

Abu Dhabi to build the world's first zero carbon city

The United Arab Emirates is no stranger to grabbing the headlines when it comes to construction. From the world's tallest building to the biggest man-made island, its reputation for extravagance and excess is now being put to an eco-friendly use as it builds from scratch the world's first sustainable city. **Jonathan Andrews** reveals the ambitious plans for Masdar and asks whether such a zero carbon city can change the habits of one of the most oil rich nations on Earth.



Islamic-inspired garden spaces and piazzas are featured in the new city

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Sitting on the edge of Abu Dhabi's airport lies a fenced off six square kilometre area of scrubland. To the casual observer, there is little to indicate that this site could soon be the home to 50,000 people, 1,500 businesses and a high-tech university that will specialize in renewable energy technology. Buildings go up fast in the ever-changing skyline of Abu Dhabi, and by 2016 the government hopes that this USD 22 billion project will be the world's first zero carbon, zero waste, and car-free city that will be run entirely on renewable energy.

"Masdar city represents more than a real estate development: it aims to be a Silicon Valley for the clean technology age," says Khaled Awad, director of property development at the Masdar Initiative. "It will be a living, breathing community that will seek to develop sustainable solutions to the global energy and environmental challenges we face."

Masdar, literally meaning the source, has attracted high profile organizations that want to be associated with the phenomenal task of designing, building and running the eco-city. UK architecture firm, Foster and Partners, has designed Masdar and has employed traditional planning techniques used to build ancient Arab cities.

Gerard Evendon, senior partner at Foster and Partners, believes its one of the most important projects in the world at the moment. "It's addressing all the issues that we have to address in future design as architects and engineers can no longer carry on designing in a backward way. We have to seize the challenge and design buildings which are much lower in energy consumption and are sustainable."

Encased in a wall, the city will feature dense, low-rise buildings to create a compact community with narrow streets to help keep out the fierce desert sun, yet allow gentle breezes to flow through. All streets will be pedestrianized, and residents and workers will walk around a string of Islamic-inspired garden spaces and piazzas more commonly found in southern Italy. The entire city will be suspended on stilts rising six metres from the ground, so as to increase air circulation and to keep the city off the hot desert floor. It will further be split into three levels. Located on the middle level will be the functioning life of the city with shops, businesses and homes, much like any other city, except it will be completely car free.

One level above, residents can hop on any number of driverless personal rapid transport pods, which are metro cars that seat four people. Based on studies from European urban development agencies, a maximum walking distance has been set at 200 metres. Essential services will always be located within this distance from any point, including shops that will sell locally grown produce. Goods will also be transported this way.

Evendon, from Foster and Partners, says that it will be a fully integrated city complex. "We're not having a situation whereby we have 'oh that's the medical quarter over there and the entertainment over there'. What we are trying to do is say, 'Okay, we've got this community here and that one relates to another so what do they share?'"

The residential space within the city will be provided for those people who work there. As tenants are signed up, companies are allocated residential space for their employees. Photovoltaic panels will generate power for the city, while cooling will be provided via concentrated solar power. A large patch of land adjacent to the city has been given over to solar panels, where 70 percent of the 10 MW grid connected solar plant is complete – the largest in the Middle East and North Africa region. It is so far developing enough energy that developers believe it could power most of the construction work in the first building phase.

Roofs and shading over the streets will incorporate thinner film photovoltaic canopies. Although most of the panels and technology come from Chinese, German and US suppliers, the main goal for Abu Dhabi will be to move up the solar value chain, by becoming a solar industry hub in its own right.

Water will be provided through a dew and solar-powered desalination plant. Landscaping within the walls and crops grown outside the city, will be irrigated with grey water and treated waste water produced by the city's water treatment plant. As the city grows so too will the trees and natural environment, as wastewater will feed the gardens. An intelligent metering system will also allow any citizen to view how much energy, water and carbon he or she is consuming compared to the average citizen.

Overall the city will need about a quarter of the energy of a normal city of comparable size. The World Wildlife Fund (WWF) is another big name that is throwing its support behind the project. "This will quite literally kick-start a global revolution in renewables," says Eduardo





Personal rapid transport pods will ferry people around

PHOTO © MASDAR INITIATIVE



Dense, low-rise buildings help keep the desert sun at bay

PHOTO © MASDAR INITIATIVE



Gonçalvez, from WWF's programme One Planet Living, that is taking a hands-on role in the Masdar project. "The UAE is the only country in the world that has agreed to work with WWF to set targets for reducing its national carbon footprint."

Zero carbon: fact or fallacy?

Criticisms still abound though about Masdar's claim to be completely emission and carbon free. Businesses that do not meet the city's strict eco-friendly requirements will not be able to set up shop but will have to go somewhere outside the perimeter. Some foods will still need to be imported and although a light rail system will connect the city to the airport and the rest of Abu Dhabi, many will still have to drive to the city. Outside the city walls there will be giant car parks, leading many to dub it an eco-city theme park for day-trippers.

Gonçalvez from the WWF rebuts these criticisms and says the project needs to be looked at in the context of a range of initiatives being undertaken by Abu Dhabi and the UAE.

"Abu Dhabi, and the Masdar city project are working to lead the way in both the developed and developing world and put many governments, especially the G8 countries to shame," says Gonçalvez. "The G8 countries alone account for one

third of total human ecological footprint." Masdar will of course have an impact on the UAE's carbon footprint, as it will help Abu Dhabi fulfil its pledge to source seven percent of its domestic energy needs from renewables by the year 2020 – a major step for a country that is the world's fourth largest oil exporter.

