

# **AN INQUIRY INTO STIMULATING CITY-WIDE IMPROVEMENTS IN ENERGY EFFICIENCY PERFORMANCE, IN EXISTING COMMERCIAL BUILDINGS**

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## **SUMMARY**

This paper reviews green building plans which have been implemented around the world as part of larger city wide climate change actions. It explores examples of targeting public and private buildings and potential for addressing split incentives. It is found that the key to success for a green building program is for it to be a part of a larger city-wide vision with a combined approach of voluntary and mandated programs and policies.

## **KEYWORDS**

Energy performance, regulation, emissions studies, building retrofit, climate change.

## **1 INTRODUCTION**

The role of cities in climate change has become increasingly evident with 60% of the world's population predicted to be living in cities by 2030, consuming around 60-80% of the world's energy production, and approximately an equal share of greenhouse gas emissions (Kamal-Chaoui & Robert, 2009). Governance of climate change policies to mitigate GHG emissions in cities started at a more global scale, with formation of networks such as the Climate Alliance and ICLEI's Governments for Climate Protection in the 1990s (Bulkeley & Newell, 2010). Over time the strength of municipal-level climate change policy is emerging, no two cities are identical and programs must be adapted depending on the characteristics and energy needs of individual cities.

GHG emissions are continuing to rise from cities and for countries to reach reduction targets more urgent action is required. The IPCC (2007) report brought attention to the level of GHG emissions which come from commercial buildings and it has since been identified that a significant proportion of these are easily targetable for reductions, bringing increased attention to improving existing buildings. Cities are now introducing large scale green building programs. A significant driver of this movement has been the Clinton Climate Change Initiative C40 Cities Program established in 2007, which has seen the development of city scale climate change mitigation plans such as Leading to a Greener London and PlaNYC (New York), with specific building strategies embedded as part of these plans.

This paper will review a number of these building programs in cities around the world and see how they are overcoming barriers such as owner engagement and split incentives and concludes with recommendations for strategies that could address the identified barriers, to accelerate city-wide improvements in energy efficiency performance.

## **2 MATERIALS/METHODS**

This paper will review city programs currently in place that target energy efficiency in commercial buildings. The focus of the paper is on schemes outside of the traditional nationally and internationally governed systems (such as LEED, BREEAM and Green Star) that target individual buildings but rather schemes which cities are using to stimulate energy efficiency on a wide scale for existing commercial buildings.

The role of governments in encouraging greener building will be reviewed and a number of city programs will be discussed, including several 'Better Buildings Partnerships' modeled

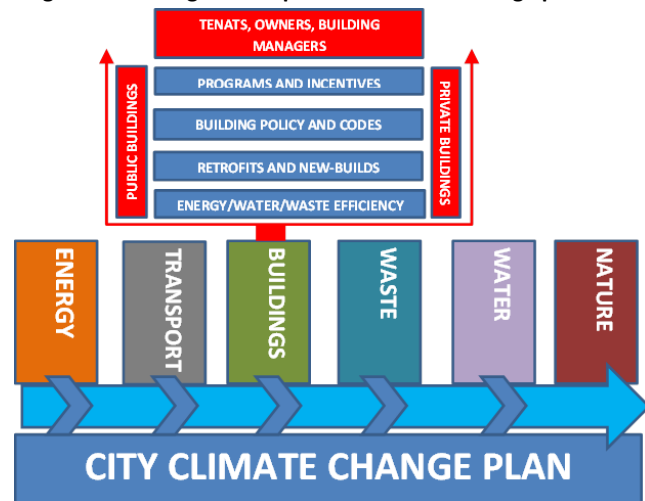
programs and a proposed urban emissions trading scheme in Tokyo. The drivers behind the implementation of these programs will be reviewed and what tools are used to encourage participation and overcome barriers for uptake.

### 3 RESULTS

Cities that are large economic centres have recognised the need to address climate change and most major cities have GHG reduction targets and plans in place. Embedded within these plans are initiatives to address buildings which currently use around 40% of the world’s energy (WBCSD, 2009). As population living in cities continues to grow occupancy rates in commercial buildings must also increase, so there is a need for buildings to work more efficiently and be enabled for a low carbon future.

Cities are being rated on their ‘livability’ and strong links are being recognised between GHG emissions and the supporting infrastructure and economy in cities (Hoorweg et al, 2011). Green buildings are just one component of making a city more sustainable, and must be interlinked with other areas. Figure 1 shows areas typically included in city wide climate change plans, with buildings as a key component.

Figure 1: Buildings as component of climate change plans



#### CITY-WIDE PLANS

“One of the ways we think about sustainability in NYC is about ensuring a quality of life that is attractive. It is not just about the environment” Rohit Aggarwala, Director, NYC Office of Long-term Planning and Sustainability (SustainLane, 2008). New York city planners realised the city needed to be able to absorb a predicted population growth of one million people through re-building existing infrastructure. Baseline studies found 78% of emissions were from energy use in existing buildings (ARUP, 2011) and 85% of the building stock in 2030 would be buildings currently constructed, in addition energy demand would outpace energy supply within the next 10 years (Ewing & Knapp, 2010) making action inevitable. Therefore they would need to aggressively address energy conservation in existing buildings.

