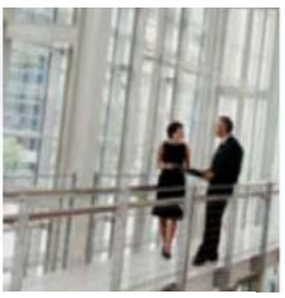

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WWF and Abu Dhabi's Masdar Initiative unveil plan for world's first carbon-neutral, waste-free, car-free city

"Masdar City" to be flagship of WWF One Planet Living Programme

Abu Dhabi, United Arab Emirates, 13 January 2008 - The WWF and Masdar, The Abu Dhabi Future Energy Company, today launched a "Sustainability Action Plan" to deliver the world's greenest city – Masdar City. Located near Abu Dhabi International Airport, Masdar City will be the world's first zero-carbon, zero-waste, car-free city, aiming to exceed the 10 sustainability principles of "One Planet Living™"– a global initiative launched by the Worldwide Fund for Nature and environmental consultancy BioRegional.

Masdar City's electricity will be generated by photovoltaic panels, while cooling will be provided via concentrated solar power. Water will be provided through a solar-powered desalination plant. Landscaping within the city and crops grown outside the city will be irrigated with grey water and treated waste water produced by the city's water treatment plant.

The city is part of the Masdar Initiative, Abu Dhabi's multi-faceted investment in the exploration, development and commercialisation of future energy sources and clean technology solutions. The six-square kilometre city, growing eventually to 1,500 businesses and 50,000 residents, will be home to international business and top minds in the field of sustainable and alternative energy.

A model of the Masdar City will be unveiled on January 21, at the World Future Energy Summit in Abu Dhabi. Ground breaks for the construction of the city in the first quarter of 2008.

Jean-Paul Jeanrenaud, Director of WWF International's One Planet Living initiative, said: "Today Abu Dhabi is embarking on a journey to become the global capital of the renewable energy revolution. Abu Dhabi is the first hydrocarbon-producing nation to have taken such a significant step towards sustainable living.

"Masdar is an example of the paradigm shift that is needed. The strategic vision of the Abu Dhabi government is a case study in global leadership. We hope that Masdar City will prove that sustainable living can be affordable and attractive in all aspects of human living – from businesses and manufacturing facilities to universities and private homes," Jeanreneaud continued.

Dr. Sultan Al Jaber, CEO of the Masdar Initiative, said: "Masdar City will question conventional patterns of urban development, and set new benchmarks for sustainability and environmentally friendly design – the students, faculty and businesses located in Masdar City will not only be able to witness innovation first-hand, but they will also participate in its development."

"We are pleased to be able to work with One Planet Living to make our vision a reality," he said.

Pooran Desai OBE, co-founder of BioRegional and Technical Director of the One Planet Living Communities programme, said Masdar would be the largest and the most advanced sustainable communities in the world.

"The vision of One Planet Living is a world where people everywhere can lead happy, healthy lives within their fair share of the Earth's resources. Masdar gives us a breathtaking insight into this positive, alternative future.

"In realising the goal of a sustainable future, Masdar is committed to surpassing the One Planet Living Program's 10 Guiding Principles, covering issues that range from how waste is dealt with to the energy performance of the buildings."

The One Planet Living programme is based on 10 unique principles of sustainability. Masdar City will meet and exceed each of these, as detailed below.

These targets are to be achieved by the time the Masdar City is completed and fully functioning in 2015.

One Planet Living principle Masdar Target

ZERO CARBON: 100 per cent of energy supplied by renewable energy – Photovoltaics, concentrated solar power, wind, waste to energy and other technologies

ZERO WASTE: 99 per cent diversion of waste from landfill (includes waste reduction measures, re-use of waste wherever possible, recycling, composting, waste to energy)

SUSTAINABLE TRANSPORT: Zero carbon emissions from transport within the city; implementati

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McGraw-Hill CONSTRUCTION Continuing Education

Model Behavior: Anticipating Great Design

Cutting-edge projects throughout the Middle East rely on a variety of simulation programs to inform design and predict building performance

December 2008

Josephine Minutillo

The Middle East is a land of extremes—economic, climatic, and cultural. When it comes to building construction, it is also a place for superlatives, with projects that are the biggest, the tallest, and the most expensive in the world. Added to that is a growing list of structures that promise to be among the most innovative in terms of design and energy performance. To determine the feasibility of these complex projects—many of which engage natural phenomena created by the wind, sun, and moon—architects are increasingly relying on building simulation programs, utilized both in-house and by consultants who are now being called on during the earliest stages of the design process.

Chicago-based Adrian Smith + Gordon Gill Architecture (AS+GG) and Environmental Systems Design (ESD) used a host of simulation programs to develop the design for their competition-winning Masdar Headquarters in Abu Dhabi's Masdar City, which is expected to be the world's first zero-carbon, zero-waste city fully powered by renewable energy. "When we started the competition, we knew that in order to meet Masdar's goals we needed to have an integrated practice approach, bringing the engineers in at the concept phase," explains AS+GG partner Robert Forest, AIA.

