」和「建築物大堂」的要求-- 均落後於國際形勢。以涉及層面最廣的辦公室照明爲例，《守則》建議每平方米面積的最高照明耗能爲 17 瓦 (17W/m^2)，要求既低於澳洲的 7 瓦/平方米，也追不上印度 10.8 瓦/平方米的水平 (表一)。

建築照明節能標準比較 (表一)

地方	最高照明功率密度 (瓦/平方米)					
	香港	澳洲	新加坡	美國	中國	印度
開放式辦公室 / 獨立辦公室	17	7.0-10.0	15	11.8-16.1	11.0-18.0	10.8
餐廳	23	20	15	15	13	14
中庭/大堂	25	10	10	-	-	6.5

香港地球之友研究統籌劉恬君 (Catherine Lau) 推算，全港若用上印度的照明標準 (10.8 瓦/平方米) (相較於政府建議的 17 瓦)，一年可額外節省 2.89 億度電，相當於減少排放二氧化碳 20 萬噸。而整體減省的 2. 9 億元電費，足夠政府總部使用 34.6 年。

要實施印度的標準，並非遙不可及。舉例而言，本會剛遷往炮台山的新址，較灣仔舊址大上一倍，在善加規劃照明裝置下，每平方米的照明耗能卻由原來的 14.4 瓦，大幅減少 34% 至 9.5 瓦，並且不影響同事的工作 (表二)。

香港地球之友新舊辦公室照明耗能比拼 (表二)

比拼項目	灣仔舊址	新辦公室	與舊址相比的增減幅度
辦公室面積	1500 呎^2	3050 呎^2	+103%
員工人數	18	20 人	+11%
光管數量	84 支	95 支	+13%
光管型號	T-5 光管	T-5 光管	--
瓦/平方米 (W/M^2)	14.4	9.5	-34%

本會總幹事劉祉鋒稱，《守則》規管的四大項目 – 照明、空調、電力裝置，及升降機 / 自動梯中，改善照明耗能的成本較低，絕對有空間收緊至不低於新加坡標準 15 瓦的要求。

	政府建議標準 (比較基準)	新加坡標準	印度標準
照明功率密度 (瓦/平方米)	17	15	10.8
耗能比較 (百分比)		-11.8%	-36.5%
額外節省耗電度數 (kWh)及電費		9,350 萬度電 (元)	2.89 億度電 (元)
額外減排二氧化碳噸數		65,438 噸	202,413 噸

除收緊照明的耗能標準，本會又建議推出的《守則》，應做到以下要求：

- 參照電器能源效益標籤計劃的分級制度，按樓宇的節能表現分級，讓公眾掌握建築的節能表現；
- 物業發展商須在售樓書中，列明樓宇所屬的能源效益級別；

- 須在建築物當眼處，張貼節能級別証書；
- 政府可參照英國政府豁免徵收印花稅的做法，對達至最高能效級別者提供稅務優惠，鼓勵業界提升建築物的能效；
- 定期檢討及提升《守則》標準。

香港建築物消耗全港 89%的電力，而本港兩電的排放佔全港 89%的二氧化硫、45%的氮氧化物、28%的懸浮粒子，還有 63%的溫室氣體二氧化碳 (環保署 2007 年數據)，故應盡早落實《守則》，以收節能減排之效。

本會強調，政府絕應盡早強力推行綠建築，甚至參考新加坡的做法，在 2030 年前把全國 80%建築的能效，提升至綠建築的水平。本會認爲，此舉不但能大幅減少排放溫室氣體，刺激節能產業，並且爲建築物使用者減省大筆電費開支，一舉多得。

傳媒查詢：劉祉鋒；朱漢強 ；劉恬君

完

Position Paper on Legislative Framework of the Mandatory Implementation of the Building Energy Codes in Hong Kong
(Draft Paper)

Executive Summary:

paper 2010/2/03

1. The Issue: Green Building in Hong Kong

Background: Buildings in Hong Kong at present consume 89% of the city's total electricity. When measured, energy consumption and emissions account for about 30-40% of total building performance. In recent decades we have been in transition from a manufacturing-oriented economy to a service-based one, and should therefore be able to attain a reduction in energy consumption. However the commercial sector has shown a steep rising curve in energy consumption while the industrial sector has gradually lowered its energy consumption after its peak in 1990. Among possible options, energy conservation is the best relatively low-cost solution, and the starting point to tackle global climate change and local air pollution.

Energy Consumption and Savings Potential: By phasing out outdated energy technologies, an estimated 6 - 32% of energy savings in terms of electricity consumption for the city's buildings is feasible.

Legislation Gap: FoE (HK) believes the government proposed Mandatory Building Energy Codes (MBEC) will be inadequate and is in fact a backward step when viewed from a global perspective; the MBEC being proposed for Hong Kong is of a lower standard when compared to other places in the world such as Australia, India, Mainland China, Singapore and the US. MBEC should be regarded as a "pass grade entry" of energy efficiency buildings at the "Design stage" only, as it is a lax measure to tackle air pollution and energy over-consumption. FoE (HK) suggests the proposed MBEC should at least be revised with a three-tiered grading standard in addition to the basic MBEC which will then allow the market drives for greater improvement.

Obstacles to Green Building: According to the Building Environmental Assessment Method scheme (BEAM), their scheme could lead to a 31.9 % saving in annual electricity consumption; however only about 190 developments have been graded under this voluntary benchmarking scheme in the past 13 years. This scheme only praises the best performers without the "shaming" element which could otherwise have applied pressure to those underperforming buildings to make them improve. The pledging mechanism, in use elsewhere, for leasing green offices could also be influential in the future HK-tenancy market. Government should lead the green building labeling scheme and promote green leasing in the market in order to create green market force and attract customers and large corporations with a green mind-set, who are opting for platinum-rated offices.

