

“Next Generation” 1st prize 2008 Africa Middle East

Dune anti-desertification architecture, Sokoto, Nigeria

Project data

Type of project Architecture (research/development)
Estimated start of construction Not applicable

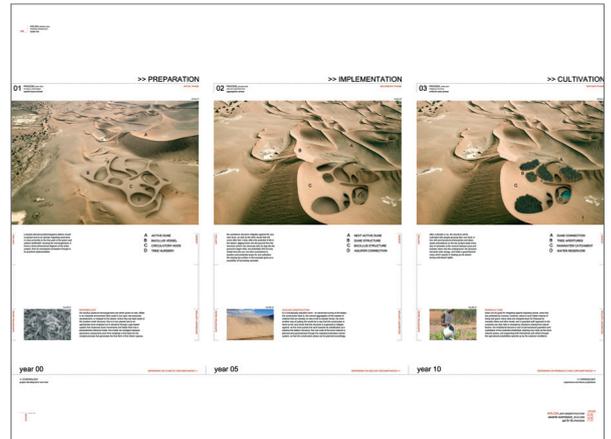
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A process drawing showing the structure over time.

Comment of the Holcim Awards jury Africa Middle East

This outstanding and absolutely novel project proposes an architectural complement to the “Anti-desertification Green-wall Sahara” initiative of the Sahel-states. It envisages facilitating the creation of oases for human habitation through the application of cutting-edge bio-technology: micro-organisms whose metabolic processes bind loose sand into sandstone to create structurally stable dune-like formations which not only stabilize the sand dunes but also provide shelter for people. The possibility of semi-natural dwellings in complement to the ongoing tree-belt initiative would significantly enhance the adaptive capabilities of those now faced with migration to escape the escalating environmental crises of the encroaching desert. Although the project is highly speculative, the jury commended it due its visionary concept and sound scientific background.



Final render of the scheme as seen from a helicopter cockpit.

Project description by author

This project investigates adaptive (as opposed to mitigatory) strategies leading to the creation of a climate-conscious architecture that responds to the extreme environments of tomorrow’s globally-warmed world. Highly speculative yet buildable, the scheme aims to find innovative solutions to combat desertification in the Sahel region of Africa, where sand dunes are currently moving southward at a breathtaking pace of around 600m per year, ruining the land and making it impossible for the inhabitants of this area to make a living or even stay in their homes.

The forced migration of desertification refugees is perhaps more threatening in Nigeria than anywhere else. With a population of over 140 million people, Nigeria is the most populous country in Africa, with serious desertification issues throughout its northern states. It was Nigeria’s former president, Olusegun Obasanjo, who initiated the anti-desertification Green Wall Sahara initiative in 2005. This pan-African scheme seeks to plant a shelterbelt across the continent, from Mauritania in the west to Djibouti in the east, in an attempt to stop the dunes from migrating. The trees are being planted right now.

An architectural response to this campaign would be to go beyond the mere planting of a mitigatory shelterbelt. Habitable spaces can be created in close proximity to the trees. By cutting through the sand dunes and digging down to find water and shade, an artificial oasis can be formed underground. The sand is solidified using bacillus pasteurii, a microorganism with which professor Jason DeJong has turned sand into sandstone in a mere 1,400 minutes. This technology of organically cementing networks of sand dunes into habitable barriers that stop the desert from spreading has never been proposed before, but on hearing about this project, the professor was enthusiastic: “I do think the application you are talking about is possible”.

I’m proposing anti-desertification structures made out of the desert itself, sand-stopping devices made of sand: a poetic proposal that simultaneously works in a sustainable way with local materials and assets. Special emphasis has been put on finding a solution that is high-tech in result but low-tech in application and construction, with the economical scenario being hard to pin down as this method is virgin territory. It is recognized that poor people are highly vulnerable to the effects of weather, as drought can cause famine while good rains can cause drops in crop prices. The architecture presented here could form a stable base from which to fight back against both effects.

Relevance to target issues by author

Quantum change and transferability

Traditional anti-desertification methods include the planting of trees and cactuses, the cultivation of grasses and shrubs, and the construction of sand-catching fences and walls. More ambitious projects have ventured into the development of agriculture and livestock, water conservation, soil management, forestry, sustainable energy, improved land use, wildlife protection, poverty alleviation, and so on. This project, apart from utilizing a completely new way of turning sand into sandstone, is the fact that it incorporates all of the above. Inside the dunes, we can take care of our plants and animals, find water and shade, help the soil, care for the trees, and so on. It’s an environmental project that provides an innovation for other architects/builders to copy time and time again.

Ethical standards and social equity

Desertification is a major threat on all continents, affecting 110 countries and some 70% of the world’s agricultural drylands. Nowhere is the problem more serious than in Africa. Desertification seriously threatens the livelihoods of the millions of people in Africa who depend on the land for most of their needs. The ethical implications of this are the very starting point for this project. The question: “Can we challenge desertification in a new way?” This project seeks to do three things: make it possible for desertification refugees to remain in their home area, offer better spaces for social interactions, and, finally, create an inverse separation barrier: a bridge between countries sharing the desert condition.

Ecological quality and energy conservation

The proposal is based on permacultural feedback loops. Water is an example: from rainwater swales through to the digging of tunnels down to aquifers. The latter picks up on the history of the Garamantes tribe, a Saharan Berber-speaking people who used an elaborate underground irrigation system in the Sahara desert, where they were a local power between 500 BC and 500 AD.

Economic performance and compatibility

The actual cost of implementing the bacillus pasteurii method of construction has not yet been calculated, as no one has ever tried anything like this. The best way of assessing the structure’s economic performance might be to meditate on the alternative: land owners no longer being able to make a living off their grounds. Here’s architecture with the power to turn an economy.

Contextual and aesthetic impact

The curvilinearity of the dunescape is what truly makes a desert a desert. Basing the aesthetic strategy on tafoni, a kind of cavernous rock formation that exist on the site, the impact is surreal and continuous – the solidified dune mitigates against the migrating dunes, whilst offering living spaces and affectual points of interaction where events can occur outside of the scripted program.



Sun, Desertification.



Desertification: an overview.



The Green Wall Sahara.