

Hope is not a Strategy: China's pathway towards ultra-low energy buildings



Image: C40 New Building Efficiency Network workshop delegates – 2 - 4 April 2019, Beijing

Delegates from South African cities attended the launch of C40 China Climate Action Plan (CAP) Regional Academy and the C40 New Building Efficiency Network that took place in Beijing from 2-4 April 2019. The C40 China Buildings Programme was launched in September 2018 and the four Cities of Beijing, Fuzhou, Qingdao and Shanghai committed to rapidly reduce emissions from existing buildings, ensure new buildings reach ultra-low energy consumption standards and promote buildings to become low carbon energy consumers. Similarly, the four South African Cities of Cape Town, eThekweni (Durban), Johannesburg and Tshwane have committed to accelerate the development and implementation of transformational energy efficiency policies and programmes for new buildings in South African cities.

Although the global buildings programme focus is on improving building energy performance, a people-centred, human development approach to construction remains a priority for both China and South Africa. This requires policy makers to take cognisance of safety, quality, jobs and the affordability implications of policy approaches. This value was echoed by Duane Jonlin from Seattle in his “Roadmaps to Zero Carbon” presentation¹, where he highlighted the importance of incorporating human-centric values that improve the health and comfort levels of building occupants.

¹ Jonlin, D. 2019. Roadmaps to Zero Carbon, C40 New Building Efficiency Network, Beijing.

The C40 New Building Efficiency (NBE) Network Workshop

The three-day workshop kicked off with a high level event attended by the Ministry of Environment and the Ministry of Housing and Urban-Rural Development (MoHURD), which emphasised a strong national mandate towards building an “ecological civilisation” as captured in the National Development and Reform Commission (NDRC). This is equivalent to South Africa’s National Development Plan (NDP) which puts emphasis on economic development which is socially and environmentally driven.

Tackling climate change and improving the lives of citizens is central to President Xi’s drive towards this vision. The evidence speaks for itself. Entering Beijing from the airport, a fleet of electric vehicles flood the highways, alongside highly efficient public transit systems and well-utilised cycle lanes. Greenways, boulevards, litter-less streets and highly efficient construction methods are prominent throughout the Beijing landscape.

A research study commissioned by C40 and McKinsey² demonstrated 12 critical actions that cities can take to reduce their emissions, half of which related to buildings. The built environment accounts for a third of the world’s global carbon emissions and needs to be at the forefront of efforts to drastically reduce the amount of carbon dioxide (CO₂) generated. For China, buildings contribute 25% of GHG emissions. With the advent of urbanisation, Chinese cities are expected to accommodate 70% of the population by 2050 which translates to more buildings being erected and a doubling of the floor area space. Therefore, it is crucial that ultra-low energy consumption requirements are embedded in new construction developments.

The objectives of the workshop were to exchange knowledge and share best practise, fostering intercity networks and relations to accelerate Net Zero Carbon commitments. The workshop explored the following areas: pathway towards Net Zero Carbon (NZC), high performance requirements for new buildings, compliance and enforcement and monitoring and verification.

² <https://www.c40.org/researches/mckinsey-center-for-business-and-environment>

Table 1: Participating C40 Cities

C40 South Africa Buildings Programme	C40 China's Building Programme	C40 Innovator Cities
Johannesburg	Beijing	Copenhagen
eThekweni (Durban)	Shanghai	Seattle
Cape Town	Qingdao	Washington D.C.
City of Tshwane	Shenzhen	Portland

The various cities gathered to exchange knowledge towards unpacking the road to net zero carbon buildings. The range of presentations from the cities touched on unpacking technical as well as institutional solutions towards the drive to “net zero”. City of Cape Town and Tshwane respectively presented on unlocking institutional solutions such as mainstreaming climate change through change management and effective stakeholder engagement towards policy creation. Washington D.C., Seattle and Portland, presented on policy solutions towards implementation of high performance building energy standards. Two crucial points were highlighted in this regard, namely, the need to develop regulatory standards i.e. building energy codes to transform the building sector as well as creating market signal’s by mapping the step-down approach to target-setting.

The concept of Ultra-Low Energy Buildings (ULEBs) put emphasis on high performance design and construction of “near-zero” emissions buildings as opposed to renewable energy generation considerations. A typical example of this was emphasised by Fuzhou in their “*Feasibility of Fan Ventilation Measures in Low Energy Buildings*” presentation, where they considered fans to supplement natural ventilation for their humid (hot summer, warm winter) climate conditions, similar to eThekweni Municipality. This intervention provides a huge impact towards reducing buildings’ energy consumption as opposed to HVAC systems. Qingdao’s approach focused on a residential retrofit programme and Shanghai provided an overview of their renewable energy demonstration project.

Leveraging off global building efficiency standards from Oslo, Copenhagen and Stockholm, and together with the support from the German government, Beijing will demonstrate their high performance building standards by piloting 300 000 m² by 2020. A third of this target has already been achieved and 100 million RMB (approximately 200 million ZAR) worth of financial incentives are on the offer to propel ULEBs implementation. The collaboration with the German Energy Bureau on the pilot projects will demonstrate superior buildings standards that provide safety and durability, liveability, health and comfort, resource efficiency, cultural preservation and convenience through smart technology applications.

The Beijing Cuicheng D23 multi-family residential building is a testament towards the feasibility of these high performance buildings and has already become the first to be certified by both the Passive House Institute and the German Energy Agency. The building envelope is extremely tight and well-insulated with triple glazing and insulated cavity walls to maintain environmental control between indoor and outdoor surface areas. In a drive to facilitate local employment and provide quality assurance, the developer opted for the prefabrication construction approach for its high efficiency and effectiveness. An interesting fact is that prefab construction could produce the same output in 3 weeks as opposed to 6 months with the conventional approach. Furthermore, the upcoming Beijing 2020 Winter Olympic stadia are expected to operate at NZC/ ULEB standards which will demonstrate that good design not only rests on aesthetic but can be high performance, too.