Communication Gaps: Hong Kong does not have a single independent agency within the government to oversee all electricity matters. The promotion of sustainable energy consumption remains merely rhetoric and is ineffective without strong political commitment. The newly established Hong Kong Green Building Council might be one step forward. However, the government role as a facilitator and legislator will be critical in order to steer public and business involvement.

Under-utilization of Benchmarking Index: Hong Kong does not have a comprehensive energy end-use database or popular energy benchmarking tool that is accessible by energy end-users and customers to track or rank their energy consumption, carbon dioxide emissions or energy cost, per unit of conditioned area. Such a database could provide a means of comparing energy efficiency and grading different types of buildings or premises, and also be a good indicator of the relative potential for energy savings. EMSD does have a similar database already (Energy Use Index - EUI) - which should be promoted.

2. FoE (HK)'s Position on Building Energy in Hong Kong

(A) FoE (HK) calls for no more misleading information about our energy profile from our government; "Energy Intensity" as a measure is highly dependent on GDP, and it is inappropriate to compare our situation as a non-industrial city with other manufacturing-based countries.

(B) FoE (HK) believes the application of a mandatory Air Ventilation Assessment for all new buildings will alleviate heavy demand for air conditioning and lighting. Natural ventilation will lower the city temperature and hence reduce energy consumption and air pollution.

3. FoE (HK)'s Recommendations

1. FoE (HK) urges the government to set a 10% reduction target as the minimum for electricity saving by commercial and industrial buildings by 2015 (based on Year 2005);

and the government should also set targets for green buildings in Hong Kong (say 80% by 2030)

2. FoE (HK) believes the government should lead society to a vigorous demonstration of MBEC compliance or Energy Labeling by Government buildings and buildings of the Government-funded or Government-subsidized organizations, alongside the adoption of a three-tiered grading standard based on the basic MBEC.

3. FoE (HK) requests mandatory listing of building energy labeling (containing a detailed breakdown display) on sales brochures and websites or energy performance certificates, which will motivate developers to design buildings with much higher energy efficiency.

4. FoE (HK) calls for the provision of a transparent online benchmarking of the EUI system by EMSD in a high profile manner, e.g. regular reporting, or large scale appraisal of buildings or individual premises, to enable more public participation.

5. FoE (HK) urges the introduction of economic incentives, such as taxation exemption schemes; and stimulus of demand for high energy efficient buildings, as this will have a co-benefit of promoting the environmental pillar industries.

6. FoE (HK) urges the establishment of Government-led Green Leasing programmes. This will primarily benefit real estate businesses and also the owners of commercial-lease properties with green orientations.

7. FoE (HK) believes the introduction of Smart Metering will be the first step to provide information for building managers to understand the energy consumption profile of a building. As smart meters could help building managers to achieve an average of 12% reduction of carbon emissions and 5% in electricity consumption judging from overseas experience.

8. FoE (HK) requests mandatory Air Ventilation Assessment (AVA) for new large buildings at the planning stage.

9. FoE (HK) urges the government to further promote greening in urban planning, with at least 30% greening in any development, where two-third's of the greening should be covered by trees as simple surface greening like green roof is not sufficient to tackle the problem of climate change or reduce air pollution.

Position Paper on Legislative Framework of the Mandatory Implementation of the Building Energy Codes in Hong Kong.

Acknowledgement

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1. The issue: Green Buildings in Hong Kong

1.1.1 Background

The issue of green building design is of increasing concern for Hong Kong as currently 89% of Hong Kong's total electricity consumption is accounted for by buildings.[1]. With the primary aims of reducing the overall impact of the built environment on human health and the natural environment, principles include: energy conservation, conservation of water and materials, waste minimization and indoor environmental quality, as well as site development via better orientation of the building blocks so as to avoid the street canyon effect (discussed section 2.2). When measured, energy consumption and emissions account for about 30-40% of total building performance, it is based on a number of components including emissions to air; greenhouse gas generation; releases to water; contamination of land; waste management; use of non-renewable resources; and use of

[1] Other developed countries consume about 20-40% energy in the building sector (Pérez-Lombard et al, 2009), while in Hong Kong buildings consume 45% of total energy.

renewable natural resources (Lee and Burnett, 2006); thus buildings that are more energy efficient could therefore reduce our electricity peak load and hence in the long term reduce the need for building further additional power plants which is a major source of greenhouse gas emissions even if it is a relatively more efficient gas-fired power plant. Our fuel mix is currently considered 'dirty' as coal is the dominant fuel being used, so prior to switching to a cleaner fuel mix (such as more gas instead of coal, or the truly cost-effective renewables), energy conservation is deemed to be a relatively cost-effective way to tackle climate change and air pollution. (The Hong Kong power sector alone contributes 89% sulphur dioxide, 63% carbon dioxide, 45% nitrogen dioxide and 28% PM_{10} emissions).

Hong Kong, with no indigenous fuels (locally sourced/available fossil fuels) on which to rely, is in a precarious situation, and therefore should aim to achieve much higher energy efficiency to lower our heavy demand on imported fuels; energy conservation is recommended by academics and energy experts as the best low-cost solution and starting point to tackle energy use and the related environmental issues. In recent decades we have been in transition from a manufacturing-oriented economy to a service-based one, and should therefore be able to attain a reduction in energy consumption. However the commercial sector has shown a steep rising curve in energy consumption while the industrial sector has gradually lowered its energy consumption after its peak in 1990 (Figure 1).

