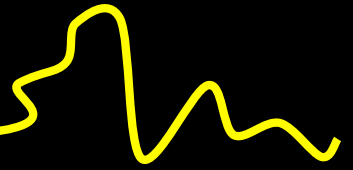


# SYSTEMAGINATION

The ZERI Foundation's Monthly Newsletter



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## ZERI, NIGERIA: HISTORY AND FUTURE

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*Gunter Pauli, left, with Professor A. S. Sambo after signing the agreement between the ZERI Foundation and ATBU. Professor G. A. Babaji, the present Vice Chancellor, ATBU, is positioned between them in the picture, and the author is extreme right.*

### History

The ZERI concept was first brought to the attention of the Abubakar Tafawa Balewa University (ATBU), Bauchi, by Abubakar Nuhu Koko who was a Nigerian fellow at the United Nations University Institute of Advanced Studies (UNU/IAS) in 1996. He thought the ZERI concept was a revolutionary one and wanted his country to look in the ZERI direction. The vice chancellor, at the time, Professor A. S. Sambo (now the director-general of Nigeria's Energy Commission) and I took one look at the concept and agreed with Nuhu Koko.

Through Nuhu Koko's facilitation, UNU/IAS and ATBU quickly reached an agreement on collaboration on the ZERI concept. Then a team of four, led by the director of UNU/IAS, at the time, Professor T. Della Senta, visited Nigeria to flag off an international conference on Zero Emissions in Abuja, Nigeria's capital city. In 1997, the University established a Center to house the ZERI collaboration. Given the unique relationship between the collaboration and the linkage with the then

Federal Environmental Protection Agency (FEPA) in the country, it was thought appropriate for both linkages to operate under the same administrative umbrella and the Center was called the FEPA/ZERI Research Center.

I was named the founding director. Three other academic staff members were seconded to the Center at inception, and later, a research assistant was also hired. The support staff consisted of five members. When FEPA metamorphosed into the Federal Ministry of Environment (FMEnv), the name of the Center changed to the FMEnv/ZERI Research Center. The Center is run by a director, with the assistance of a deputy director and a 10-man committee. A board, chaired by the vice chancellor, oversees the activities of the Center.



*Gunter Pauli delivering a public lecture on "Upsizing"*

In 1998, Professor Gravitis, who was a member of the UNU/IAS visiting team, brought the impending ZERI conference in Namibia to my attention, and the University funded my participation. At this conference, I met Gunter Pauli, listened to him and immediately knew I was looking at the ZERI founder.

To educate our team on the Zero Emissions program, the ZERI Foundation sent Anders Karlsson to Nigeria in 1999, and a training workshop for ten was organized at the FMEnv/ZERI Center. This was followed in 2001 by an international training course in

ZERI that Gunter Pauli ran at Awalah Hotel, Bauchi, in 2001.

During this visit, Gunter also gave a public lecture at the University on "Upsizing: Zero Emissions." At the closing ceremony, the participants were awarded their certificates, and a cooperative collaboration between the University and the Foundation had begun. The vice chancellor, Professor A. S. Sambo, signed for the University and Gunter Pauli signed for the ZERI Foundation. To follow up quickly on Gunter Pauli's visit, the Center sent two participants to one of the mushroom cultivation training programs run by Margaret Tagwira under the aegis of the ZERI Foundation, and another participant to a ZERI training workshop at the Songhai Center ([www.songhai.org](http://www.songhai.org)) in Porto Novo.

Both ATBU and the ZERI Foundation were to develop the FMEV/ZERI Center into a research station for innovative socio-economic development. In a rare move to eliminate the digital divide, ATBU was to serve as the computer hub for the ZERI Foundation, once a fast line was installed for the Center. The ZERI Foundation donated its SGI server, along with three windmills, to the Center and had Isa Jalo operating from the Center as the webmaster for ZERI from 2002 to early 2004.

## Activities

The Center has undertaken a number of studies. Some of these include appropriate conditions in Bauchi for mushroom cultures, slant and spawn developments, and cultivation on corn cobs, corn stalks, cowpea shells, sawdust, etc. Also the fiber utilization by the mycelia of *Auricularia auricula* and *Pleurotus ostreatus* were studied. Additionally, some wild mushrooms were extracted with appropriate solvents and screened for antimicrobial activity.



