THE EXTRAORDINARY BENEFITS OF A HOUSE MADE OF MUD

By Peter Schwartzstein

Photographs by Moises Saman

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The walls of the 19th-century Grand Mosque of Bobo Dioulasso are more than six feet thick, protecting worshippers from the heat. Such thick mud brick slowly absorbs the heat of the day and then releases it as the night cools.

On a mid-May morning in the village of Koumi, Burkina Faso, Sanon Mousa has nearly finished annual maintenance on his three-room house. He replaced termite-ridden roof supports with freshly cut beams and reinforced the heat-defying mud walls, some of which are a yard thick and more than a hundred years old. After replenishing the roof thatch and sacrificing a goat to the memory of his ancestors, all that remains is applying layers of rainproofing to the exterior.

“The mud will keep us cool. The motor oil, clay, and cow dung will keep us dry,” Mousa says as we tour his living space, which is a good 25 degrees cooler than outside. “We’ve perfected this.”

Mousa, a 50-something retired school librarian with a somber demeanor, is proud of his house. That doesn’t mean living in it is his first choice, though. In recent years he’s watched his wealthier neighbors in this verdant strip of the country’s southwest rebuild their homes in concrete. He has smarted at what he sees as a symbol of his relative poverty. Despite his considerable debt and consecutive failed harvests of the crops he relies on to pad his pension, status and safety are tempting him to borrow money and abandon his mud home. When we met, two brothers in the village had recently been killed in their sleep when a mud wall collapsed on them.

The mud-brick walls of the Grand Mosque of Bobo-Dioulasso are waterproofed every year with shea butter. But mud often can't hold up to the intense rains climate change brings.

On the outskirts of Bobo-Dioulasso, Burkina Faso's second largest city, workers have manually carved a half-mile-long sand quarry out of the soft, red earth. Many dozens of truckloads of sand a day feed the country's booming cement plants.

Inside a crumbling mud meetinghouse, Mousa sits to the side of the village chief. Sanu, who goes by only one name, is furious. He has mandated mud construction in the village center in a bid to preserve the old ways, but fewer and fewer residents are following his instructions—including his own sons. "This is our heritage," Sanu says. "For thousands of years these houses gave us a good life. Why would we change when we most need them?

"I guess this is modernity," he adds. "Maybe we can't fight it anymore."

Mud versus concrete

Across Africa's Sahel region, there are thousands of villages like Koumi—and in the dozens I've visited in several countries, the use of concrete is increasing. As living standards rise and access to concrete expands, some of the world's hottest, poorest landscapes are rapidly morphing from brown to cinder block gray.

But abandoning traditional materials and the construction techniques that underpin their uses is anything but a sign of progress. Or so says a growing coterie of architects, community leaders, and government officials. Particularly not now, when climate change is making already hot regions even hotter, and concrete is fueling some of that warming. The manufacture of cement, a key ingredient of concrete, accounts for around 8 percent of global carbon dioxide emissions. Proponents of traditional building techniques are adamant that climate-battered communities need more, not fewer, homes, schools, and civic buildings made in the traditional way.

"The reality is that cement construction is simply sexy," says Francis Kéré, a Burkina Faso–born architect and globally renowned advocate of ecosensitive architecture. "But it's bad sex. It is not producing comfort."

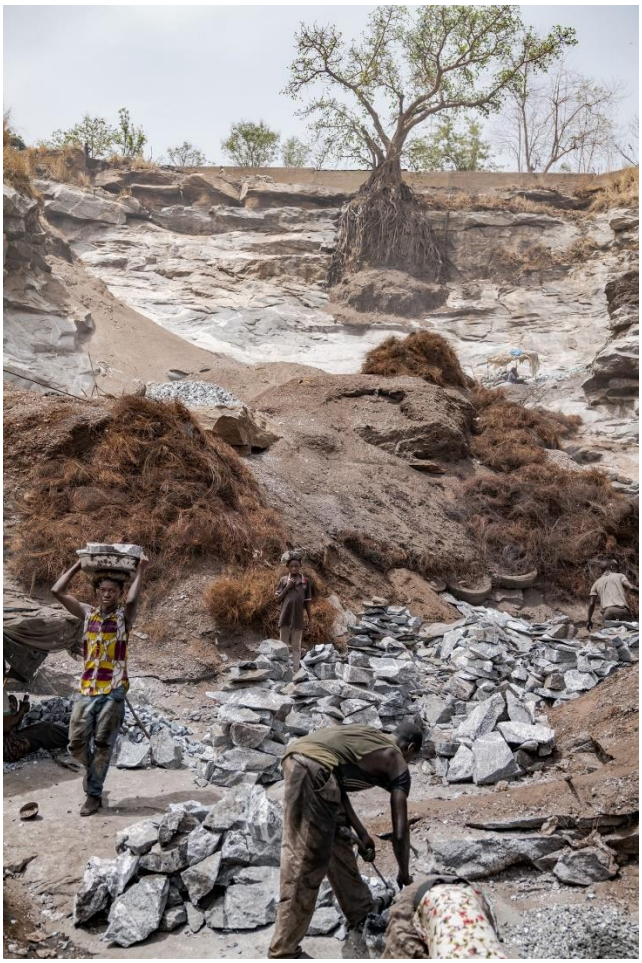
Mud walls, when built thick enough, can absorb and store a lot of heat, which then dissipates as outside temperatures cool in the evening. By contrast, thin concrete cinder blocks, with their hollow recesses, allow heat to pass through freely, rapidly warming interiors.