The Hong Kong Government and private developers have formulated some voluntary initiatives and benchmarking tools to promote green buildings, such as the Building Environmental Assessment Method (BEAM), Voluntary Building Energy Code, Energy Efficiency Award, Energy Audit, Appliance Labeling and Standards, Demand Side Management, etc. However, their market penetration and public involvement in the development of green buildings to date has been limited.

Up to April 2009, the Hong Kong Energy Efficiency Registration Scheme for Buildings, an 11-year old voluntary BEC only has 974 building venues registered out of the total forty-thousand buildings in Hong Kong. A study by Friends of the Earth (HK) in late 2007 found that only 10.8% of the certificates granted came from private developers. Furthermore, BEAM has graded just over 190 developments under its voluntary benchmarking scheme since its launch in 1986.

1.1.2 Energy Consumption and Savings Potential in Hong Kong

Lam et al (2008a) presented the energy use situation in Hong Kong from 1979 to 2006. The primary energy requirement (PER) nearly tripled during this 27-year period, rising from 195,405 to 566,685 TJ, about two-thirds of which was used for electricity generation. This represented an average annual growth rate of electricity consumption of over 5.7%, while population growth rate was merely 1.2% (almost a five-fold difference, Fig 2). The residential and commercial sectors are the two largest electricity end-users with an average annual growth rate of 5.9% and 7.4%, respectively (Fig 1, Lam et al, 2008).

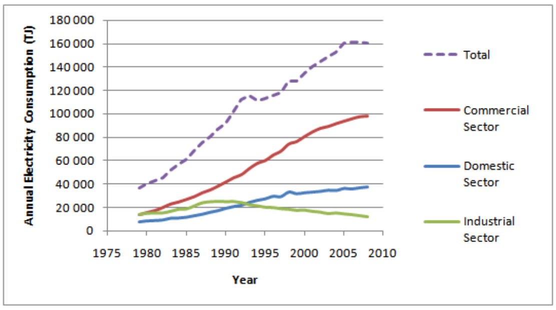

Figure 1: Annual Electricity Consumption

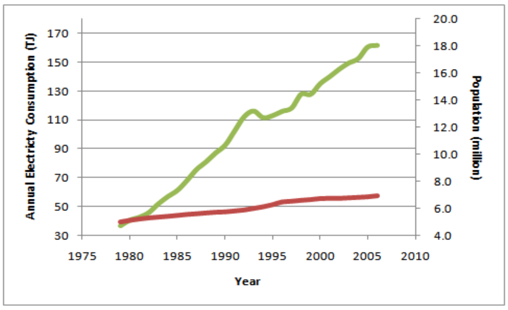

Figure 2: Annual Growth Rate of population and Electricity consumption

According to academics and industry, by phasing out outdated energy technologies, an estimated 6 to 32% of energy savings is feasible in terms of electricity consumption in Hong Kong buildings, i.e. moving from air-cooled air conditioning to water-cooled can reduce 44% electricity; introducing automatic lighting controls and natural lighting strategy (can reduce 41%); synchronous motors and control strategy for lifts and escalators (50%), etc. (Close, 2008; Yu and Chow, 2007; Ma and Wang 2009). This will depend on public involvement and a policy approach such as the implementation of the mandatory building energy codes. According to a UK study (Barker et al, 2007), which showed that energy conservation programmes, together with public participation (voluntary or compulsory commitment) was economically viable: a 10% reduction of CO_2 emissions and 8% of energy savings was made by various energy-efficiency policies in just a 10-year period with a positive macro-economic effect in UK[2].

Commercial	
A/C	**27%:** Change from conventional Variable Air Volume Systems (VAV) system to a low-temperature air distribution system (i.e. downsize of equipment, increase cooling capacity for existing distribution, small booster fan, etc.) **44%**: change from a conventional constant volume all-air system to HVAC system combining chilled-ceiling with desiccant cooling.
Lighting	**41%**: Daylighting strategy, an automatic lighting system control with sensor; **50%**: change CFL from T12 to T8/T5
Lifts and Escalators	**50%**: Synchronous motors; New frequency controlled hydraulics; Control strategies; Power regenerated motor
Standby power	**12%:** 60 million KWh/year (office only); One watt initiative; smart metering
Miscellaneous	**10%:** Building energy management controls including better occupant comfort sensitivity and integrated renewables**.** **15%:** In-house Management action including accounting, audit and control efforts, and encouraging an energy conscious attitude among staff by appointing green managers, etc.

(Close and Fok, 2008; Davies and Chan, 2001; HEC, 2005; Ma and Wang, 2009; Ming and Cho, 2009; Yu and Chow, 2007)

1.1.3 Legislation Gap: MBEC

Mandatory compliance with Building Energy Codes (MBEC) is to be legislated in the near future in Hong Kong, when energy efficiency will become a priority within the building environment in terms of improving air quality and cutting down GHG emissions. The MBEC contains four prescriptive codes of practice: Air Conditioning, Electrical Motor, Lift and Escalator, and Lighting. However, it has been predicted these changes will only have a maximum of 5-7.9% electricity saving potential (Hui,

[2] The macroeconomic benefit due to deployment of various energy efficiency policies and programmes in UK over the period 2000-2010 was around 11%, i.e. policies promoting energy efficiency commitment, appliance and standards, and frequently renewed building regulations, etc.

