

An Indian city is a 'living lab' for cutting emissions

NET ZERO FROM AI

The community, which began construction in 2008 and is being developed in phases, aims to not only slash its planet-warming emissions to zero but also to provide a road map for communities facing the pressures of more extreme weather. As cities around the world grapple with rebuilding after disasters, or meeting the needs of an influx of people, Palava hopes to provide a model for adapting to a climate-transformed world.

"Our testing, we try to focus on resilience and decarbonization," said Abdullah, Lodha's head of sustainability. "Palava really is a living lab."

India, experts say, is an ideal place for piloting a net-zero-energy city, which meets all of its energy needs with renewables. The country of more than 1.4 billion people is one of the world's fastest-growing economies, and its leaders have pledged to achieve net-zero emissions by 2070.

"A lot of the increase in energy consumption and carbon emissions are slotted to come from the developing world," said Sameer Kwatra, senior director of the India program at the Natural Resources Defense Council, an environmental group. "India's carbon emissions haven't peaked yet, while those of many developed [nations] are either plateaued or expected to decline, so the big opportunity to do things differently, environmentally speaking, is in developing countries."

In places like India, planning for life in a warming world is critical, Kwatra said, especially because developers and governments "have the opportunity to do things right the first time."

Creating and maintaining a sustainable smart city from scratch is complicated. Palava's developers have had much more leeway than typical governments, establishing their own management system to handle functions such as utilities, wastewater treatment and policing.

But building a city in isolation still comes with challenges, according to Shaishav Dharia, Lodha's CEO of townships, including higher costs for residents and the need to develop a transit system that connects to surrounding areas.

In the decade of experimentation, Dharia said, "we learned, we made mistakes, some things worked even better than we expected."

'A living lab'

The development's orderly clusters of blocky, pale apartment buildings rise high above the villages outside its boundaries — a collection of shantytowns scattered along streets crowded with noxious traffic and roadside vendors hawking produce, meat, snacks and housewares.

Life for the tens of thousands of people living in those modern-looking towers is vastly different than for those living outside.

Inside the gates of Palava's "Phase II" development — which one day could house more than 270,000 people — solar panels are a common sight. In addition to the city's wind-cooling features, its buildings are designed to reduce how much heat seeps in.

Residents stroll through densely vegetated parks or down spacious, tree-lined sidewalks. Cars and buses trundle by quietly along wide roads — a stark contrast to the incessant honking heard on many of India's grid-locked streets.

To reduce the need for cars, Palava's architects designed the community to be a "5-10-15" city, an established approach for walkable urban areas. For residents, daily essentials are made to be available within a five-minute walk from their homes; things they need every several days are within a 10-minute walk; and what they may use within a week or month is no more than 20 minutes away.

"The 5-10-15 planning principle was actually one of the fundamental principles for planning the city," said Sonal Bhide, the development's lead architect. "You're not using any transportation."

Minakshi Kumari, who moved to Palava several years ago from the nearby city of Kalyan, walks every day.

The 37-year-old takes her two



PHOTOS BY ATUL LOKE, FOR THE WASHINGTON POST



children to school on foot, sometimes allowing her 14-year-old daughter to walk alone. She routinely walks to the grocery store or outside the gate to buy produce from roadside vendors. In the evenings, she and her husband amble through the park nestled in the middle of their apartment complex.

"There was no proper place to walk [in Kalyan]," Kumari said, adding that in Palava, "the air is refreshing. There's no pollution, no honking from too many vehicles in the street."

Like many residents in Palava's high-rises, Kumari rarely turns on the four air conditioning units in her three-bedroom apartment. She prefers to leave her windows and balcony door open to let in the breeze.

Keeping buildings cool with minimal energy is a priority for Palava's developers, who have continued to try different strategies since construction began.

Early apartments were built with smaller windows to reduce the amount of heat that could enter, Abdullah said. But when residents complained about the window size, he said, the develop-

CLOCKWISE FROM TOP: Palava City was designed to be walkable, with tree-lined streets and daily needs located within a five-minute stroll from homes. Developers paid attention to the windows of apartment buildings, experimenting with different designs to help block heat and keep units cooler. Minakshi Kumari on the balcony of her family's apartment; even though the weather can be muggy, Kumari rarely uses air conditioning, she says.

ers responded by constructing apartments with larger windows set farther back into the building. This design provides shade and cuts the amount of direct heat hitting the glass. More recently, Abdullah said, they've been experimenting with glass treatments such as films that can be applied to windows to keep heat out.

