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Architecture

Beyond the mud hut: the return of raw-earth architecture

Why the oldest and most eco-friendly of building materials is making a comeback



The seven-storey adobe 'high-rises' of the 16th-century walled city of Shibam, in Yemen © Alamy

Louis Wustemann MARCH 20 2020

Jean Dethier believes that rich nations suffer from “collective amnesia” about the value of raw earth. The Belgian architect and former adviser for architectural exhibitions at the Pompidou Centre in Paris argues that though mud was the world’s dominant building material for 10 millennia, we have ignored it for the past 100 years.

The walls of all our houses and public buildings may be made with ingredients extracted from the ground, but these are mixed with chemicals and baked at thousands of degrees to make bricks or cement, and often transported hundreds of miles.

Dethier has long championed building with earth straight from the ground — mixed with water and shaped into blocks and air dried or simply built up in layers on walls — as an abundant, free and environmentally friendly construction material.

His latest attempt to correct our mass memory lapse about its value is a book, *The Art of Earth Architecture*, which surveys the history of cob, adobe, rammed earth and other forms of soil construction.

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towering crenellated fortifications of ancient Babylon and Uzbekistan.

It is far from simply a record of lost or ruined treasures. There are the glowing ochre earth walls of the Alhambra in Spain, standing proud after 700 years, and the seven-storey adobe proto high-rises of the 16th-century walled city of Shibam in Yemen. Shibam, described as “[the Manhattan of the desert](#)” by travel writer Freya Stark, is still home to 7,000 people.

Dethier describes the book as a “manifesto” for a return to earth building, which was common in northern Europe in the 19th century. There are thousands of rammed-earth houses, built in the 1800s, in the Auvergne-Rhône-Alpes region of southern France and cob homes in Ireland and the West Country of England, but they are often hiding in plain sight, disguised by plaster rendering.



A rammed-earth residence in Scottsdale, Arizona, by Jones Studio © Timothy Hursley Photography

Why did raw earth fall out of favour? Dethier thinks the soil’s very ubiquity worked against it, since that denied anyone an interest in exploiting it commercially. “I describe it as an ‘acapitalist’ material,” he says. “Unlike concrete, it has no industry lobby to promote it.”

I wanted it to have an archeological feel, like it had been carved out of the hillside almost

Cassion Castle

Earth construction also suffers from an image problem, calling to many people’s minds lopsided mud huts and rural poverty rather than Shibam’s soaring flats. Even Hassan Fathy, the Egyptian architect who fused vernacular and modern styles to build settlements in adobe in the middle of the

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But Dethier sees grounds for optimism. The last third of his book is given over to 100 examples of contemporary raw-earth buildings, including shopping centres, offices and libraries as well as striking [Modernist houses](#) from Austria to the US.

He points to starchitects Herzog and de Meuron, designers of London's Tate Modern complex, who used rammed earth for the walls of a herb-processing factory in Switzerland, and developer Quartus's plans for 58,000 sq m of homes, shops and offices on a 12-acre site in Ivry-sur-Seine, a suburb of Paris.

The buildings will be constructed of rammed soil excavated from tunnel extensions to the Métro network. "It's a practical application of the circular economy," says Dethier.



A villa at the Hassan Fathy-designed village of New Baris, Egypt © Alamy

Raw earth's eco credentials could spur the renaissance he hopes for. Cement production accounts for an estimated 8 per cent of global CO₂ emissions and steelmaking another 4 per cent. Raw earth not only has a 40th of the [carbon footprint](#) of the equivalent volume of concrete but is endlessly recyclable and reduces transport emissions as the material is already on site.

It is weaker than concrete or brick but the necessity to build thicker walls adds the benefit of efficient insulation. As national climate-change targets begin to bite, these attributes may interest a construction industry that will be under growing pressure to clean up its act.

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properly compacted, to be used without any artificial “stabilisers”, such as cement.

He points to Domaine de la Terre, a demonstration project he organised in the 1980s to build 64 social-housing units

south-west of Lyon. One of the blocks rises three stories “without a single gramme of cement . . . it’s still in excellent shape after 35 years”.

But Andrew Waugh, whose practice Waugh Thistleton used rammed earth to build two new prayer halls at Bushey cemetery, in Hertfordshire, for the United Synagogue, thinks stabilisation is necessary if earth building is to become re-established in the UK, given the varying [soil composition](#), climate and lack of specialist construction skills.