Figure 2: C40 Technical Officers at site visit/ study tour of the Beijing Cuicheng D23 building, 2 April 2019



Figure 1: High performance Beijing 2020 Olympic Stadia
Source: Archdaily.com (2019); Ausleisure.com.au (2019); Theb1m.com (2019)

Cities go beyond national targets

In Beijing, accelerated climate action is translated through the development of local building standards that go significantly beyond the national requirements. The recent 13th Five Year Plan mandates for buildings have to be at least 75% more efficient than the baseline of a 1980s-constructed building. However, with the support of the C40 China program, the aim is to reach efficiencies of 90% and beyond. With 100% code compliance, it is no doubt that Beijing will achieve its targets.

Similar to the C40 China Buildings Programme approach, the four South Africa cities are in the process of developing a net zero carbon building policy and associated by-law with stringent energy efficiency requirements above the current national standards SANS 10400XA developed in 2011. The policy will

also address renewable energy supply component in an effort to ensure low carbon building energy consumption and meet their commitment to have all new buildings operating at net zero carbon by 2030.

A technical standard has been developed for ULEB and will be published this year, highlighting key areas for training and capacitation including technical standards for the design, construction, operation and maintenance of such builds. Monitoring and verification will be done on a 3-year cycle where developers, owners, and/or tenants will be required to upload energy data. Benchmarking will be used to verify whether the data is on par with the standard requirement.

We can learn from the enormously successful ‘hit-the-ground-running’ approach of China. To illustrate the success of China’s approach and its front-lead status in delivering its ULEBs targets, Duane Jonlin presented the case of high-speed rail implementation over the last decade by providing a comparison between the US and China in the figure below.

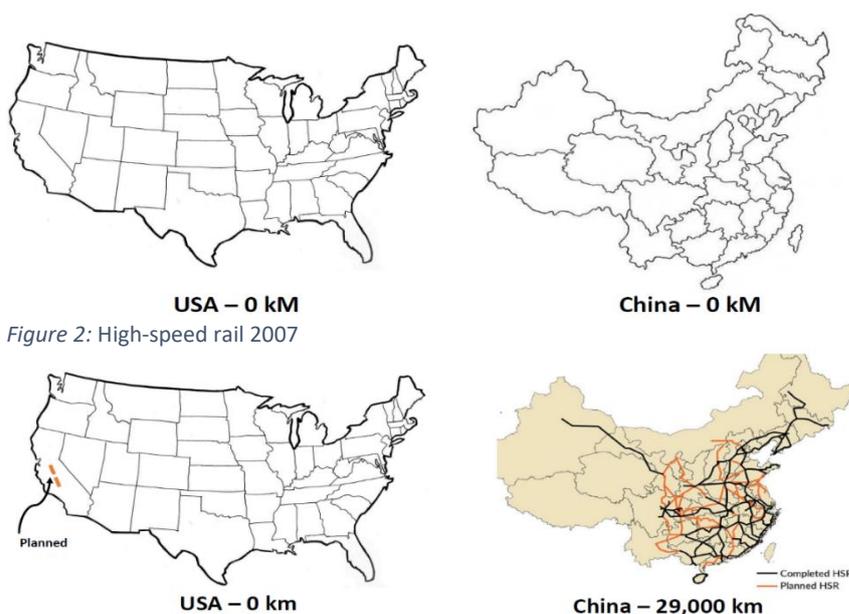


Figure 2: High-speed rail 2007

Figure 3: High-speed rail 2007 vs 2019 (Donlin, 2019)

Navigating Beijing’s ancient city finds – Miscellaneous adventures

Our glimpse of China revealed a land of challenging contradictions. The springtime season brought along with it cherry blossom trees and clear skies for the most part of the week, however, it was inevitable that we would encounter smog especially as the days warmed and a few days in the City had a knock-on health effect for many delegates. Thanks to the highly efficiency rail system, we navigated the city with ease and explored the night time food and street markets in precincts scattered across the City where our bargaining skills were superbly sharpened.

A visit to the acclaimed UNESCO World Heritage Site, The Great Wall of China, confirmed the effects that urbanisation had on its immediate and surrounding environs. As we struggled up the monumental structure, a reflection of Chinese workmanship, it was evident to see the thick cloud of smog blanketing the entire rural landscape.



Figure 3: Post-workshop city tour at The Great Wall (2019)

The rural towns were filled with colourful food and cultural markets and the rural street networks were flooded with cars heading to the countryside to honour the national holiday “Tomb Sweeping Day”. We saw a large group of people huddled around what seemed to be a manmade fishpond in a restaurant/ marketplace’s courtyard. The idea being that the customer’s catch their own fish for the restaurant to prepare and serve. Talk about giving flesh to the adage “give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime”!

The 2019 C40 New Building Efficiency Network Workshop in Beijing was insightful and invaluable. It was mind-opening to see how the rest of the world face similar challenges to the developing South and that the C40 South Africa Buildings Programme could take lessons from the so-called ‘innovator cities’ instead of reinventing the wheel. The Chinese cities have demonstrated that it is simply not enough to “hope” as they forge ahead with massive implementation of their aspirational targets. It is hoped that we can bring a similar spirit to the South African New Buildings NZC programme. A big thank you and well done to the hosts C40 Cities Climate Leadership Group, Center of Science and Technology & Industrialization Development (CSTID) and Beijing Government for a successful event.

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