At a quarry in Pissy, on the western edge of Ouagadougou, Burkina Faso, men, women, and children mine granite to be made into concrete and gravel. Because of high demand for concrete, this quarry is still open despite competition from nearby mechanized ones.

Architects like Kéré are motivated in part by a desire to preserve heritage and identity. For all mud's recent association with poverty and backwardness, bricks made from the material can produce spectacular, globally significant architecture, such as Timbuktu's city center in Mali and Burkina Faso's Grand Mosque of Bobo-Dioulasso.

Countries with impressive but largely lost traditions of mud construction, including Saudi Arabia and the United Arab Emirates, also are trying to replicate the aesthetics and cooling features of traditional architecture, incorporating wind tunnels, building orientation, and use of shade. They appear less interested in the construction materials that were once used. "Our forefathers built things with whatever they had, and maybe if they had had a certain type of modern composite panel 500 years ago, they'd have used it," says Chris Wan, head of design management in Masdar, a pioneering sustainability-oriented city in Abu Dhabi. "It's about adapting traditional materials, traditional designs. We also build whatever's best within our means."

But mud-brick revivalists have a grander ambition as well, particularly in Africa. On a continent that accounts for just 4 percent of global emissions yet is suffering much of the worst climate-related fallout, they're trying to assume ownership of some of the solutions, even as world powers struggle to take meaningful action. In beating the heat,



Rock from the Pissy quarry is used to form the foundations of new houses, exemplifying a move away from traditional mud structures.

Workers at the quarry endure extreme heat and noxious fumes from burning tires as they carry heavy loads on their heads up the steep slopes. Some say they work there because they want to be able to afford concrete houses.

these architects suggest, homegrown, nature-based traditions could be every bit as important as foreign technology and expertise.

“We have chosen artifice. We have chosen to detach ourselves from our origins,” says Salima Naji, an award-winning architect. Naji champions mud construction in Morocco, which has aggressively turned its back on the material in recent decades, even though the country boasts one of the richest collections of earth architecture in the world. “We have done this because we have forgotten the extraordinary benefits of these buildings in the heat. But we must remember, because we need it now more than ever,” Naji says.

Workers cool off during their break at a residential building site on the outskirts of Marrakech. The Moroccan city has embraced concrete in its construction boom.