2007; Lee and Yik, 2002). The codes of practice laid down in the MBEC have been criticized for being too simple, easy to achieve and their effects on building energy conservation are indirect since none of them reviews the building as a whole (Ma and Wang, 2009) whereas the Performance Based BEC (PB-BEC), including the OTTV standard[3] which joins the four prescriptive codes together, emphasizes the total energy consumption of buildings and allows certain trade-offs within the system components. This approach provides the means for energy conscious developers to understand the energy performance of their buildings at the planning stage. However, this alternative compliance criterion is admittedly generally complicated and requires extensive work and skills for its implementation. (Lee and Yik, 2002)

Furthermore, MBEC is considered inadequate and is in fact a backward step when viewed from a worldwide perspective, with the proposed MBEC for Hong Kong is of a lower standard when compared to other places in the world such as Australia, India, Mainland China, Singapore and the US. For example, India has a lighting power standard of 10.8 W/m^2 lighting load density for office areas while HK has a 36% less efficient requirement of 17 W/m^2 (Fig. 3); it is also very much behind other nations' standards like those in Australia, Singapore, US, and Mainland China as shown in figure 3. Additionally, Lam et al (2008b) show that a modest 2 W/m^2 reduction in the current lighting code for office buildings is feasible; and Lee et al (2001) also found that the use of traditional lighting-technologies has a lighting power density of 18.4 W/m^2 (range from 14.4 to 25.9) for offices, which can be reduced to 13.8 W/m^2 if electronic ballasts are adopted. (Lee et al, 2001)

[3] Overall Thermal Transfer Value (OTTV), 1995, is a measure of the energy consumption of a building envelope via the building design and construction. The envelope components include the type of glazing, window size, external shading to windows, wall colour and wall type to meet the maximum OTTV criteria, which is 35W/m^2 for building tower and 80 W/m^2 for podium. (Year 2000 has been upgraded to 30 and 70 respectively)

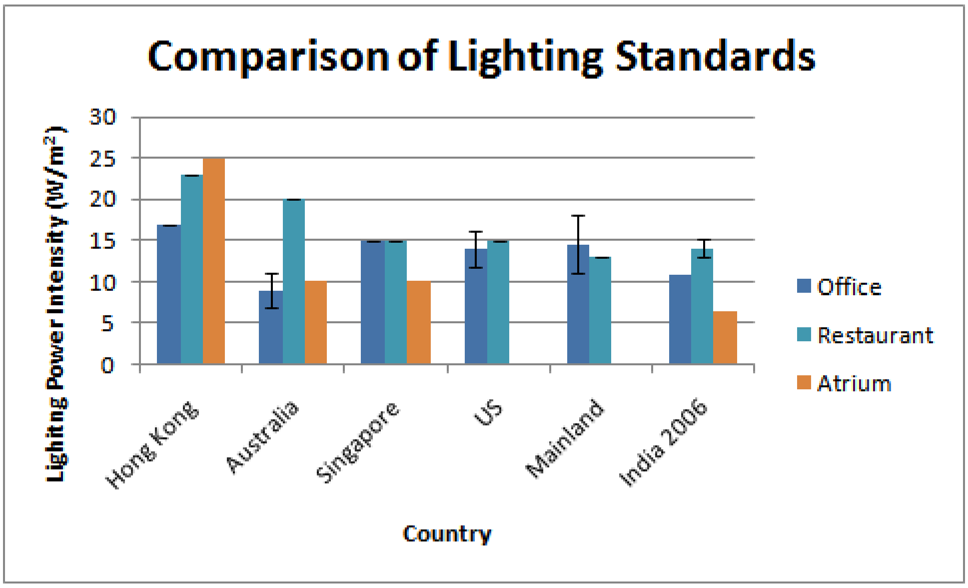

Figure 3: Comparison of Lighting Power Standards in different countries

The OTTV standards were compared with that of other countries, such as Singapore, Malaysia, Thailand, Philippines, and Jamaica by Hui (1997), who showed that the 1995 OTTV limits in Hong Kong are merely moderate for "tower"; and are generous for podiums. This also applied to the mildly revised 2000 OTTV standards, which has the deficiency of excluding daylighting calculation, and the use of OTTV for assessing the thermal performance of residential building envelope designs has also been proven to be inadequate (Wan, 2003). Other simplified performance-based methodologies such as "Annual Cooling Load" are preferred in other pioneering countries. Therefore MBEC should be regarded as a "pass grade entry" of energy efficiency buildings at the "Design stage" only, as it is a lax measure to tackle air pollution and energy over-consumption. MBEC should be modified with the addition of a three-tiered grading standard on top of the basic MBEC, e.g. the lighting standards of $17W/m^2$ would obtain a "Pass" mark; $15W/m^2$ - "Grade 3"; $13.8W/m^2$ – "Grade 2"; and $10.8W/m^2$ – "Grade 1".

1.1.4 Obstacles to Green Building (GB) in Hong Kong: Voluntary Benchmarking (Holistic Approach)

Our existing benchmarking tools in Hong Kong lean towards praising the best performers as in BEAM[4] and CEPAS[5]. These environmental building assessment methods have been developed to evaluate how successful any development is with regards to balancing energy, environment and ecology, taking into account both the social and technological aspects of the projects (Ding, 2008). As the BEAM and CEPAS seek to measure and label the performance of buildings over the whole life cycle, the assessment spans from the planning stage, through the design, construction, commissioning, operation, maintenance, and management stages, and finally to deconstruction (Table 1) (Ho et al, 2005). In the BEAM scheme, Lee and Yik (2002) show that it could lead to a saving in annual electricity consumption of 31.9% (Lee and Yik, 2002). For example, the energy efficiency of lighting installations is similar to the MBEC lighting code, except that higher performance targets in respect of the installed lighting power density are set for higher credit levels (Lee and Yik, 2002). The table below shows each individual approach has an important role in the building industry. Missing any one of them will stall the progress of achieving GB utopia.