On a sunny June day, the interior of a newly constructed unit with treated windows is noticeably cooler than the outdoors, even with the air conditioning shut off.

But window design is just one way the community saves energy. Palava has cut residential energy use through a combination of approaches, including installing solar-powered water heaters on buildings and efficient air conditioners inside.

Around 30,000 five-star ACs — rated as the most efficient — are installed in the city's Phase II development. Some empty units are serving as testing sites for next-generation air conditioners that could slash energy use and emissions even further.

If residents allow it, the devel-



opers hope to install sensors that will provide more insights into energy use and ways to make improvements.

"Without data ... we can only speculate," Abdullah said.

The city is also engineered to cope with extreme weather.

Many of the development's public green spaces are situated to buffer against floodwaters. One major park features a bioswale, a grassy channel that helps control stormwater's velocity to prevent flooding. Rainwater is collected and stored in two quarries in case of shortages.

The community also has its own wastewater plants, and is able to treat and reuse all of its graywater — what drains from showers, tubs and sinks, as well as from washing machines — and blackwater, which comes from toilets.

Operating a net-zero city

The windowless room hums with electricity. Eight screens covering one wall play CCTV footage, displaying more than a dozen different views of the city. Several staffers hunker down behind computers.

While the room looks like any standard security office, it is the hub that keeps the community running — responsible not only for ensuring the safety and security of its residents, but also for overseeing its electricity, water, public transportation and waste management.

Dharia described managing a city without the formal powers of a government as "the most challenging thing," and the difficulties are likely to only grow as Palava continues to expand toward its goal of housing 2 million people.

On the other hand, building and operating the community without the oversight of local government has been critical to making progress toward the city's sustainability goals, he said.

"If the government got involved, there would probably be a lot of rules and restrictions that would come in," Dharia said.

Instead, the Lodha Group created the Palava City Management Association to run the development. Inside the command center, staff can monitor more than two dozen water meters installed around the township to track residents' and businesses' water use.

The company has shared some of that data with residents, Abdullah said, to encourage water conservation.

While the goal is to become largely self-sufficient, the fledgling development still enjoys some government support. The city gets power from the Maharashtra State electricity utility,

since only about 10 percent of the electricity used in common spaces comes from solar panels. And it relies on the local government to manage external roads, buses and trains to help connect the city to neighboring areas. The development operates an internal bus system and offers subsidized paid shuttles to nearby train stations, but some residents say it can take more than an hour to commute to work.

Without more roads and improved transit outside the development, "Palava cannot exist," Dharia said.

The future of cities

Lodha touts the township as a model for the future of cities, but acknowledges that it built and created a sustainable community under unique circumstances.

"Saying 'We'll make a city' still seems crazy," Abdullah said.

Replicating this approach elsewhere could be challenging, said Kwatra, NRDC's India expert.

"Not every country or every region would have the luxury to have major new development," he said. "It becomes a balancing act between starting from a scratch and developing something innovative but also wanting to have access to major commercial centers."

Life in this futuristic development can also come at a greater cost. Apartments in Palava typically start at about 5 million rupees, equivalent to about \$58,000, according to Lodha. Last year, the estimated gross national income per capita in India was 208,633 rupees, or just over \$2,400.

Still, the city's builders maintain that many of the elements can be incorporated around the world. For example, local governments could purchase energy-efficient appliances in bulk to install in people's homes.

"Suppose you're doing a hundred things here, definitely 50 of them can be applied in any existing city depending on the context," Abdullah said. "Obviously all hundred cannot be, because this is a clean-slate development."

Kwatra said he is hopeful that Palava and other projects like it will succeed, in part because other cities can also integrate walkability, renewable energy and energy efficiency into their plans.

"It could be a blueprint for many other similar developments in India," he said.

Stepping outside into a Palava courtyard full of trees on a muggy June day, Abdullah glanced skyward. A gentle breeze rustled the leaves as birds hidden in the dense canopy chirped.

"You don't hear bird sounds in Mumbai," he said.



A temple in Palava City, which is being built in stages. Its goal is a population of 2 million people.