A refuge for the sweaty

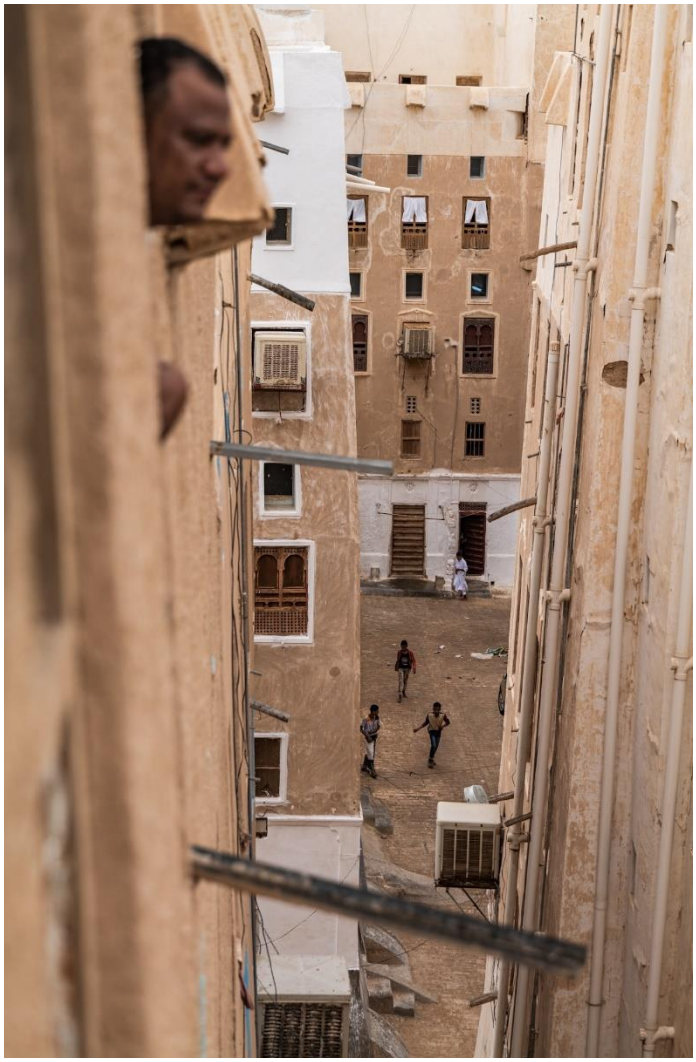
Crisscrossing Burkina Faso by car provides an illustration of mud's many perks. It's at least 113 degrees Fahrenheit in the shade by the time I arrive in the northern town of Kaya but well under 86 degrees inside architect Clara Sawadogo's latest design. The vaulted earth ceiling and stone-mud walls of the half-finished clinic cocoon the cool. Angled toward the prevailing north winds and surrounded by lush, shady greenery, the site is already enticing enough for dozing stray dogs.

Sawadogo is young, environmentally savvy, and part of a global movement to repopularize mud. She's got plenty of talking points. The material is essentially free, or at least locally available for a fraction of the cost of concrete, which requires several ingredients that, in Burkina Faso's case, are mostly imported. At the adobe pits that dot the outskirts of many of the larger villages, teams of laborers lever mud from the ground; compress it into rectangular, cookie cutter-like fittings; then sell each air-dried brick for 40 West African francs, about 10 U.S. cents.

"People tell me: It's the 21st century. Stop using mud," Sawadogo says, gesturing at the clinic. "But look at this. What's not modern about this?"

Mud construction contributes little to global warming. And concrete tends to be a gateway, once people can afford it, to another fossil-fuel-guzzling invention: air-conditioning. Worldwide, both the electricity and the coolants required by air-conditioning are growing sources of greenhouse gas emissions.

The Yemeni city of Shibam was designed with the scorching desert heat in mind. Nicknamed Manhattan of the Desert, its towering earthen buildings of various heights provide shadow. The white walls reflect direct sunlight and prevent heat from accumulating.



Shibam, which has about 7,000 inhabitants, is known for its mud-brick high-rises.

The walls of Shibam date from the 16th century; the city is considered a shining example of urban planning using tall buildings.

The greatest selling point of mud in Burkina Faso, where temperatures seldom dip much below 90 degrees, is that it makes the heat tolerable, even without air-conditioning. Most of Africa is on track for more than two degrees Celsius (3.6°F) of warming by late this century, a figure that masks even more dramatic temperature increases in parts of the continent.

In Boromo, roughly a three-hour drive southwest of the capital, Ouagadougou, Ilboudou Abdallah has recently rebuilt his part-concrete, sheet-metal-roofed house entirely in mud. “I can’t tell you what a joy it is being able to spend time inside the house now without suffering,” he says. The Nubian Vault Association, an international NGO, helped construct the home, one of more than 600 private houses it built in Burkina Faso in 2020.

The organization’s vaulted model requires neither metal roofs, which magnify heat in both concrete and mud houses, nor wood. That’s vital in a country losing up to 600,000 acres of woodland a year to deforestation, according to forestry officials, some of it for roof supports.

In the Royal Court of Tiébélé, a commune along the Ghanaian border where most residents have long since turned to concrete, some appear to regret ever having abandoned their mud homes.

“They see the comfort that they said no to before,” says Bayeridiena Abdou, a farmer who lives inside the local chief’s mud-only compound and has witnessed clandestine nocturnal returns to the exiles’ crumbling old houses. “They’re sneaking back.”

Doctors in four medical facilities I visited report a roughly fivefold increase in heat-related admissions and deaths over the past decade. Some of them suspect that a disproportionate number of these patients rebuilt in concrete but lacked the means to artificially cool their new houses.

At the Morija clinic in Kaya, a place to the north of Ouagadougou, workers craft a curved “Nubian vault” structure, designed to keep interiors cool. The earthen building will be Burkina Faso’s largest of its kind.