“We built sample walls without any cement and they didn’t last,” he says of the Bushey project, which was shortlisted for the Stirling architecture prize in 2018. “It rained and we ended up with a pile of mud.”

Adding a small amount of cement and clay to the earth excavated at the site created a robust composite that allowed them to build 26ft-high walls without the need for a wide overhanging roof to protect them from the rain. The earth mix could still be crumbled and spread on a field if the building was ever demolished, he says.

“I’m a pragmatist over a purist. If we can reduce the amount of cement by 90 per cent, then fine.”

Waugh is a convert to earth building, and not just for environmental reasons. “One of the lovely things is that the buildings blend in to the soil around them,” he says.

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A house by Cassion Castle architects in the north Kent Downs, made from chalk that was excavated and pulverised, then mixed with lime and a small amount of cement

This natural integration helped swing local authority planning officials behind an application by architect Cassion Castle for a five-bedroom house in the middle of the north Kent Downs, where building is heavily restricted. Castle designed the two-storey house, which has just started construction, in a stepped, vaguely neoclassical style.

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“I wanted it to have an archeological feel, like it had been carved out of the hillside almost,” he says. In fact, it is the raw material that has been carved; around 100 tonnes of chalk were excavated and pulverised, then mixed with lime and a small amount of cement, and are now being compacted to form the interior and exterior walls up to 3ft thick.

Castle, like Waugh, is energised by the material’s potential. “It has twofold benefits; the sustainability is one, but there

is also a poetic aspect to building with something that comes out of the site and makes the building feel part of the place.”

If building with earth creates such enthusiastic advocates among the [architects](#) who try it, perhaps Jean Dethier’s hoped-for resurgence is on its way.

A cob house in Cadhay shows off its curves

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A cob house in Devon

Michael and Vivienne Gascoigne-Pees moved into a two-storey new-build cob house at Cadhay, near Exeter in Devon, 12 years ago. The house was one of several in the county built by cob specialist Kevin McCabe. “We didn’t want to move into a boring place,” says Michael, “and this place was just so interesting.”

Cob construction was common in Devon until the start of the 20th century. The Cadhay house was built in the traditional way, mixing subsoil — dug out to make space for the foundations — with straw and clay and forming the thick walls in layers on a stone base. Rendered in lime plaster to weatherproof them, these walls carry oak trusses supporting a reed-thatch roof.

The house has attractive curves at its four corners, making a virtue of near-necessity. “The weak point in a cob building is where two side walls meet, so if you build round you avoid that,” Michael says.

Curves aside, the house maintains a traditional West Country aspect but the spiral staircase inside, with its tiled earth steps and circular cob wall, looks as though it could have been transplanted from Mexico.

Early shrinkage of the structure meant “I used more paint than filler in the first year”, says Michael. But his wife notes that was a one-off operation and the building has needed little maintenance since.

“You have to let it breathe,” Michael says of the walls. “I used porous vinyl paint for the interior.” Fixings for wall-hung items such as cupboards need to be heavier than those used on brick or blockwork. Keeping the thatch in good condition is important, so there are no leaks into the walls, which could weaken them: “You have to keep a dry bottom and dry top.”

Are they happy in the cob house? “We love it,” says Vivienne.

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All raw earth building uses the subsoil rather than the fertile top layer. Depending on the composition, it may be mixed with small amounts of clay or sand to create the right mix of particle sizes to ensure they lock together to form a durable solid material. The following are the most common forms of earth building.

Rammed earth

A damp earth mixture is layered between wooden or metal shutters and compacted — once by human feet, now by mechanical rams — to a quarter of its original volume. Known as *Pisé* in France, where it was used in the 1800s, it is the most popular method among contemporary architects.

Adobe

Mud is placed in wooden moulds to form bricks or larger blocks which dry in the sun. These are then laid to form walls, often using more mud as mortar. Still widely used in Africa and the Middle East.

Cob

The most basic form of earth construction. Stiff mud is mixed by hand with straw to form clumps that are laid on top of each other and the gaps filled with more mud. Commonly used for houses in Ireland, the south-west of England and north-western France until the 20th century.

Wattle and daub

Earth infill for timber-framed buildings, packing mud or clay against woven wooden strips. Moved west from Turkey and became one of the most popular earth-building techniques in the Middle Ages for timber-framed houses in northern Europe.

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