Masdar City: 'City of Possibilities'

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As the global population continues to migrate to cities, new models for sustainable city design are being developed and tested. Masdar City in Abu Dhabi, United Arab Emirates is one such project. In 2006, the government of Abu Dhabi announced that it intended to spend $22 billion with the aim of becoming a leader in renewable energy; a key part of this plan was to build a new carbon-neutral, zero-waste city from the ground up to demonstrate state-of-the-art sustainable city design. As initially conceived, Masdar City was something of an experiment: a clean-technology incubator powered by renewable energy, which was intended to exhibit the highest levels of efficiency. Partly due to the global financial crisis of 2008 and partly due to experience gained from continued assessments of the original concept, Masdar has scaled back the initial ambitions for the city's carbon and waste targets, as well as the development approach and timeline for the entire city. This, however, may ultimately prove to be the best outcome for Masdar City if it is truly to become a model for sustainable cities of the future.

Masdar City – the concept

Masdar City, located in the emirate of Abu Dhabi in the United Arab Emirates, is part of the broader Masdar Initiative. Masdar was founded in 2006 by the Abu Dhabi government to diversity the UAE economy away from dependence on oil and gas and toward a more sustainable energy and economic system. Masdar is wholly owned by the Mubadala Development Company, which itself is an Abu Dhabi-owned enterprise. Masdar has a mandate to advance sustainable energy through education, research and development, investment, and commercialization.

To achieve this mandate, Masdar is organized into three main business units: Masdar Capital, Masdar City, and Masdar Clean Energy, as well as an independent research university, the Masdar Institute of Science and Technology. Masdar Capital is a major investor in clean-technology companies around the world, while Masdar Clean Energy focuses on the development of large-scale renewable energy and carbon abatement projects. Masdar City is a special economic zone and a model for commercially viable sustainable living. The Masdar Institute of Science and Technology is a graduate-only university developed in cooperation with the Massachusetts Institute of Technology (MIT). Although not under the Masdar corporate umbrella, the university is a key part of the Masdar concept as it is located in Masdar City and is intended to be an anchor for intellectual activity within Masdar City and the UAE more broadly.

'… TO BUILD A NEW CARBON-NEUTRAL, ZERO-WASTE CITY FROM THE GROUND UP TO DEMONSTRATE STATE-OF-THE-ART SUSTAINABLE CITY DESIGN.'

Although Masdar is a broad initiative with impact on environmental sustainability far beyond the borders of the UAE, Masdar City is the iconic feature that many associate most closely with the brand. Masdar City is a 6 sq. km development located approximately 17 km from downtown Abu Dhabi City. It is Masdar's vehicle for the demonstration, through a combination of urban design and technology, of a new paradigm in sustainable living. The originally announced plan for Masdar City was that by 2016 it would be the world's first carbon-neutral and zero-waste city, with all of its buildings sitting on an elevated platform where 40,000 residents and 50,000 commuters would engage daily in educational, work and social activities. It was always apparent that a relatively small development such as Masdar City, with substantial financial backing from the Abu Dhabi government, could be a test bed for the new technologies required to meet extremely demanding sustainability targets. This resulted in a great deal of Masdar's early emphasis on environmental sustainability via architectural design and technology deployment, which had the aim of capturing economic benefits from patents, IP ownership, game changing technology innovations, strategic alliances, and direct technology ownership.

In parallel to the development of a number of technology roadmaps intended to achieve these technology ambitions, Masdar undertook various assessments to identify how the city could rapidly become a commercially viable clean-technology hub capable of providing a home to a diverse assortment of organizations, including multinational companies, start-ups, research institutes, and NGOs. The idea was to leverage all the elements of the Masdar concept to create a small-scale version of Silicon Valley within the UAE. Partially influenced by the global financial crisis of 2008 and partially based on the results of strategic assessments, Masdar City's development strategy was revised to accommodate a more measured pace of development, and some of the most expensive and challenging elements – such as having the entire city built on top of a podium with a personal rapid transportation network underneath – were eliminated. Plans for power,

water, and waste technology demonstrations for commercial purposes have been largely disregarded due to regulatory challenges, as well as the large scale required for meaningful demonstrations. Likewise, the state of the regional clean-technology market, the undeveloped nature of the local research and innovation ecosystem, and the lack of local frameworks for attracting global companies made rapid and commercially viable development of a clean-technology cluster impossible within the timeframe initially planned for the city's development. Hence, Masdar City's development strategy has adjusted to reflect the reality of developing a new city with many simultaneous ambitions, some of which have taken decades to realize in other countries.

In fact, Masdar City's strategy today is built on a more incremental approach, focusing less on buildings and technology, and more on the establishment of a new model for city form, structure, and mobility. This necessary course correction is one that provides Masdar with the opportunity to avoid the fate of infamous 'eco-cities' such as Dongtan in China, which was full of visions for sustainability that could not ultimately be realized economically. It would seem that Masdar City is now moving toward triple bottom line sustainability, which is an essential aspect of future city design both regionally and globally. Therefore, the three lenses of environmental, economic, and social sustainability can be used to assess Masdar City's current trajectory and future evolution.

Environmental sustainability

Environmental sustainability remains at the heart of Masdar City's design. When benchmarked against comparable buildings in Abu Dhabi, the city's buildings are intended to yield a 40 per cent energy demand reduction, a 30 per cent interior water demand reduction, and a 15 per cent reduction in embodied carbon in construction materials. No potable water is used for exterior purposes in the city, and 50 per cent of operational waste and 70 per cent of construction waste is diverted from landfill. Rigorous building and city vehicle emissions standards are also core aspects of the city's environmental sustainability plan. In order to meet these sustainability targets, Masdar has evaluated both procurement and technology development options, with the intention of capturing financial returns from technology development partnerships in the domains of smart buildings, supply chain, transportation, ICT, lighting, and cooling. These domains are ones that promote partnership with companies seeking to engage Masdar City for technology demonstration, and hence are aligned with the city's overarching commercial strategy.

