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Down to earth: BC materials transforms urban excavated earth into building materials

'Human activity' is measured by Gross Domestic Product, a monetary measure of the market value of all the goods and services produced in a year. It is a rough indicator used to judge the state of a nation.

It is supported by a paradigm of growth in which higher growth is considered better, and it presupposes a definition of value: that which can be counted in terms of market value. It reduces human interactions into services and commodifies time into working hours. What cannot be counted is left out of the GDP equation: justice, equality, ecology, sharing, caring. This perspective on human activity leads to 'overgrowth': an ongoing increase of a limited kind of human productivity, turning a blind eye to the long-term effects of extraction and exploitation of natural, social and human resources.

A belief prevails that scientific knowledge and resulting technology will come up with a solution to make the overgrowth model possible within the production boundaries of our planet. Histories of technological innovation, such as the work of Professor Vaclav Smil, counter this belief. The current model cannot decouple economic growth from the material and social externalities it is supported by. It seems like the defaults in the overgrowth model are built into its structure. No technological innovation can overturn this model.

The kind of change needed is cultural. Transition needs to be learned as a practice. This is especially true for the construction sector. It takes time for construction communities to acquire certain kinds of knowledge – a tacit knowledge, which comes

01 BC materials' demountable production hall on a wasteland site in the centre of Brussels (Photo: Dieter Van Caneghem)





02 Architects and contractors take part in an earth discovery workshop at BC materials (Photo: Dieter Van Caneghem)

through learning by making and learning by collaborating. It is an act of 'getting close' to a material and a method, through processes of trial and error, finally resulting in the recapture of a close relationship to the sources and resources that constitute our materials, elements and buildings.

BC started building elsewhere, outside of Belgium. Projects in Morocco, Burundi, Ethiopia and Benin used local materials and techniques such as earth blocks, fibres, wood, natural stone. The practice

tapped into locally available craftsmanship and typologies in mostly rural areas, where there is not yet a prevalence of industrial materials. The culture of construction of the place encouraged us to adopt and adapt vernacular and bioclimatic principles. Together with the site's foremen, community members and partner organisations, BC rethought how buildings were made, what economic models they presume, what role they will take in the future, and how they will be perceived.



03 The Library of Muyinga, Burundi was built of laterite compressed earth blocks and was the first experience that BC architects & studios had as a practice. It proved to be informative for all of BC's further projects on the African and European continent.

04 Rammed earth floor by BC materials & GROND, made with excavated earths and recycled demolition gravels in Putte, Belgium (© Jasper Van der Linden)

05 Clay plasters by BC materials in a straw bale project in Brussels by Hé Architectuur (© Jasper Van der Linden)



BC subsequently brought these experiences back to Europe, intending to find a solution to keep the practice economically viable in a higher wage construction culture. In contrast to the classic solution to take on more projects, BC's response was to be more involved in each project. Expanding our role beyond the professional commission to design and supervise, BC was also hired as material consultants and asked to organise workshops on how to build with local materials, spreading knowledge about them, and encouraging their use. Local materials such as earth and hemp are not necessarily expensive, but the labour

involved in their transformation and implementation can be, and workshops provide a way to lower the costs of construction: people interested in these materials can participate and learn the technique by implementing it in a live BC project, providing voluntary labour while doing so.

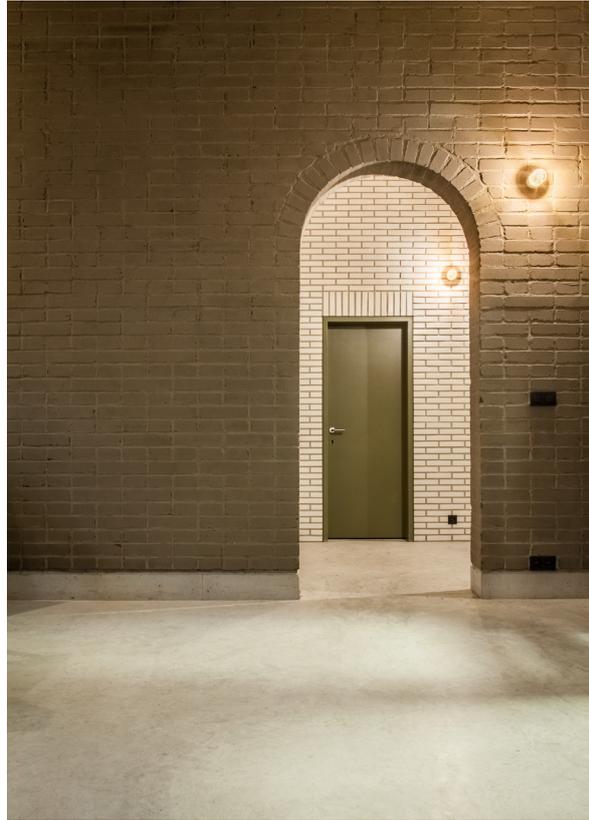
After a set of public and private projects undertaken in this way, interest from other architectural offices and contractors rose, and BC decided to spin-off the activities of material production and consultancy. At the same time, we translated the concept of using

