NATIONAL GEOGRAPHIC Daily News

High-Tech Energy "Oasis" to Bloom in the Desert?

An illustration of the planned Sahara Forest Project test facility.

Image courtesy Sahara Forest Project

Christine Dell'Amore

National Geographic News

Published January 22, 2010

A renewable-energy "oasis" slated to be built in 2010 may serve as a proving ground for new technologies designed to bring green living to the desert.

The planned research center is part of the Sahara Forest Project—but that doesn't mean it'll be built in Africa. Sahara means "desert" in Arabic, and the center is meant to be a small-scale version of massive green complexes that project managers hope to build in deserts around the globe.

(See pictures of the planned Sahara Forest Project reseach center.)

Experts are now examining arid sites in Australia, the U.S., the Middle East, and Africa that could support the test facility.

"The Sahara Forest Project is a holistic approach for creation of local jobs, food, water, and energy, utilizing relatively simple solutions mimicking design and principles from nature," said Frederic Hauge, founder and president of the Norwegian environmental nonprofit the Bellona Foundation.

For instance, special greenhouses would use hot desert air and seawater make fresh water for growing crops, solar energy would be collected to generate power, and algae pools would offer a renewable and easily transportable fuel supply.

In addition, planting trees near the complex would trap atmospheric greenhouse gases such as carbon dioxide while restoring any natural forest cover that has been lost to drought and timber harvesting.

(Related: "Africa-wide 'Great Green Wall' to Halt Sahara's Spread?")

"From my perspective as an environmentalist, this could be a game changer in how we produce biomass for food and energy, and how we're going to provide fresh water for the future," Hauge said. "I've never been so engaged and fascinated as I am now."

But not all experts are as enthusiastic about the project.

In terms of the reforestation plans, "trying to grow trees in the Sahara desert is not the most appropriate approach," said Patrick Gonzalez, a forest ecologist at the University of California, Berkeley's Center for Forestry. After all, even though it was literally green in the past, the Sahara was never heavily forested. (See an interactive Sahara map.)

"I can imagine that this scheme and type of technology in limited cases might work in certain areas like Dubai, where they're used to making palm-shaped islands and 160-story-tall buildings," Gonzalez said.

If the goal is restoring a desert's natural ecosystem, however, "it would be more effective, but less flashy, to work with local people on community-based natural-resource management."

From Mirage to Reality

The Bellona Foundation's Hauge counters that replanting trees—even in a desert—is an uncontroversial measure for stopping desertification and combating climate change.

In fact, tree-planting is one of the strategies that the foundation and its partners have carefully studied as part of their efforts to make the Sahara Forest Project more than a mirage.

The project's members are conducting feasibility studies in several countries, the initial results of which were presented in December 2009 at the Copenhagen climate conference.

And the testing center slated for imminent construction should provide even more data on how well the project's suite of green technologies might work in real life.

So-called seawater greenhouses, for example, are basic and cheap, making them a cornerstone of the project.

Hot desert air going into a greenhouse is first cooled and humidified by seawater. This humid air nourishes crops growing inside the greenhouse, then passes through an evaporator, where sun-

heated seawater flows. When the now warm humid air meets a series of tubes containing cool seawater, fresh water condenses as droplets on the outsides of the tubes and can be collected.

The process mimics a natural process: Sun-heated seawater evaporates, cools to form clouds, and then falls as precipitation.

Only 10 to 15 percent of the humid air gets condensed into fresh water. The rest flows outside to water surrounding trees, so that the "greenhouse will create a large area around it that will be become green," according to Hauge.

The center will also test the use of concentrated solar power, which uses mirrors to focus sunlight on water pipes and boilers. The concentrated light creates superheated steam inside the pipes that can power conventional steam turbines, generating electricity.

Any power not used to run the complex can be sent to local communities.

Likewise, biomass-based fuel from the center's photobioreactors would be easy to export, Hauge said.

The ponds would cultivate algae through photosynthesis in open, shallow saltwater pools. The algae's fatty oils could then be harvested as energy-rich biofuel.

Lab-grown algae have been shown to generate up to 30 times more oil per acre than other plants used to make biofuels, according to the National Renewable Energy Laboratory. And farming algae in pools doesn't take up valuable agricultural land, Hauge said.

(Related: "Five Last-Ditch Schemes to Avert Warming Disaster.")

Local People Key to Success

Hauge said he has gotten "fantastic response" from some governments, and he hopes to build the first full-scale facility within the next couple years.

UC Berkeley's Gonzalez noted that in Africa, at least, there are already programs across the continent that are battling green issues in the desert by giving local people rights to existing natural resources.

Such programs have proven effective at sustainable-resource management and ecosystem restoration—without complex technological fixes.

The Sahara Forest Project's Hauge agrees that local community involvement is key, noting that the project would rely on local people to maintain the complexes.

"Working in developing countries, you need technology that is easy for local people" to operate, he said. "We are very aware of how this is approached from the local communities."