Table 1:

	Building Life Cycle							Types of Building			
	Design	**Construction**	**Commissioning**	**Operation & Maintenance**	**Management**	**Deconstruction**	**Energy End-use Database**	**Sector diversity (e.g. Hotel, Office, etc.)**	**Existing**	**New / Renovated**	**Energy saving Potenttial**
MBEC	✓							Variety		✓	5.0-7.9%
BEAM	✓	✓	✓	✓	✓	✓		Specific	✓	✓	31.9%
EUI[6]	✓		✓	✓	✓		✓	Variety	✓	✓	5*-30%

* Installation of smart meters

[4] **BEAM**: The Hong Kong Building Environmental Assessment Method is a voluntary establishment of a local building environmental assessment method from 1996, with 4 grades Bronze to Platinum.

[5] **CEPAS**: Comprehensive Environmental Performance Assessment Scheme (CEPAS) for buildings since 2001, developed by the Buildings Department. This well researched Government-led assessment method has been adopted by BEAM rather than taking the lead in public, due to the decades history of BEAM which is hard to replace.

[6] Energy Use Index, EUI, please refer to Section 1.1.7 for more information

1.1.5 *Overseas examples of Benchmarking tools (via Grading/Rating - Market Transformation)*

There are different benchmarking tools around the world. Some are initiated or operated by government such as in the US (LEED), Taiwan (EMGB), Australia (BASIX, NABERS, ABGR), Spain (CEN, CALENER), Singapore (Green Mark), Japan (CASBEE) while others have a private or voluntary origin such as in Australia (GreenStar), and UK (BREAAM) (Ding, 2008). Among these, the most successful ones are usually government-led partially or wholly. LEED is the current leader, which may well be due to its being government-led and a sophisticated facilitator.

Green leasing shows the magnitude of the penetration rate of the green building concept in the community, e.g. the Philadelphia Green Office Pledge (Delaware Valley Green Building Council, 2008) has launched the "Green Leasing: LEED by Example" programme, and LEED is getting more popular than the green leasing-origin, Australia, who initiated the green leasing concept (Green Building Council of Australia, 2009). This pledging mechanism could be influential in HK-tenancy market for green offices in the near future. It may create green market force and attract customers such as large corporations with a green mind-set, who are opting for platinum-rated offices. However, some of Hong Kong's Grade 'A' offices still have a long way to go to keep up with the global standard.

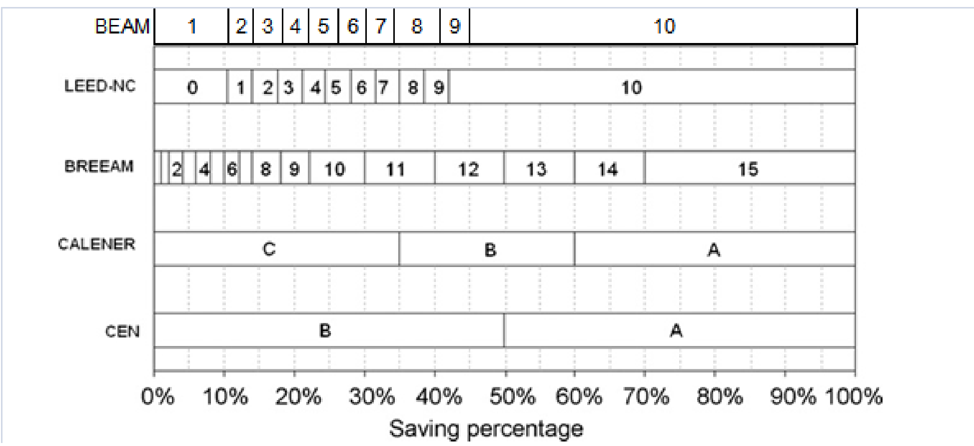

Figure 4: Different Benchmarking Tools for Grading the Energy Saving Percentages (Pérez-Lombard et al, 2009)

1.1.6 Communication Gap: Monitoring of electricity consumption

Hong Kong does not have a single independent agency within the government to oversee all aspects of electricity usage (Lo, 2008). Responsibilities are divided among a few loosely allied government departments: the Economic Development and Labour Bureau (EDLB) is responsible for financial arrangements; the Environmental Protection Department (EPD) for environmental performance; Electrical and Mechanical Services Department (EMSD) for the safety of supply and use of electricity. In addition, advisory bodies such as the Council for Sustainable Development (CSD) and the Energy Advisory Committee (EAC) also offer advice to government on energy issues. With no single department or organization taking full responsibility for energy and electricity usage in buildings, the promotion of sustainable energy consumption remains merely rhetoric and cannot be effective.

The newly launched Hong Kong Green Building Council (HKGBC) might be one step forward. However, the government role as a facilitator and legislator here will be critical. If everything is voluntary and left to private initiatives we fear this will be entirely a carbon copy of CEPAS or HK-BEAM, with limited public involvement and actual market penetration.

1.1.7 Under-utilization of Benchmarking Index

Energy efficiency is referred as an invisible attribute[7]. It is impossible to assign a market value to it unless the methodology or procedures used to determine it are standardized across geographic regions. Energy benchmarking tools provide a comparative appraisal of the energy performance of an existing building within a comparison scenario (Pérez-Lombard et al, 2009) such as the European standard EN 15217, which describes methods for expressing energy efficiency and certification of buildings by an overall energy performance index (EPI), also known as an Energy Use Index (EUI) in the United States. It states in terms of energy consumption, carbon dioxide emissions or energy cost, per unit of conditioned area and thus allows for a comparison between buildings.