Eleven imposing, steel-and-glass-enclosed cones define the eight-story building. When completed by the end of 2010, the headquarters will be the world's first large-scale, mixed-use, positive-energy building, producing more energy than it consumes. Simple building orientation and shading studies were carried out by the architects using Ecotect, a software recently acquired by Autodesk. The three-dimensional architectural model was then transported into eQUEST, a sophisticated building-energy-use analysis tool initially developed as part of DOE-2, which allowed the engineers to optimize the mechanical and electrical systems, as well as the building envelope. According to Forest, "These programs are used to bring up the minutiae of energy performance so we can fine-tune different components of the building." By taking a section of the exterior wall, for instance, the designers are able to examine facade orientation and overhang size to study heat gain.

Continuing Education

Use the following learning objectives to focus your study while reading this month's Continuing Education article.

Learning Objectives - After reading this article, you will be able to:

1. Describe how different simulation software is used for predicting energy use and climate effects on buildings.
2. Discuss incorporating culturally important concepts into building design.
3. Explain why engineering consultants need to be brought in at the early stages of design.

The Masdar Headquarters in Masdar City, Abu Dhabi, UAE, will be the world's first large-scale, mixed-use, positive-energy building (above). The design consists of eleven glass-enclosed wind cones, some of which will have gardens and water features in the courtyards at their base (below).

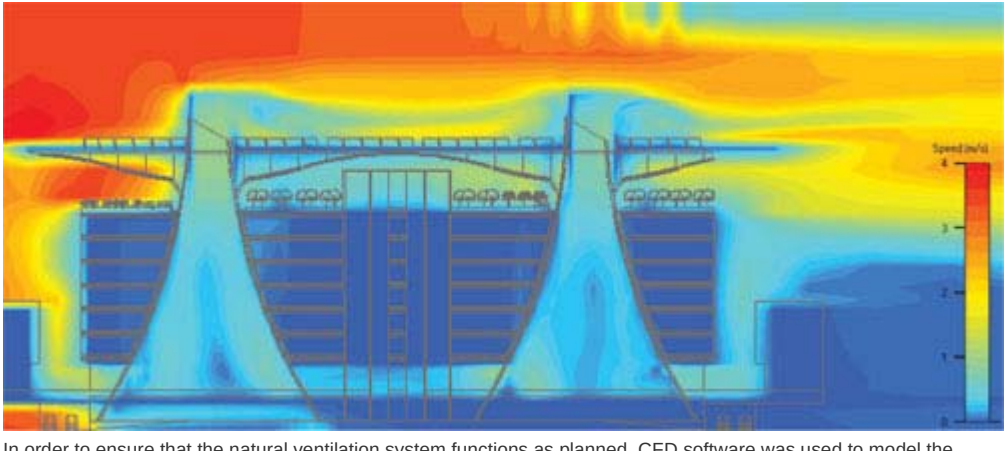
images courtesy Adrian Smith + Gordon Gill Architecture

In addition to providing structural support for the roof, the staggered cones bring daylight deep inside the 1.5-million-square-foot complex. More important, they cool the interiors by drawing warm air up and out of the building through their tips. Computational fluid dynamics (CFD), which utilizes numerical methods to simulate the interaction of fluids and gases within complex systems, was employed extensively on this project to ensure that the flow of air through these cones produces the greatest cooling effect.

"We looked to traditional Middle Eastern wind towers when designing the cones," Forest recalls. "At first, we were going on an intuitive reaction that they would work in terms of light and ventilation." To validate their assumptions, the team used FloVENT, a program that predicts 3D airflow, heat transfer, and contamination distribution in and around buildings. ESD did a simple model of the cones, including the courtyards created at their base, to get an initial understanding of conditions. "By doing such a model, we were able to pinpoint areas of air intake and airflow into the base of the cone," explains ESD's Mehdi Jalayerian. "For example, we analyzed the effects of repositioning the intake from the base of the cone to the side. We found that by putting it to the side, air swirls around in the cone and provides more uniform ventilation." CFD analysis was especially useful given the speed at which the project had to be developed. Follow-up testing was performed in wind-tunnel facilities, wait times for which can run up to a month.

The cone's design has similarities with traditional Arabic wind towers.

Image courtesy Adrian Smith + Gordon Gill Architecture



In order to ensure that the natural ventilation system functions as planned, CFD software was used to model the building geometry and surrounding wind patterns. Hot winds traveling at high velocities around and over the cone openings create low pressure areas, inducing airflow out of the cones. The cone's shape captures cool air moving in the opposite direction.

Image courtesy Adrian Smith + Gordon Gill Architecture