Workers at a quarry in Houndé, Burkina Faso, hammer laterite stone bricks from the solid ground. Mud bricks must be shaped before drying, but laterite can be extracted in rectangles. Both traditional building materials create much cooler structures than concrete, are cheaper, and require less energy to produce.

On a sizzling hot day in midsummer, the town of Léo is still—except for the local clinic. Rambunctious children chase one another among its shaded courtyards. Their parents rest beneath the surrounding trees. Even newly arrived patients, among them a man who’s just been pried from a car wreck, marvel at the naturally cool wards. Francis Kéré, designer of these buildings, is pleased but unsurprised at the effect.

“We’ve learned that it’s not just about the materials. It’s not about concrete necessarily being bad,” he says. “It’s what you do with them. This is what it can look like when you spend the time to make a proper clay structure.”

Big names near and far seem convinced by his reasoning. In recent years Kéré has designed a new national assembly building in Benin that’s nearly complete. A “symbol for the nation,” he says, modeled on a palaver tree. Another one he created for Burkina Faso has yet to get off the ground. In March 2022 he became the first African architect to win the Pritzker Prize, the most prestigious award in architecture.

Dangerous to live in?

Mud-brick buildings, for all their seemingly magical cooling powers, have at least one major drawback.

Until the late 1990s, the historic *ksar,* or fortified village, of Bounou in southern Morocco trilled with the sound of more than a hundred families. But its rammed-earth walls began to collapse, and a falling gatehouse badly injured a teenage boy, shaking residents' faith in the ksar's structural integrity. Tales of even worse disasters elsewhere—some fatal—reinforced that fear. Gradually, Legnaoui Bil Eid and his family found themselves almost alone. Now, without the critical mass of residents needed to maintain the historical crenellated defenses, the ksar is crumbling at record pace, becoming an even riskier habitat.

"People are scared, and you can understand why," says Bil Eid, an agricultural laborer who earns extra income roping together palm-frond fences to keep encroaching desert sands at bay. "Sometimes the walls just fall down. You could die."

In one of climate change's many bitter ironies, the same warming that has bolstered mud's importance against heat is also triggering more extreme weather events, which imperil mud structures. Despite frequently resurfacing his home's exterior walls, Bil Eid says, the downpours these days are far too strong to keep the interior dry, no matter how much protective layering he adds. He too is thinking of relocating.

At the Burkina Institute of Technology in Koudougou, designed by celebrated Burkinabe architect Francis Kéré and completed in 2020, poured clay forms the massive walls. A facade of eucalyptus wood creates shade. Above each classroom, a vent allows hot air to escape.

In Telouet, in the Atlas Mountains between Bounou, in the Sahara, and Marrakech, those fiercer rains have combined with the impact of centuries of deforestation to fuel devastating flash floods through the denuded valleys. Most years, at least a few locals die. Those who remain have noted that it's concrete houses, not those made of the traditional mixed mud and stone, that appear to weather the torrents. Some of the abandonment of traditional materials may simply be a function of changing tastes.

In his lush, beautifully maintained garden in Marrakech's leafy northern periphery, Mohamed Amine Kabbaj, one of the country's leading architects, regrets some of the aesthetic changes that have come with the exodus. But he says it's only natural that people would favor concrete. Most traditional mud structures permit only small windows that let in minimal light, and most of them require regular maintenance of the kind that time-pressed or leisure-seeking families prefer to avoid. "These kinds of designs might be exotic if you come from London or Paris for one or two days," he says. "But if you're given a choice, you'll prefer to live somewhere else."

As much of Morocco has shifted from communal to more individualistic lifestyles, and as incomes have increased enough for people to afford AC, mud houses—and their reliance on the collective to maintain and often build them—do appear increasingly out of step with modernity. Deeper environmental and economic forces, though, frequently leave little choice. In the countryside, drought and desertification are hobbling agriculture, the dominant rural profession. That loss of viable livelihoods is driving people into the cities. Some villages have lost up to half their inhabitants to urban areas in recent years. It's all contributing to a situation where many fearful and displaced villagers have also ended up unhappily living in concrete.

"You need to understand how much I miss the cool of my old house. Few of us wanted this," says Driss Mataoui, who migrated from a mountain village to an impoverished Marrakech neighborhood 30 years ago. "But life demanded that I move to the city, and city life is not good for mud."

Urbanization presents a particular challenge for proponents of traditional materials and building techniques. Although mud has historically been deployed in dense urban settings, as with Yemen's centuries-old skyscrapers, architects fear for its place in cities of the sort that are swelling across Africa. The helter-skelter, unplanned nature of those booming metropolises doesn't always allow for the effective use of wind direction, airflow, and other natural cooling devices. For their part, insurance companies and municipalities remain unconvinced of mud's safety, so they frequently legislate against its use. Even obtaining traditional materials in urban settings can be surprisingly tricky.