06 Acoustic earth plaster by BC materials with an absorption coefficient of 0.3 in the Usquare project in Brussels, funded by ERDF Europe, an exemplary circular economy project. The earth resources come from a construction site less than 1 km from the Usquare project. (Photo: Sander Lambrix)





07 Excavations of a storm basin by the earthworks company De Meuter in Brussels. The Ypresian geological layer, a cohesive clay, is laid bare, and is one of the resources that BC materials uses to make building materials. (Photo: De Meuter)



09 Edegem: Masonry wall of compressed earth blocks by BC materials in a public project in Antwerp, Belgium. (Photo: Thomas Noceto)

08 Edegem²: Compressed earth block production for the first public earth building in Belgium: 19,000 blocks were produced in 3 weeks, made from local clay from Boom, taken 2 km from the construction site. (Photo: Thomas Noceto)



local materials on a project-by-project-basis to the more systemic and scalable stock production from urban mining of locally excavated earths. In October 2018, the co-operative BC Materials was started, which transforms excavated earths from construction sites into building materials.

Different excavation earths from different geological layers and sites are mixed in recipes. These recipes need to be monitored continuously in order to get from heterogenous resources from urban mining towards homogenous building materials – which requires a level of ongoing and local craftsmanship. Consequently, the work cannot be delocalised, or be fully automated or fully industrialised.

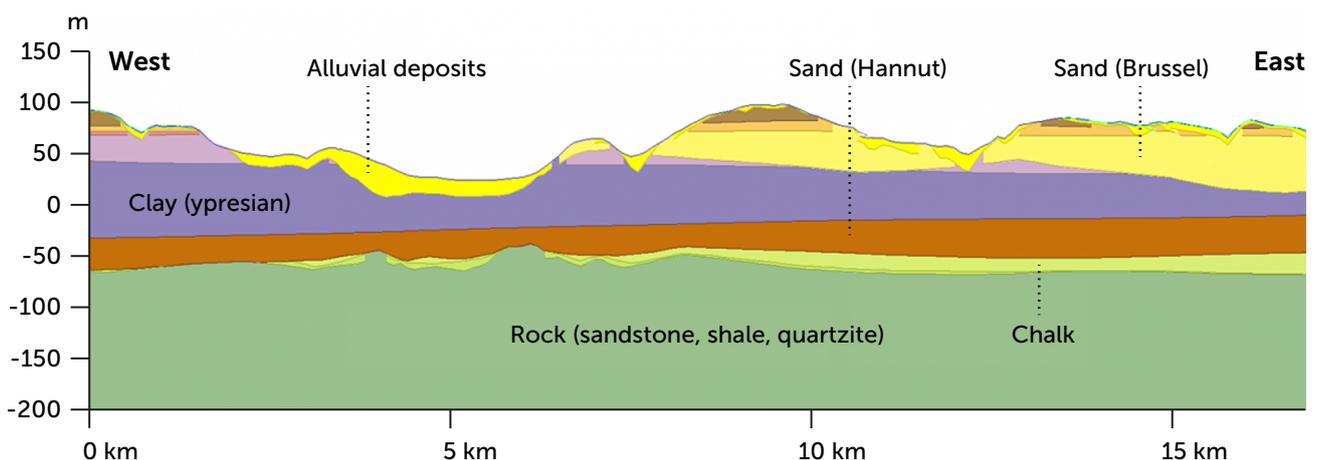
BC materials' resources come from an existing waste stream of around 36 million tonnes of earth per year in Belgium with all its issues of transport and disposal. Around 75% of this stream is non-polluted, and of this amount 40% is reused in a non-circular way for road infrastructure and 60% is dumped as waste in quarries and landfills. These numbers are proportionally similar in almost all European countries.