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[7] Florida Solar Energy Center 2007, http://fsec.ucf.edu/en/consumer/buildings/homes/ratings/how.htm

USEPA[8] describes the energy use index (EUI) as the "most common means" of expressing the total energy consumption for each building. Energy Service Companies also use EUI as a starting point in energy audits (Pérez-Lombard et al, 2009) and to assess saving opportunities by comparison with existing references (benchmarks) of average, above average, and excellent practice.[9] This provides energy end-users or customers with a way to understand their EUI and even tracking their energy consumption from year to year in the same building, and is a good indicator of the relative potential for energy savings.

The actual EUI can be compared with the benchmark table for the benchmark score. It has been used in the Asia-Pacific Economic Cooperation Energy Benchmark System and slightly modified as the basis of the Energy Star benchmark (Chung et al, 2006). EMSD already has a similar database (Energy Consumption Indicator)[10]; it has 9 separate sectors, i.e. offices, schools, hotel, supermarkets, etc. with their sub-groups. Research studies by Chung et al. (2006, 2009) which have been adopted by EMSD previously, show that Hong Kong supermarkets for instance have an average EUI value (Table 2) that is much greater than that of the UK Energy Benchmark (3960 MJ/m^2/year), and US Energy Star (3526 MJ/m^2/year), this discrepancy might due to different operating conditions among different countries. However another local study (Chung et al., 2009) showed that different energy management practices in building offices were also critical in energy conservation, for example, Grade A offices employed a shared air conditioning system for the whole building, where the air conditioning fee is charged inclusively in the management fee without breakdown. Therefore this does not provide a piece of important information and incentive for tenants of the building to be aware and to take proper measures to reduce their energy consumption for air conditioning respectively. On the other hand Grade C offices generally achieved the lowering of EUI due to their higher self-awareness when it comes to managing their own electricity bills; as tenants they have to foot the electricity bills for their air conditioning which is usually separated from the management fee.

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8 USEPA, http://www.epa.gov/cleanrgy/documents/sector-meeting/6ciii_expanding.pdf

9 At the design stage, energy performance indices for different designs are of great use when choosing suitable technologies, particularly if benchmarks for similar buildings are available.

10 EMSD's online benchmarking (EUI), http://202.155.228.28/energy2/introduction.htm

Table 2:

Type of building	Average EUI (MJ/m^2/annum)		Difference (%)
	Actual (year)	Suggested (EMSD)	
Private Office	1051- 1665	1270.6	-17.3 to 31.0
Government Office	827	1043 (excluded common area)	-20.7
Hotel	1950-2030	1575	28.9
Supermarket	5853	5077-5853	15.3

+ve: great room for improvement

-ve: suggest adoption of higher standard

(Deng and Burnett, 2000; Li, 2008; EMSD, 2008; Chung et al, 2006; Deng, 2003, Chung, 2009)

Critics (Lee and Burnett, 2006; Ma and Wang, 2009) found that while Hong Kong does not have a comprehensive energy end-use database it is taking an important role in supporting and strengthening building performance assessment methods. In a survey, Lee and Burnett (2006) found that the majority of the architects, town planners, government officials, and engineers think that using "actual operating figures" was a fairer method to judge the performance of similar buildings rather than "simulation" methods (e.g. PB-BEC). Currently, EMSD is trying to gather such information via MBEC and the Energy Audit. It is a slow and non-responsive means to tackling the major culprit of energy over-consumption in existing buildings. Hong Kong people are entitled to know how their buildings are performing in environmental terms.

1.1.8 Partial Solution: Smart Metering

Good management requires regular and reliable energy data. One of the measures taken was to install separate meters for different floors and for some of the equipment with large electrical loadings. Remote monitoring technology is used to automatically track individual consumption patterns (Li, 2008).

In CEPAS, installation of energy meters in different building components does take a part in Energy Efficiency accreditation RE2.4 (Buildings Department, 2006), obviously government also thinks that energy monitoring serves as an important database or tool for end-users that are heading towards green building design or practice. Furthermore, according to EMSD energy audit guidelines, as an activity of the environmental management programmes (EMP), the building management should install meters (permanent type) or make provisions for ready connection of meters for each main system, its sub-systems and its associated components. Based on these metering facilities, the building management would have better assessment of the energy consumption in the long run. (Energy Efficiency Office, 2007) Energy monitoring based on sub-metering can be expensive but offers essential performance information of great use to energy auditors and building maintenance personnel (Pérez-Lombard et al, 2009).

1.1.9 Overseas Examples of Policy

The current Hong Kong government policy without clear and systematic progress in terms of legislation or progression of energy conservation is dragging behind the global movement (Table 3), leaving the environmental goals in the mist. Developed countries like the EU, US, UK, Australia, Japan and Singapore, have established energy service companies (ESCO) or energy saving regimens either by the government or private enterprise. Singapore also has a set of specific targets of 80% total building numbers achieving Green Mark by 2030 (Building and Construction Authority, 2009)[11]. Another indication of the weak interest towards GB in Hong Kong was shown by Chan et al (2009) in that the building designers in Singapore (60%) prefer the availability and affordability of GB technology than do those in Hong Kong (40%).