PlaNYC was developed, a sustainability framework for the city which includes the ‘Greener Greater Buildings’ plan. The key component of this plan in incentivising energy efficiency is greening the building codes and energy legislation. Four codes were introduced requiring buildings covered by the legislation to report energy and water consumption annually to an online database administered by the city and available to the public, undergo energy audits every 10 years and retro-commissioning to ensure they are operating efficiently, lighting standard and sub-metering requirements and code compliant renovations.

The city is targeting the 16,000 public and private buildings using city buildings as demonstration projects and creating an Energy Enterprise Metering System (EEMS) to monitor energy use through the city. They realized that there is little incentive for public buildings as bills are paid centrally, a problem also seen in Australia which has led to the creation of Green Lease Schedules for government buildings (DECEE, 2011). The City has developed a model for energy aligned leases for commercial office spaces to overcome the split incentive issues often experienced when attempting to implement energy efficiency

retrofits and a not-for-profit organisation 'New York City Energy Efficiency Corporation' to finance retrofits.

Chicago is another C40 City and similarly to New York has a buildings plan which forms part of the city's overarching climate change plan. Chicago has also had energy conservation building codes in place since 2001 which has contributed to 15 million square feet of municipal buildings being retrofitted (Hayhoe & Wuebbles, 2009). In March 2012 Chicago announced the 'Building a New Chicago Plan', a 7 billion dollar program targeting the city's infrastructure network. This includes the total infrastructure targets such as rapid transit network development, parkland, water pipe replacement, public school enhancement, and Retrofit Chicago targeting city buildings (City of Chicago, 2012).

Chicago has a well-planned and researched Climate Change Plan for the City involving a number of advisory and research committees, specific taskforces, dedicated staff and funding streams and monitoring activities. The green building plans are therefore guided by a solid framework. With the building plan forming part of a larger city-wide vision it makes the momentum to carry forward more viable. It discourages internal political battles and arguments for funding and time allocation when it is part of a larger mission. In addition, the buildings plan is supported by energy efficient legislation that has been in place for years.

Seattle is another US city which can demonstrate the power of local legislation, with energy conservation programs first introduced in 1977 which incentivised a number of programs one of which was a sustainable building action plan launched in 1998 (Office of Sustainability & Environment, 2012). The city is considered a top 'smart city' in the US and has environment embedded into the planning processes. There are a number of tax breaks and loans to incentivize green building available (Lesser & Taube, 2012).

Similarly to US cities, Hong Kong has an online benchmarking tool that has been in development since 2001. The City has 89% of their end-use electricity emissions from buildings, so recognise the need for efficiency (EPD, 2009). There are 32 energy consumption benchmarking profiles for buildings that were developed by their Energy Efficiency Office, and made publicly available so consumers can compare themselves to similar buildings. Hong Kong also has a number of Building Energy Codes (BECs) for new and existing buildings, and certificates are awarded to buildings that meet minimum energy performance standards. As at March 2012 there were 1358 buildings involved with 3560 certificates awarded for varying installations (EMDS, 2012).

Tokyo and Hong Kong have both taken the energy reductions a step further with the introduction of carbon reduction schemes for buildings. The Hong Kong Carbon Audit campaign is voluntary and provides a guide for buildings to report on scope 1, 2 and 3 emissions and currently has around 230 organisations participating (ARUP, 2011). Tokyo's scheme is a mandatory cap and trade scheme targeting energy related emissions (so does not include other scope 1 and 3 emissions). There are no clear results on the effectiveness of these programs yet but it will be useful to observe the outcomes from mandatory verses voluntary schemes. It is also likely future considerations for counting carbon in buildings will go beyond energy alone and a full carbon assessment allows for consideration of other scopes which are interlinked and mutually dependent (such as transport).

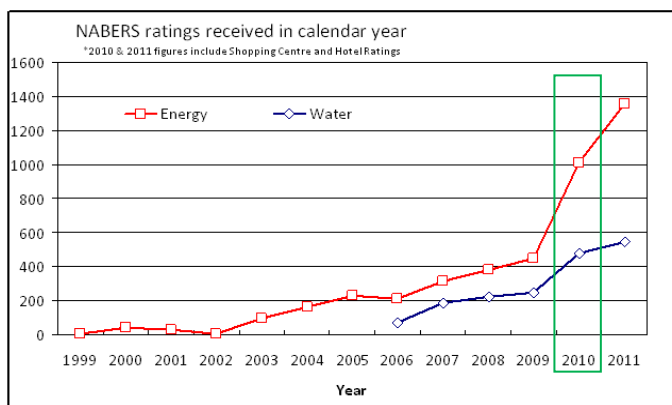
#### *PUBLIC VS PRIVATE BUILDINGS*

Many cities in the US have mandated LEED standards for public buildings as 'regulations that require green civil buildings often set a good example for private developments and are easier

to enact than mandatory regulations’ (Hupp, 2009). The European Union is introducing directives targeting buildings and services, where public buildings will be required to fulfill obligations to be operating as near zero energy buildings two years prior to the private sector as they are considered a ‘role model’ and can drive efficiency in the market (Schüle, Höfele et al. 2011). Similarly the UK requires all new builds or major refurbishments to have a minimum BREEAM standard

In Australia the Energy Efficiency in Government Operations legislation requires minimum NABERS ratings for new or refurbished public buildings. The government has also introduced Green Leases. There are also some state driven programs in Australia with initiatives such as the Victorian ‘Green Government Building’s Program targeting energy and water performance and management in buildings. By 2020 the project is planning to save 23% in GHG emissions, 16% in water with an NPV of \$170 million (Burke, 2011).