BC materials transforms these resources into beautiful, local, healthy, carbon neutral, no-waste products. BC materials hence operates doubly in a circular economy: our building materials are circular in origin, coming from excavated earth streams legally consid-

ered as waste; and they are circular in destination, as earth building materials can be endlessly reused without loss of quality. BC materials produces and sells three stock products: the *Brusseleir* (clay plaster), the *Brickette* (compressed earth block), and the *Kastar* (rammed earth). This is sold mainly B2B, through our sales channels of architects and contractors and building material shops, or directly via professional (public and private) clients. While a small part is B2C, it is not our core market. We produce just-in-time, and therefore have no need for big storage areas. We receive most of our resources for free from earthworks contractors, given that it derives from the waste streams of construction sites. In addition to our three stock products, BC materials also provides two services: consultancy on a per-project basis, and workshops. These services are conceived to help architects, contractors and clients implement quality earth construction projects, from A to Z.

As such, BC materials is not a normal materials production company. It operates on a wasteland site in Brussels in a fully demountable and circular production hall, which can be transported to other wasteland sites in the Brussels region. It is governed as a cooperative of workers and sympathisers, reflecting its aim for broad and lasting impact in the construction sector by building a community and creating capacity around earth construction; our aim is not to achieve the fastest possible sales of building materi-

10 High Brussels (yellow) is a mountain of sand, with a historical presence of quarries for mortar sand. Low Brussels has alluvial deposits with soil and clays available. BC materials uses excavated earths from all over Brussels as resources for building materials. The Metro3 project in Brussels digs its way through all of Brussel's geological layers, facilitating the definition of perfect reformulations for clay plaster, compressed earth blocks and rammed earth. (Image: ©BBRI)



als with the highest possible profit margins. The balance between a commercial activity and a societal mission is one that keeps driving our business model forward. In the current overgrowth model of production, BC materials aims to show, and to implement, strategies for a proper transitioning of our construction sector.

Of course, we are not alone: BC materials operates within a fantastic network of actors, such as European earth construction colleagues, funding organisations, investors, laboratories, governments, architects, contractors, earth movers, standardisation institutions, universities, ... As such, the impact is at least as deep in the construction culture in general, as it is in the building materials market in specific.