Left: *Auricularia auricula* and Right: a plastic digester

wild mushrooms showed *Staphylococcus aureus*, a common clinical isolate that is prevalent and fast becoming resistant to antibiotics. The phytochemical studies of some of these and the structural elucidation of the active components continue to hold the attention of the Center through collaborative efforts with the various departments that include biological sciences, chemistry, and agriculture production programs.

Following a short course in Australia on the construction and management of plastic biodigesters, the Center, through the efforts of Kenneth Yongabi, started to process the waste from university animals through these cheap-and-easy-to-maintain digesters. The resulting slurry was found to be better fertilizer than inorganic fertilizers in terms of farm yield. The Center's goal is to bottle the resulting gas. This technology can then be taken to rural areas, where it will save the thinning forest and improve agricultural yields.

The Center organized a 4-week long training course on the construction and management of plastic biodigesters in 2004. Other training programs organized by the Center include simple sand filtration techniques for well water and medicinal plants in Nigeria's savanna region. Below is a snap shot of other activities the Center has been involved in:

- Partial baseline studies of the Gongola basin - phase 1; 1999
- Participation in the reviews of the following EIA reports through the vice chancellor, Professor A.S. Sambo; Capital dredging of approach channel by MOBIL at Offshore Bonny, Chevron proposed Gbokoda and Dibi Oil Field development projects, proposed Kolmani-Ax Well drilling project by SNEPCO, and the proposed Otumera Field development project by SPDC
- World Environment Day (June 5) symposium; 1998
- Studies on the impacts of agrochemicals in some selected local government areas in Bauchi State; 2000
- Studies on the effluents discharged from agro small and medium scale enterprises (SMEs) in some selected local government areas of Bauchi State; 2000
- Formulation of antifungal/antibacterial lotions, creams, and soap products from indigenous plants with active extracts

The potency of some of the extracts from the

- Participation in the review of Nigeria agenda 21 document, and also the document on environment policy for the country
- Participation as guides (Isa, Aisha, and Michael) in the ZERI Pavilion, EXPO 2000 in Hannover
- Analysis of the effluents of the petroleum products depots in the northeast region of the country
- Participation in the on-site inspection of the impacts of the drilling activities in the Gongola basin

### Future

Four years ago, the university established the Environmental Management Technology Department offering undergraduate and graduate programs. “Upsizing; the Road to Zero Emissions,” is a reading text for some of these programs, and it is anticipated that a Master’s degree program in ZERI could be designed, along the same line as those in Italy and Columbia.

The Center would also like to complete the baseline study of the entire Gongola basin - an area that is likely going to see intense mining of kaolin, limestone, gypsum, tin and possibly natural gas in the near future. In line with some of the Center’s earlier studies, the inventory, culture and the cultivation of indigenous mushrooms from the waste in agriculture and agro-allied industry are likely to remain areas of interest for the Center. The same is true for the biodigester work, especially given the Center’s interest in developing a 500-hectare integrated biomass system (IBS) farm on the out-of-town university massive 4,800 ha

land, about 20 kilometers north of Bauchi. The composting of municipal solid waste, the control of erosion, the production of soaps, creams and lotions with components of plant extracts that have antifungal/antibacterial properties, and the remediation of oil spills through microbial breakdown of hydrocarbons are some of the other areas that hold some attraction for the Center. There is also the massive challenge posed by water hyacinth in the country’s coastal waters.

### Conclusion

The activities of the FMEnv/ZERI Research Center are enhanced by the six Schools of Agriculture, Engineering, Environmental Science, Management Technology, Science, and Technology Education that make up the Abubakar Tafawa Balewa University, which is owned by the Nigerian government. The FMEnv/ZERI Center has done, and continues to do, its work through the mobilization of the entire faculty of the University. The Center needs and seeks funding, capacity-building and sharing, appropriate technologies, and collaboration in getting away from the linear model of production to the cyclical and more natural one.

*\*Michael O. Agho was a 2-term director of the FMEnv/ZERI Center from 1999 to 2004 (in line with the university’s 2-term maximum tenure for directors). He is presently the director of academic planning.*

## The Masdar Initiative

By: Dick White

In December, I had an extraordinary opportunity to consult on a fabulous ZERI-related project in Abu Dhabi, the Masdar Initiative (<http://masdaruae.com>).