Table 3

Country	***Target year***	***Energy reduction target (%)***
EU directives	9 years	9% energy savings
Japan	2003-2030 (27 yrs)	30% energy consumption/GDP
APEC	2005-2030 (25 yrs)	>25% energy intensity
China	2006-2010	10% energy intensity

[11] Singapore BCA Green Mark Scheme http://www.bca.gov.sg/newsroom/others/pr270409.pdf

2.1 FoE's Position on Energy Profile in Hong Kong

The proposed MBEC report shows that Hong Kong has reduced its energy intensity by 13% when compared with 1995. However we believe the term "Energy Intensity" is inappropriate and often misleading when it is applied in Hong Kong which does not rely on heavy industries to support its economy. It is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP (Baksia and Green, 2007; Smil, 2003). The international comparison of energy intensity, at the aggregate level, produces misleading conclusions with respect to energy efficiency and the quality of technology used in a particular country (Liao, 1997). Therefore, the EU approach of using absolute terms in energy reduction targets would be a more suitable approach for Hong Kong to follow.

Furthermore, Ho and Siu (2007) have shown that 'real' GDP could reflect a long-term relationship (from year 1966 to 2002) with electricity consumption but not 'primary energy requirement' as used by the Hong Kong government. It should involve a 5-year adjustment process in order to correlate their relationship according to the transition nature of a manufacturing-oriented economy to a service-based one.

We call for no more misleading information about our energy profile and no more disguise of the relatively heavy consumption of energy by Hong Kong. Energy intensity is highly dependent on GDP, it is inappropriate to compare our situation as a non-industrial city with other manufacturing-based countries. Furthermore, GDP calculation is currently being criticized by energy experts in mainland China and other European countries as well. A normalized electricity consumption database like EUI is therefore more appropriate.

2.2 FoE's Position on Urban Planning

We suggest Hong Kong introduce a mandate to apply Environmental Impact Assessments (EIA) for all new large buildings, since "natural ventilation" and orientation of each building block in urban planning is a green building design principle which will affect the demand for air conditioning and lighting in the post-occupancy stage[12]. The Planning Department has a guideline for "Air Ventilation

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[12] Post occupancy stage refers to the condition of buildings or premises after they have been built and

Assessment" (AVA) that is incorporated in the Hong Kong Planning Standards and Guidelines, which suggests a 1.5 m/s of wind speed at ground level could be optimal for creating outdoor pedestrian comfort during the hot summer months[13] (Planning Department, 2005,). This AVA guideline is a weak (or low speed) wind design protocol for congested urban planning (Ng, 2009) which has been practiced by the Housing Department for all new public housing projects (Ng, 2006). This should be adopted into the GFA concession policy; it should cover site coverage, building alignment and disposition, etc. to ensure that buildings and the corresponding urban planning design do not block the ambient background wind (Ng, 2009)

We should not set our building separation solely on a 15-meter interval as suggested by CSD[14], nor stipulate height restriction. These are reactive measures or inferior (or secondary) options, while AVA and an Urban Climatic Map should be adopted which could sustain the wind speed and categorize each district condition specifically. In the figure shown below, Ng (2009) has shown that a terraced podium design of buildings with the same interval distance could improve the air movement, and also the axis of the building should be parallel to the prevailing wind direction. A holistic approach of AVA for sensitive or dense urban areas has advantages for tackling the street canyon effect and hence to reduce energy consumption by air conditioning with lowered city temperatures.

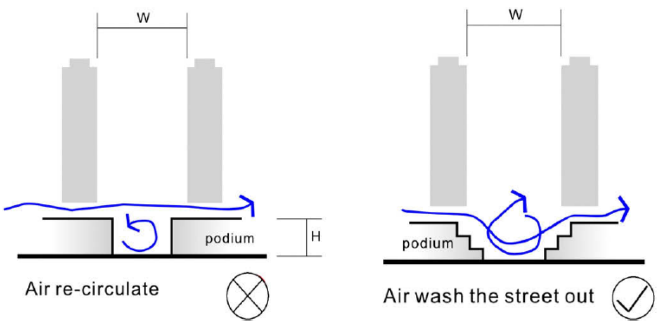

Fig. 5: Scale of Podium (Ng, 2009)

occupied for some time.

[13] The channeling effect created by the void at ground level helps to improve the ventilation performance for those residential units on the lower floors. For very deep canyons or very tall building blocks, mid-level permeability may be required to improve the ventilation performance for those occupants who reside at mid-floor level.

[14] Council for Sustainable Development (CSD), Building Design to Foster a Quality and Sustainable Built Environment (Invitation for Response Document 2009).

3. FoE's Recommendations

1. FoE (HK) urges the government to set at least a 10% reduction target for electricity consumption by 2015 (based on Year 2005); and the government should also set targets for green buildings in Hong Kong (say 80% by 2030 – Building and Construction Authority, 2009)
2. FoE (HK) urges the government should lead society to a vigorous demonstration of MBEC compliance; or Energy Labeling; or Government Green Procurement Policy by Government buildings and buildings of the Government-funded or Government-subsidized organizations, (both new and existing ones), alongside the adoption of a three-tiered grading standard based on the basic MBEC;
3. FoE (HK) believes the mandatory listing of building energy labeling (containing a detailed breakdown display) on sales brochures or energy performance certificates, which will motivate developers to design buildings with much higher energy efficiency, for example:
   i. EU Directive (2002/91/EC) on the energy performance of buildings: Since 2002 energy certificates were used as a marketing tool when selling apartments in new buildings in Slovenia.
   ii. All homes (and other buildings) in the UK since 2007 have to undergo Energy Performance Certification before they are sold or let.
   iii. In Turkey: Establishment of energy certificates called "Building Energy Performance Certificates" which contain information on the energy requirements, insulation features and efficiency of the heating and/or cooling systems of a building as well as the building's energy classification for use during selling, renting or owner transfer[15]
4. FoE (HK) urges the government to provide a transparent online benchmarking of the EUI system in a high profile manner for greater public participation, e.g. regular reporting, or large scale appraisal of buildings or individual premises.
5. FoE (HK) urges the introduction of economic incentives, such as a taxation exemption scheme; stimulus of demand for high energy efficiency buildings, as this will have a co-benefit of promoting environmental pillar industries. Since government has announced that environmental protection is one of the six economic pillars to improve the city's economy, EE industry as a twin-blade sword