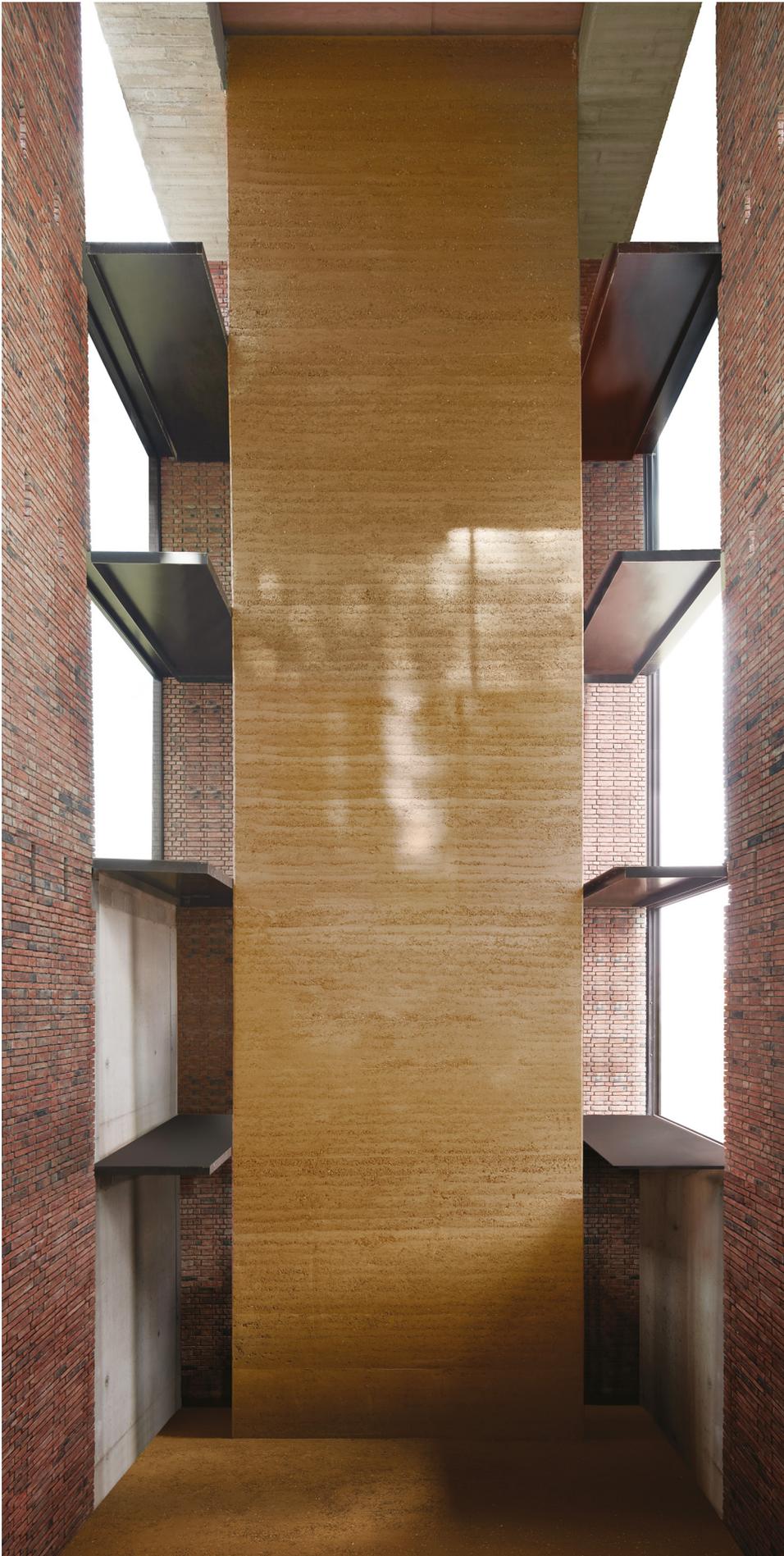
BC materials is currently working together with the Belgian Building Research Institute (BBRI) to translate DIN 18945, -46 and -47 into Belgian norms (Clay-Bio-Masonry research project). Our hope is that this research will make it viable for earth building materials to be trusted and used in Belgium. In the meantime, we use the German DIN norms tested in Belgian labs to classify our building materials.

BC materials has also filed for R&D funding with BBRI and the Spanish earth constructors Fetdeterra to transform excavated earths from the Metro3 project in Brussels into 27000 m² of compressed earth blocks (UTUBE-project). Here, research is aimed at how to feed excavated earth resources into existing compressing infrastructure from the concrete sector, with the goal of scaling up production and lowering the cost per block. This exemplary and innovative urban mining project could potentially be repeatable for other large infrastructure projects in cities in Benelux and Europe. And indeed, Cycle-Terre in Paris, France is also operating in the same direction, with a factory which will process excavated earths from Paris region.

At BC materials, we believe the policy context in Europe is being put in place to allow such new production models to become viable. More and more players on the building market will be forced, due to the Circular Economy Package (of the EU) and the Green Public Procurement obligations (a legal obligation in 2021), to produce, buy and use circular products in building projects, with a low LCC (life cycle costing) and clean end-of-use treatment. As part of the Cir-

11 Negenoord: The first public rammed earth building in Benelux, designed by De Gouden Linaal Architecten. The rammed earth mixture was made from local resources by BC materials, in collaboration with CRAterre. (Photo: Filip Dujardin)





12 WALL: A 15-metre-high rammed earth wall by BC materials and Het Leemniscaat for AST77 architects. The rammed earth mixture was made from soil from the site with the addition of sands and gravels. (Photo: Steven Massart)

cular Economy Package, waste reduction targets will also become more demanding by 2022. As McKinsey notes in the report "Value Creation in Building Materials": *"While sustainability is an important decision factor already, we are only at the very beginning of an increasingly rapid development. [...] Manufacturing will become more sustainable (for example, using electric machinery), and supply chains will be optimized for sustainability as well as resilience. [...] Water consumption, dust, noise, and waste are also critical factors."*

We dare to envision a European decentralized network of earth building materials producers, linked to urban mining activities in the specific regions and cities in Europe. Maybe the upcoming circular economy will create the conditions for a breakthrough for contemporary earth-based materials.

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