Economic sustainability

Masdar City's model for economic sustainability has improved significantly and is now based on a model in which Masdar acts as both real estate developer and master builder. As a real estate developer, Masdar leases land to third parties that must adhere to the development, design, and sustainability guidelines set forth by the City and aligned with Abu Dhabi's broader sustainability ambitions. Sustainability in Abu Dhabi's built environment is realized through the Estidama programme, an initiative developed and promoted by the Abu Dhabi Urban Planning Council (UPC). Similar to BREEAM (British Research Establishment Environmental Assessment Method) and LEED (Leadership in Energy and Environmental Design), the Estidama programme has a rating systems called Pearls, which covers buildings, villas, and neighbourhoods. Like LEED and BREEAM, Pearls is a point-based system that awards projects points for different credits that are grouped under a number of general categories; these are added together to give a final rating, which ranges from One to Five Pearls. It is expected that only a very small number of buildings in Abu Dhabi will achieve a Five Pearls rating as this requires a net positive contribution to the environment in terms of energy, water, and improving diversity and health of living systems. In Masdar City, all developed property must be at least 3 Pearls. This is perhaps a conservative standard given the city's desire for sustainability, but demand for sustainable development in Abu Dhabi must be proven before a more demanding requirement can be realistically imposed.

In its role of master builder, Masdar develops buildings according to projected demand, and owns these buildings. The Masdar Institute of Science and Technology campus and the soon to be completed 32,000 square metre Masdar headquarters building (a 4 Pearls building), are examples. Finally, Masdar builds to the demand of the government and private sector. Siemens' new headquarters building for the Middle East region in Masdar City is an example of this model. The building has been designed to optimize both its natural environment and carbon efficiency, to offer a sustainable and commercially viable solution. It meets the highest requirements in terms of architecture, energy efficiency, and equipment, with the objective of achieving a 45 per cent reduction in energy consumption (benchmarked against the internationally acknowledged ASHRAE standard) and a 50 per cent reduction in water consumption (compared to LEED baseline).

Social sustainability

Social sustainability in Masdar City, and cities in general, relates to understanding what people need from the places they live and work in, and in providing them with an enduring quality of life. For this reason, Masdar City's current development strategy is most intriguing with regard to its emphasis on social dynamics. Social dynamics in Masdar City's current development plan are tied to a structure predicated on distinct neighbourhoods linked by a network of mobility. This approach to city design comes from Masdar's relatively recent recognition that the building blocks of a city are, in fact, not large districts or downtown cores the size of Masdar City itself, but rather neighbourhoods. In the Masdar City concept, neighbourhoods are not just residential, they can also be working neighbourhoods, mixed-use neighbourhoods, and R&D neighbourhoods. As such, the Masdar City development plan is now organized into nine neighbourhoods with Masdar Institute as an R&D neighbourhood at the core. Mobility between these neighbourhoods, and outside the boundary of the city, is accomplished by pedestrian corridors, a group rapid transit corridor, and a light rail transit corridor, thus making multiple forms of sustainable transportation possible. Because the city continues to be designed for an optimum microclimate that takes advantage of passive design and natural cooling, walking through internal courtyards, urban squares, and parks is possible all year round. In fact, Masdar City has the opportunity to become a new model for urban mobility that integrates transportation, commerce, and social interaction while eliminating vehicle traffic, carbon emissions, and urban heat islands. Although some may argue that Masdar City is too small for its evolving concept of interconnected neighbourhoods to create a paradigm shift in urban design, it is a concept that reflects Masdar City's emphasis on replicable design and social sustainability.

'ENVIRONMENTAL SUSTAINABILITY REMAINS AT THE HEART OF MASDAR CITY'S DESIGN.'

Final thoughts

Today Masdar City calls itself the 'City of Possibilities'. This tagline is very fitting given its current trajectory and its long-term ambition to become a city that fully embodies environmental, economic, and social sustainability. Starting from a concept that seemed to many to be more of a showcase for architecture and technology than a model of sustainable development, Masdar City now has the opportunity to become a paradigm for sustainable cities both in the region and globally. The mandate for Masdar City's development has pivoted toward a complete package of sustainability with a comprehensive focus on economy, society, and the environment. Masdar now seeks to provide a city model that integrates sustainable urban design, future city technologies, as well as supportive social and commercial frameworks. This is a reflection of a more general pattern in the UAE, whereby aspirations for the establishment of a sustainable, knowledge-based economy are slowly becoming a reality through increasingly thoughtful investment in sectors where the country has or can establish a competitive advantage.

In the case of Masdar City, the idea of neighbourhoods linked by sustainable transportation is clearly replicable. Furthermore, the gradual development of these neighbourhoods allows Masdar City's design to be responsive to rapidly evolving technological and social trends – such as workplace automation, on-demand mobility, and social media – which will increasingly change the way people live, work, and interact in cities. Aligned with Masdar's ambitions for global impact, exportable knowledge can be generated and captured not only from the human and intellectual capital produced by Masdar Institute, but also from the companies attracted to Masdar City because of the Institute as well as the rest of the City's evolving ecosystem. However, Masdar City will only fulfil its ambition of becoming a model for future cities by maintaining a thoughtful course focused on brand development, partnerships, and its unique offering that is distinct from the rest of the massive real estate build out taking place in the UAE and elsewhere in Asia. If this course can be successfully navigated, Masdar City may ultimately achieve true sustainability and become a replicable model for sustainable cities of the future.