[15] Turkish 2008 legislation (Grade A to G), http://www.planbleu.org/actualite/energaia08/Sess3_4_Intervention_Tulin_Keskin.pdf

which can reduce pollution and enhance job opportunities should be given priority. Government should aid the EE industry in promoting their new/innovative products/services, i.e. more exhibitions and wider promotion for EE industry.

   i. In Singapore, earlier write off period for energy efficient equipment and technology; one-year accelerated depreciation allowance (instead of 3 years) in Income Tax Act[16]. In Hong Kong, the annual reports of public companies show that the cost of plant and machinery is usually written off over a period of ten years on a straight-line basis, while depreciation for buildings is calculated on the basis of an expected life of fifty years.
   ii. In the US, tax credit by The Energy Policy Act of 2005; the taxpayer must obtain certification of the savings from the energy-efficient property to qualify for federal tax deductions (Deru, 2007): 16.7% energy and power cost savings, a partial deduction of US\$0.60/ft^2 (US\$6.46/m^2) for lighting, up to US \$1.8/ft^2 for improving the energy efficiency of the building.

6. FoE (HK) urges the establishment of Government-led Green Leasing programmes, and promotion of "Green Leasing" in the developer and real estate community. This will primarily benefit real estate businesses and also the owners of commercial-lease property with green orientations. In the US, 78% of property managers believe sustainable buildings can command 10% higher rents.
   i. "green lease language" in the developer and real estate community is also a prevailing trend in the US (LEED);
   ii. UK has different levels of green leasing, grading from light green to dark green
   iii. Australia (Green lease schedule)[17]
7. FoE (HK) urges the introduction of Smart Metering which would provide information for building managers to understand the energy consumption profile of a building. As smart meters could help building managers to achieve an average of 12% reduction of carbon emissions and 5% in electricity consumption judging from overseas experience. For example:

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[16] Singapore, http://www.nccc.gov.sg/incentive/home.shtm
[17] http://www.costar.com/News/Article.aspx?id=1D36630C837CB1CE85575D86A52C4748

i. In Italy, which has had smart meters in its 30 Million homes since 2005, energy use has dropped 5% a year.

ii. In the UK, National Grid argues if that pattern was followed in the UK, the cost of smart meters would amount to £33-£68 per tonne of carbon saved from the atmosphere - significantly cheaper than building more wind power capacity, which costs £50-£79 for each tonne of carbon saved.[18]

iii. In California, a net benefit of one dollar will be earned, if one dollar is spent on improving energy efficiency (Lu, 2008)

8. FoE (HK) suggests mandatory Air Ventilation Assessment (AVA) for new large buildings at planning stage; and the promotion of greening in urban planning should be advocated, where at least 30% greening, where two-third of which should be covered by tree planting as simple surface greening like green roof alone is not sufficient to tackle the problem of climate change or reduce air pollution significantly.

What environmentally conscious citizens (individual users) or tenants can do?

- User's habit: Energy demand can be reduced by 15% without major investment, simply through energy management techniques like
  - Monitoring consumption, improving control, and early recognition and elimination of weak points.[19]
  - trying to lower the personal comfort zone to slightly higher temperatures, such as >25°C
  - Making good use of remote sensing aids to conserve energy
  - Eliminate unnecessary sources of standby power
- Environmentally conscious citizens can
  - fully utilize energy efficient products, bearing in mind the higher initial cost will be paid back within a short period of time
  - participate in green leasing, refuse to rent or buy property with low energy efficiency

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[18] http://www.guardian.co.uk/environment/2008/feb/20/energyefficiency.smartmeters

[19] Steps that involve building users can be highly successful, for example awareness-raising and motivation, and sometimes cities offer incentives by sharing the savings with building users. Many municipal energy utilities apply demand-side policies, offering advice and incentives for efficient devices and integrated energy services (Hui and Lam, 1991)

- Make good use of white roofs as this can could lower temperature and air conditioning demand (by up to 60% in overseas countries)
- White or cool roofs can have a high solar reflectance (approx. 75%)[20]
- 100 m^2 of white roof, replacing a dark roof, offsets the emission of 10 tonnes of CO_2 per year[21]

What the industry can do (best practice)?

- Power companies could focus on improving load factors
- Building designers or architects could be pioneering the green building industry
- Developers should not be limited by the low standards of MBEC, but should strive for zero- or low-energy buildings

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[20] Infrared rays (heat) will be reflected back to the sky which makes the building cooler than a dark color roof which has a solar reflectance of around 5-15%, that means it will absorb a high portion of heat energy onto the building which heats up the building and requires more loading of air conditioning which wastes energy and generates more greenhouse gases. Cool roofs can reach within 6-11 °C hotter than the background temperatures, but traditional black roofs can reach 31-47 °C hotter during a hot summer day. Furthermore green roof does not permit use as an amenity space for the building's tenants, and maintenance of healthy green vegetation and contains sufficient is required water for evapotranspiration, while white roof only requires cleaning maintenance.

[21] A typical US House roof top size is about 100 m^2
http://www.energy.ca.gov/2008publications/CEC-999-2008-031/CEC-999-2008-031.PDF

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