Greener than Oz

The design firm HOK and a major car parts manufacturer attempt to build an industrial city of 2 million from scratch, in India, based entirely on "nature's principles."

It was an unlikely conference room, a barren hill 150 kilometers southeast of Mumbai. But that's where the three partners met: financiers from Bharat Forge, the world's largest chassis components manufacturer; planners from HOK, a major international design firm; and a band of biologists from the **Biomimicry Guild**, a consulting group that looks to biological engineering for design solutions.

Together these three teams had planned to transform the surrounding landscape, a thirsty wasteland, into one of the world's greenest cities, a thriving industrial metropolis of some 2 million people, designed to perform just like the ecosystem on which its being built — a city greener than Oz, so to speak.

For inspiration, the biologists examined the rocky landscape, the scrub grass and the desiccated thorn bushes for clues on how the genius of life had come to thrive in this forbidding environment.

"The genius has left this place," they concluded. Then everyone laughed and went on planning recalled Dhaval Barbhaya, HOK's lead planner.

The project, however, is no joke. Called Khed Special Economic Zone, the city is being heavily marketed as the first urban area to be designed from scratch according to the principles of biomimicry — a concept that many corporations have used for product development, and that HOK has applied to its architecture. The credibility and coffers of large and respectable organizations, not to mention the Indian government, rest on the shoulders of the eight-person Biomimicry Guild guiding the way.

Pune, India-based Bharat Forge, which casts steel parts at plants in six countries for clients ranging from BMW to Caterpillar, has committed a undisclosed fortune to building the city (Bharat has already purchased 1,700 out of 4,500 hectares for the site). It has convinced the Indian government to exempt goods produced in Khed from taxes for its first 10 years.

HOK too is banking on the collaboration. Last year the St. Louis-based firm — known for designing the National Air and Space Museum in Washington D.C., and the first LEED certified airport terminal, at Logan in Boston — announced a formal partnership with the Biomimicry Guild. Ever since HOK has flown the biologists across the world, from Colorado to Hong Kong, to consult on sites.

The biologist-architect partnership was a no-brainer. Given the urgency of environmental challenges such as climate change, architects everywhere are hunting for design solutions to reduce waste and pollution. Meanwhile, the guild and its founder, biomimicry evangelist **Janine Benyus**, have hatched one of the hottest international design movements based on the idea that these problems were all solved eons ago, by nature.

At biomimicry's core is the abiding belief that after millions of years of evolution ***nature knows best***. "We come from a place where we feel that the natural world knows more than we do," says Taryn Mead, the guild's head biologist working on Khed. Natural ecosystems enhance the environment, not just sustain it. As Benyus says, "Life creates the conditions for life."

Designers are hoping cities will behave in the same way.

"The fact that nature's solutions are beautiful, but beautiful based on function is a reason that our relationship has value," says **Mary Ann Lazarus**, director of sustainable design at HOK. "Can you get both in one package? We're like, 'Wow, we've got to find out.'"

Indeed, the current zeitgeist for looking to nature as a teacher is so strong that last year Harvard established its own biomimicry institute, the Wyss Institute for Biologically Inspired Engineering, endowed with $125 million. Also in 2008, three other institutions — Ontario College of Art & Design, Arizona State University, and Iberoamericana University in Mexico City — teamed up

with the guild's nonprofit wing to offer minors on the subject.

Long before Leonardo da Vinci drew his flying wings in the 16th century, man has been copying nature. Corporations are newer to the game, but no less enthusiastic. In 2005, Mercedes shaped its concept car, the Bionic, like a boxfish; the strange, lumpy profile cuts drag and saves on fuel. In Japan, designers used a kingfisher's conical beak as inspiration for the aerodynamic nose of high-speed trains. And this year, a mechanical engineering team at Carnegie Mellon moved closer to perfecting an adhesive tape based on the tiny hairs on gecko's feet. The tape is not only dry, but removable and reusable.

But until now, no one has been ambitious enough to build something as complex and huge as a city based on nature.

"This is really uncharted territory for us," says Mead. According the plan, Khed will cover an area about the size of Manhattan.

Long before they were logged, the rocky hills of Khed were a dry deciduous forest, an important ecological designation because the planners hope to make the city behave like one. "We're looking to reach the metrics and performance standards of the forest." Just as the forest recycles all its waste, produces its own energy and sequesters carbon dioxide rather than spewing it, Mead hopes Khed will too.

That's a tall order. After all, Bharat plans to manufacture and export metal products, most probably car parts, which can be a dirty and energy intensive business, and certainly not anything a forest would produce. "With today's technology and what we need to jumpstart the project, it might not happen at first," says Barbhaya.

Instead HOK envisions a ramp-up. Wind and solar power will contribute only five percent of energy at first, but by setting aside space for wind and solar farms, it hopes the city will gradually become energy independent within 50 years. Similar infrastructure is being built to one day create water and waste neutrality as well.

HOK is using biomimicry at other Indian sites as well. In Lavasa, it is imitating the forest canopy by using cascading building roofs to catch rainwater and stem erosion. It's also exploring ways of storing the water in networked building foundations, much like tree roots. "When we told this to our engineers they looked like deer in headlights. Obviously, the solution is not as literal as we might think," says Barbhaya.

At Khed, HOK is loading the city with strategically placed catch basins, check dams, and living roofs to collect the rains for irrigating farms in the valley below the hills. They're also planning to paint the office and apartment towers with skins of photovoltaic cells, so that buildings act as solar panels and every ounce of energy is wrung from the arid environment.

Bharat has scheduled the first bulldozers to arrive in early 2010, but as of yet the city plan looks more like a general concept than a detailed blueprint. How Khed will recycle its industrial waste or cap its emissions is a big question mark. How — or whether — the biomimics' ideals will survive Khed's actual construction remains to be seen.

Some already believe the project rings of greenwashing: "It is a red flag that they'd make car parts," says Richard Register, author and founder of EcoCity Builders. "To cloak them in green is contemptible from the eco-city point of view. The velvet glove on an iron fist comes to mind."

Mead counters, "The project is going to move on with or without us. But we've been given a rare opportunity to influence it in a way that could help humans be a better-adapted species on the planet. We have to try."

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