While Masdar has the luxury of being financed by big petrodollars, many question whether a city such as this can be financed and built again in another part of the world.

"We realize that not everyone or every country in the world has the resources to build a city such as this," says Khaled Awad. "We must remember that the goal of the new city is to set new standards and develop new clean and sustainable technologies that can be transferred to other cities around the world."

Masdar officials refer to the technological development of computers, and that whilst less developed countries in the world cannot purchase the latest computer technology, industry development is making them ever cheaper, efficient and affordable for all.

Gerard Evendon from Foster and Partners concurs and sees the project as a Petri dish, that will in future years provide sustainable energy technologies that will be easily adaptable for all cities.

"For the first time all ideas and technologies can be brought together into a city context. That means we can test things that have never been really tested before," he says.

The city not only aims to be the world's greenest city, but will also be home to the Masdar Institute for Science and Technology (MIST), a partnership with the Massachusetts Institute of Technology (MIT), that aims to bring together some of the world's leading post-graduates to research and develop ideas for renewable energy. MIT faculty and staff will provide advice, scholarly assessment and assistance in connection with the establishment of MIST. It aims to open its doors to the first batch of postgraduate students by July this year. "MIST will feed the city with talent and innovative technologies that will enhance the economic development and promote new industries using renewable energy and resources in the emirate and the region," says Sultan Al Jaber, head of the Masdar Initiative.

Foreign partners

Reaping the economic windfall of this emerging market, Masdar's long-term aim is to leverage its early entry to become the authority of the sustainable movement. Whilst most of the construction will be financed by the Abu Dhabi Future



Located on the middle level of the three will be the functioning life of the city PHOTO © MASDAR INITIATIVE

Energy Company, Credit Suisse, has invested USD 100 million in the initiative's clean tech fund. Other sources of funds to cover running costs will be raised through the UN's carbon trading scheme. Since Masdar will perform better than any pollution regulations require, they will sell one million carbon credits to companies that do not meet local standards, raising approximately USD 15 million.

Masdar is also working with other partners such as Anglo-Australian mining company Rio Tinto and UK oil company BP which will work together on carbon-capture and storage schemes. Such partners not only allow Masdar to take advantage of foreign expertise but also to have its ideas independently scrutinized. GE has signed on as a partner, where it will build its Ecomagination Centre, by 2010. Here it will showcase its innovations and will house up to 100 technologists developing new sustainable water, energy and environmental systems.

GE's Middle East and Africa CEO and President, Nabil Habayeb, believes that the fact this is taking place in a country better known for oil consumption and exploitation speaks volumes.

"This is a part of the world where a few years ago if you were to talk about renewable energy in a meeting, it would end in a nanosecond,"

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Construction will be complete by 2016

PHOTO © MASDAR INITIATIVE

comments Habayeb. "How could you talk about renewable energy to a hydrocarbon-based economy? To see the transformation of Abu Dhabi, into that of leading the investment and development of a zero carbon emission city, and the technology that impacts the whole world, is phenomenal."

Other questions are being asked about whether or not this project can be built and attract tenants to undertake intensive research into renewable energies. The stampede into the renewable energy sector when oil hit USD 150 a barrel has become an amble now that the price has dropped considerably. Already, construction work on China's proposed zero-carbon city, Dongtan, has been postponed for two years.

Awad dismisses such concerns. "We are looking beyond the downturn. Nothing has been de-

layed and nothing has been postponed. We are in this for the long-term. We want to be in the energy business, not just the oil business and renewable energy must remain high on the agenda and continues to make absolute sense, even in difficult times such as these."

Likewise, Habayeb from GE is adamant: "Our plan is to go forward with what we have committed for Ecomagination and Masdar city. We haven't slowed down or revised our figures."

Last year *homo sapiens* turned into *homo urbanis* for the first time in human history, with the majority now living in cities. Between 2009 and 2050 the world's urban population will double from 3.2 billion to 6.5 billion. Gonçalves of the WWF says: "Masdar city is one way that is aiming to keep city living an option but one that doesn't drive us into deeper and more dangerous ecological debt." ▶



Aerial view of Masdar city once completed

PHOTO © MASDAR INITIATIVE

But will people be willing to check their liberties at the city gates of Masdar? Or will they prefer to live in the relative freedom outside the walls, with all the creature comforts that a country rich in oil can provide? Foster and Partners argue that their plans for Masdar provide people with more choice than ever before. “I think we just need to give people choice and freedom to make the decisions themselves as to how they want their bodies to react to the climate, rather than being sealed into an air-

conditioned building and dictated to about the environment they have to live in,” says Even-don. “Once we give the options back, people will realize the things that they’ve lost.”

Likewise, the Masdar Initiative argues that it will not be an ecological prison. “There will not be individual restrictions in place,” explains Awad. “For example – if you want to have a 20-minute shower, you still can. Our approach is about making people aware of their carbon impact, and it’s then up to them to change their behaviour.”



Khaled Awad

PHOTO © MASDAR INITIATIVE

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Gonçalvez from WWF says that whatever the economic situation, time is running out. “The bottom line is we need a global paradigm shift. We need to fundamentally change the way we – the human race – live, work and play. And we need to do it very quickly.” ♦