Figure 2: NABERS uptake since mandate of program



The Australian NABERS program provides evidence of increased uptake through mandating energy requirements. The *Building Energy Efficiency Disclosure Act* was introduced in 2010 requiring buildings over 2000 m<sup>2</sup> to disclose energy consumption through a NABERS rating. The uptake has tripled since the introduction of the rating system, shown in Figure 2 (NABERS, 2012).

Similar to the US, Australia also has programs which incentivise action for private commercial buildings, on a federal level the tax breaks for green building will commence in 2012 which will apply to retrofits of existing buildings. The Melbourne 1200 Buildings Program and Sydney’s Better Buildings Partnership both offer Environmental Upgrade Agreements to assist building owners and tenants with retrofits, and Low Carbon Australia also provide energy efficiency loans.

London (also a C40 city) implemented a government buildings initiative in 2010 pledging to reduce emissions from public buildings by 10%. The program succeeded and over 12 months from May 2010-2011 the government reduced emissions by 105 KT saving an expected 13 million pounds (HM Government, 2011). This initiative was taken as the UK has set GHG reduction targets for industry and realised it needed to lead by example in order to gain commitment from others (HM Government, 2011). This has led to the development of the RE:FIT program for public sector building upgrades.

For targeting the private sector London has a number of programs in place supported by an over-arching climate change plan. One of these is the Better Buildings Program (BBP) which has been used as a model for Toronto and Sydney. The BBP has a series of working groups with industry representatives that address the main challenges facing the property market, they have developed toolkits on green leases, metering, retrofits, building management and agents. The BBP are looking at ways to incentivise the market to improve buildings performance and understand that there needs to be a differential between occupiers and

owners and are looking at the Australian NABERS as a model for this development (BBP, 2012).

#### 4 DISCUSSION

This paper offers just a few examples of green buildings plan that have been implemented around the world. One of the key factors in the success of a green building plan is that it does not stand alone. As cities become more densely populated and want to manage greenhouse gas emissions all areas are interlinked, for example, a green building in a city that does not support public transport or de-centralised energy is unlikely to be as successful in reducing GHG emissions.

The way that actions are being delivered in the C40 Cities varies between private and public buildings, with mainly projects and programmes driving change in public buildings and incentives/disincentives for private buildings (ARUP, 2011). In the role of encouraging energy efficiency, governments have the responsibility to implement legislation and provide funding but importantly to also lead by example, providing industry incentive. This can also spur innovation and create new markets and jobs. The table below shows some key incentives and tools for public and private buildings.

**Table 1: Incentives and drivers for public and private buildings**

	<b>Incentives/Drivers</b>	<b>Tools</b>
<b>Public</b>	Financial savings Cutting city target GHG emissions Lead by example Job creation, encourage innovation	Projects, programs and policies Minimum standards Financial rewards and penalties Department engagement
<b>Private</b>	Improved health & productivity of staff Staff attraction and retention CSR, branding, competitiveness Financial savings Higher re-sale/lease	Financial incentives/ disincentives Funding/ EUAs Support, training, toolkits Mandates Reward and recognition

Access to information is critical and the development of publicly available benchmarks is a key factor for a successful program. Savings (energy and financial) need to be measurable. New York’s local legislation over sub-metering will take this to the next level so it is not just base building but tenancy benchmarks which are available. This starts to address the issue of split incentives, tenants should also be responsible for their energy consumption.

The Green Leases seen in both New York and Australia are targeting tenants, but there has not been a large uptake. Hong Kong is considering mandating BECs as as ‘voluntary compliance with the BECs does not appear to be forthcoming in Hong Kong’ and the majority of the certificates have been for government buildings, showing a low participation rate from the private sector (LCPEA, 2008). For countries that are not driven by high electricity prices mandating such schemes is necessary for uptake by the private sector.

The effectiveness of building programs in stimulating energy efficiency will take years to assess but it is possible to already see what constitutes a strong uptake and following. Careful planning and public engagement can assist developing financing mechanisms for building upgrades and overcome barriers such as split incentives.

#### 5 CONCLUSIONS

Greenhouse gas emissions continue to rise, and action in individual buildings has been successful across the world but it is urgent that city-wide schemes be implemented in order to effectively combat climate change. There are successful ways for cities to target buildings as part of larger plans which also address energy, transport, waste and water enabling them to prepare for a low carbon future.

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