"Where are you going to get mud to build at scale close to here?" asks Kabbaj. "You have to go kilometers away."

Salima Naji, a Moroccan architect and anthropologist, works with traditional construction materials and methods to preserve villages and communal centers in the country. She restored the Id Issa Granary in Amtoudi (seen here), which protected wheat and other forms of wealth.

Staying cool is vital in the Anti Atlas mountains of southern Morocco, where it's so hot that even the crops require shade.

Assailed by some of the same debilitating heat as their Sahelian neighbors to the south, and with air-conditioning still beyond many people's means, the likes of Salima Naji aren't admitting defeat yet. She has noticed more interest in mud architecture among villagers across Morocco, many of whom grasp its tourism potential.

Naji and her peers highlight the strong environmental imperative to rein in, or at least reform, concrete production in Morocco, where developers have robbed entire beaches of sand for use in construction. Elsewhere, in countries like Vietnam and Bangladesh, developers source much of their sand from riverbeds, which fuels soil subsidence and more intense erosion and flooding.

But reviving a tradition when it's already lost its grip on the public imagination is a formidable task. People have grown accustomed to building houses as and when their finances allow, something that mud construction, fragile until completion, doesn't permit. In some places, concrete access has expanded so dramatically and knowledge of mud has dropped so precipitously that the more modern material may be cheaper. Most important, climate and other struggles continue to eviscerate the social and natural environment in which this kind of construction was embedded. And that could be key. Can traditional architecture thrive when so much that buttressed it can't?

"This is all connected to society. You cannot disconnect it from everything that is going on around us," Naji acknowledges. "But still we push ahead. If you have just one, two, three of these [buildings], it's not enough. We're trying to create a snowball effect to normalize it again. We need people to see this."

Francis Kéré is in a reflective mood when I call. Each of the past few rainy seasons has been more destructive than the last, obliterating hundreds of mud-brick buildings across Burkina Faso, including a school, which collapsed on a classroom of children, and part of the celebrated Grand Mosque of Bobo-Dioulasso. The subsequent bad press has only reinforced the clamor for concrete, no matter the cost.

But Kéré's phone is ringing off the hook with requests for work, and he's bullish about mud's prospects. "It's a matter of time, it's a matter of belief, it's a matter of political will. It's a fight, and we're not looking left and right. I just push on," he says. "There's a lot of accumulated knowledge now. In 10 years, you're going to be surprised by our success."

Kéré and other mud advocates have been hard at work trying to rehabilitate the material's image. They're finding ways to protect mud buildings from downpours—by adding broader, metal canopy roofs that project more than three feet from the walls, for example, or mixing small portions of cement into the mud bricks to fortify them.

Just making mud bricks more available can help. In an industrial park outside the Burkinabe capital, Mahamoudou Zi's workers cut, condense, and sell thousands of standard-size compressed-earth bricks—providing the reliable supply and ease of construction that contribute to the success of concrete. "I remember how cool my grandfather's house was," Zi says. "I wanted to make it simpler for others to replicate this experience."

Through a rigorous emphasis on not cutting corners with a material that is unforgiving of shoddy construction, the mud architects hope to limit the building collapses that are damning them all by association. At her construction site in Kaya, Clara Sawadogo says she has had to be so exacting in erecting the vaulted roof that 15 of her original 25 masons quit, citing the difficulty of the work.

The United Arab Emirates has an impressive but largely lost tradition of mud construction. For the Louvre Abu Dhabi, architect Jean Nouvel's design was inspired by moucharaby latticework screens, which protect interiors from direct sunlight and provide natural ventilation. This massive moucharaby creates what's been called a rain of light over the museum.

More than anything, though, Kéré wonders if, after being fed a steady diet of half-truths about mud's dangers and concrete's promise, wary citizens simply need more everyday examples of what well-built mud architecture can offer. Around Koudougou, 60 miles west of Ouagadougou, he has tried to create something of a showcase at a secondary school, Lycée Schorge, and at the Burkina Institute of Technology, a technical college. Teachers at the schools say that the hundreds of students can concentrate better—under the multilayered and overhanging roofs, between compressed-earth-brick walls, and surrounded by floor-to-ceiling windows.

To one 18-year-old computer science student, who gave his name as Nataniel and who's never lived in a home with electricity, let alone cooling, it's almost as if these places are air-conditioned.

"We were told mud was bad," he says. "We were told we needed to work to escape this. But I would be happy to live in something like this."

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