Masdar (“the source” in Arabic) is to be a new 600 hectare (1500 acre) walled city adjacent to the airport outside the city of Abu Dhabi in the United Arab Emirates (UAE). Conceived as a high-tech business incubator with its own MIT-affiliated graduate school, Masdar is to embody the vision of zero emissions.

The context for this initiative is the explosive economic development of the UAE, of which Abu Dhabi is the largest geographically. Situated along the southernmost coast of the Arabian/Persian Gulf, to the east of central Saudi Arabia, Abu Dhabi has abundant oil and natural gas deposits and is making massive investments



Photos from [www.masdaruae.com/text/broc-coll.aspx](http://www.masdaruae.com/text/broc-coll.aspx) they are artist renditions of what the development will look like.

## Calendar of Events:

Gunter Pauli as a speaker at the UNEP Global Ministerial Environment Forum in Monaco  
.....February 20 - 22

ZERI Germany to host a conference in Ahlen, Germany  
....March 31 & April 1

Gunter Pauli as Keynote speaker at the Ninth Conference of the Parties to the Convention on Biological Diversity (CBD COP - 9) in Bonn, Germany  
.....May 19 to 30

Nature's 100 Best launch at IUCN World Conservation Congress in Barcelona, Spain  
.....October 5 - 14

*What's happening with local ZERI projects?!*

Send Laura and email so your important dates can also be added to this calendar!

both at home and abroad to diversify its economy. Included in \$100 billion of infrastructure investment planned for the next decade, Masdar will be a high-tech, mixed-use city with a resident and commuter population exceeding 50,000 at full build-out. Masdar is a first step toward defining a zero-emissions alternative to conventional urban design and construction practices.

The footprint of the city will be square. To minimize solar heating and maximize natural cooling, its diagonals will point roughly toward the cardinal points, and its internal corridors will align to capture the prevailing winds - northwesterly humid sea breezes in the scorching summer (with temperatures often exceeding 45° C [113° F]) and easterly desert winds in the mild winter. The city will admit no cars, only emergency vehicles. Although there will be parking areas built into the city walls, primary access is meant to occur via a light rail line that will run along a slightly sinuous path along the north-south diagonal. Walking and bicycling along the open corridors will provide relatively easy access to every facility. Below street level there will be an on-demand "personal rapid transit" system designed to reach within about 150 m of every point in the city. The same system will serve in reverse for deliveries to offices, shops, and residences.



Electrical power will come from photovoltaic arrays integrated into buildings and corridor canopies, and also on an adjacent site. Fresh water will come from solar powered desalination plants. Heat for domestic hot water and for driving innovative air conditioning systems will come from solar-thermal arrays and possibly from waste-to-energy conversion and/or a geothermal borehole. Ground-source cooling (the

"termite mound" system) may or may not be effective, owing to a high (and saline) water table and its relatively high temperature (27° C [80° F] at 10 m depth). Transportation fuel will come from an adjacent biofuel plantation. Given constraints on energy and water supply, efficiency will be the overarching priority, coupled with zero-waste design to recapture material and energy flows. Further challenges will be to minimize the initial carbon footprint involved in materials and construction, primarily by using materials available locally or regionally, and to plan in advance for end-of-life recycling. Meeting these challenges will make Masdar a model of sustainability for an increasingly urbanized world.

To engage leading architectural firms in this effort, Masdar has conducted a competition for the design of the landmark headquarters building, which will be sited near the geographical center of the city and will be its tallest structure (no more than 40 m, owing to its proximity to the airport, but also to minimize energy use by elevators).

The competition was the source of my consulting opportunity, as part of an on-site technical review team assembled in Abu Dhabi for four intense days in December. We winnowed the initial proposals, forwarded the best to the off-site architectural jurors, and collated evaluations for selection by the client, the Abu Dhabi Future Energy Company, which announced the four finalists on January 24.

I served as a zero-emissions/sustainability expert to complement the architectural, engineering, and city-planning expertise of the other four team members. Some of the documents for Masdar clearly reflect Gunter Pauli's intellectual influence and I am sure that I owe my participation to his recommendation.

The Masdar headquarters design will be a landmark for global sustainability, but much more work remains to fulfill the Masdar dream, much less to replicate it around the world. I hope to continue to play a role in both efforts, and I hope that similar opportunities reach many of you.

For more information, please visit:

[www.zeri.org](http://www.zeri.org)

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