The Oasis

“The Oasis at Masdar was a marvel to behold. Not because it was a deep and lush forest in the heart of a modern city...nor because the structure was producing electricity and water for that city... It was a marvel because it gave us hope. Hope that it was now possible to create such a reality for our future.”

For centuries the image of an oasis has inspired the imagination of writers, poets and travellers. The image of a safe haven with a cool, lush and bountiful climate, formed in an otherwise impossible environment, gave people hope and a sense of possibility, and inspired travellers and settlers to take on the long difficult journey.

As 21st century travellers we face the same difficult journey ahead, with the constant realities of climate change and the unforeseeable future, we also seek new possibilities to assure our longevity and safety.

The Oasis seeks to do just that. It seeks to inspire the world and those who step into it about the beauty and power of renewable energy and new technologies, showcasing the complete transformation and creation of natural public spaces.

The structure challenges visitors’ assumptions about how we consider energy and resource generation and consumption. It shows how a slot of urban land can be turned into a lush and temperate natural space using the infinite energy available to us by the sun and the wind.

Just like how the natural oasis was shaped by the interplay of the sun, land and water transforming a hot and dry landscape into a cool and shaded, luscious haven, so is The Oasis a product of the environment that it is in. Instead of fighting the solar heat, extreme temperatures and the fast winds, it uses those very elements to create the soothing, temperate and green environment inside of it. The idea of such man-made haven’s is not new, as remnants of it remain all across the middle east, but the technology and longevity of this seemingly magical creation is.

Culture: Work, Learn, Play

It is true that no matter how far we develop in technology and policy, change cannot be possible unless we recognize and incorporate human culture. Therefore it only make sense for a land art generator that celebrates renewable energy to be first and foremost an immersive socio-cultural experience.

Staying true to this adage, The Oasis sits at the heart of Masdar as a fully immersive natural public space, while it generates and supplies electricity and water for the city in its underbelly. As a space for recreation and interaction, the space consists of green pathways throughout the entire compound with water features as well as paths for various recreational activities.

After recreation, education plays another central role to the cultural role of the Oasis. Visitors are introduced to various technologies at work as they stroll through the

luscious green space. Showcases of renewable technologies, as well as live data for the amount of clean water and energy produced for the city further include the public in the very processes that have created The Oasis. Lastly, rooms inside of The Oasis are allocated to host workshops and educational activities pertaining to sustainable research and development.

To further involve the creative and scientific class of the city and to contribute to Masdar as a true 21st century city, The Oasis features a green building dedicated to co-working, which will act as a hub for innovation and co-creation across the disciplines.

Design: A Celebration of Utility

The Oasis creates renewable energy technology as a medium of creative expression while also shaping itself to the very needs of this renewable energy, blurring the boundaries of form and function. As a nod to projects that have created a destination by celebrating utility, the oasis showcases the utility of tomorrow, working with subtlety and yielding to the elements. From the quiet solar/heat panels harnessing the immense energy of the sun on the round exterior of the building, to the unique shape of the building, formed to guide and harness the prevalent North West wind, the structure has aligned itself to create and house the incredible micro-climate inside.

Within The Oasis, human experience is the central focus. The vast park features an elevated walkway, an undulating landscape marked by lush greenery and trees, as well the central pond. Here we celebrate tomorrow and what the marriage of design, science and culture can create. It's also a homage to the traditional architecture of the region for which the sun and the wind have always played a pivotal role.

Science: The Natural Orchestra

For the Oasis to become a reality at Masdar city we needed three basic resources: water, electricity and refrigeration. However, the prospects of sourcing any of the three proved challenging if we were to follow conventional technologies. Purification of water and refrigeration both demanded immense electricity and a water source, while electricity production demanded refrigeration and water for cooling. Therefore, to answer these challenges, we decided to turn to the most abundant resources in Masdar: wind and sunlight. A very specific orchestration of existing technologies was required to create a self sustaining Oasis at the heart of Masdar city.

It must be noted here that through the specific configuration we have put together using time-tested technologies, the Oasis not only fulfills its own needs but also produces a considerable excess in pure drinking water as well as electricity to feed the Masdar grid.

HARVESTING THE SUNLIGHT : HEAT AND ELECTRICITY

In Abu Dhabi a massive amount of solar energy (1.3 kWh/m2) is absorbed by the land. Of this immense energy, solar panels have been only able to convert a fraction

of it into electricity (~0.2-0.4 kWh/m2). This means that the majority of the remaining energy (~0.9 kWh/m2) is simply absorbed by the earth and the panels as heat. Not only does this immense heat go unharvested, it also reduces the efficiency of the solar panels to half of their production capacity.

This challenge forced us to expand our research to source existing technologies that address this issue. The result was our utilization of solar panels that have a dual function: absorbing sunlight for creating electricity, while absorbing the heat for creating hot water. The winning point here is twofold: Firstly, these heat-absorbed solar panels perform at 1.5 times the efficiency of regular solar panels (thereby generating ~0.4 kWh/m2 of electric energy) generating abundant electricity for the Oasis. Secondly, the hot water by-product of this process becomes the essential resource for our second component - The Absorption Chiller - which produces our cold air.

HARVESTING THE WIND : REFRIGERATION AND HUMIDITY

The absorption chiller is the beating heart of the Oasis for creating cold air. For its function, the chiller needs the constant flow of two things: hot water and wind. As mentioned above, the hot water is readily available as a by-product of our solar panel cooling system. The wind as well, is abundantly available thanks to the geography of the region, as well as the unique design of the structure shaped to create the flow needed. Inside of the chiller, the cooling process provided by the capture and flow of the humid wind, yields to a constant condensation process, giving yield to over 8,288 Litres of pure water per hour.

Environmental Impact Summary

We have approached our environmental impact in the same way as the Estidama Pearl Building Rating System, which require the need for sustainability in the three fields of design, construction and operation. As explained in the previous sections, the design of Oasis has been completely functional, and aligned to meet its utility and energy needs. Design and function have merged together to harvest the naturally available solar and wind energy available bountifully around it. Furthermore, We have remained cognizant of the construction process of the building to remain as minimal in its environmental impact as possible. Firstly, the ingenuity of the shell structure used for the Oasis translates into a significant reduction in material for erecting a building of this size. Secondly is the material used for the inner structure of the Oasis; being home to the micro ecosystem of the park. This environment incorporates organic matter in its build, primarily consisting of rammed earth and wood to create the diverse natural terrain along the vegetation and water structures. Last but not least, with its capabilities in energy production and storage, as well as its efficiency in energy consumption, the ongoing operation the building has been designed to meet the high standards set by the Estidama Pearl Building Rating System for public buildings. The structure is capable of completely producing and storing its energy and water needs, while managing to produce an excess of 18,000,000 Litres in clean water and 19,000MWh of energy for the city grid annually.

Essentials

Nameplate capacity: 13,484 kWp

Annual Energy Generated: 19,686,348 kWh

Lithium Battery Power Reservoir: 50 Megawatt

AC/DC Inverter: 10 mWh

Technology used in design: Naked Energy VirtuPVT Solar Panels, Ebara Hotwater Absorption Chillers

Annual Water Produced: 18,151,051 Liters

Order-of-magnitude conceptual cost estimate: $61,347,400

Estimated cost per watt installed: $5

Dimensions: 65m wide end (38 narrow end) x 258m x 44m (W * L * H)

Primary materials used in design: Low-Carbon Concrete, Rammed Earth, Stainless steel, Wood and other organic matters.