Interview with Anna Heringer and Martin Rauch*

***Conducted and/or edited by the Volume Editors.**

Volume Editors: You are known for innovating with the use of earth as a construction material. What is important about considering materials for construction in terms of sustainability?

Anna Heringer: It starts with availability: earth is available worldwide at no or very little cost. And its carbon neutral. To turn it into a building material it needs energy and that can be—in a very low-tech sense—100% manual labor. In a more high-tech sense, on the other hand, it can also be processed with machinery. Also mixing high- and low-tech is possible. It is in that sense a global strategy for building sustainable that works in any context.

Martin Rauch: I think earthen structures are the champions of sustainable building systems. For me, it is important to change and develop the tools, production infrastructure, and not the nature of the material. We have to design everything with the limitations of the involved materials in mind to find new structural and architectural solutions.

AH: Until today, earth shaped by the human hand has remained the most commonly used building material. Mud walls, properly built, are resilient as concrete but can return to nature without leaving environmental scars. You can plant a garden on top of the leftover of your house. It's the only material that can be taken from the ground and get recycled as often as needed without any loss of quality. From climate-neutral production to socially just implementation, building with earth is a powerful tool to tackle two of our predominant problems: climate change and poverty.

VEs: Can you imagine an entire city built out of this material?

MR: We can scale it, but we cannot build towers of 20 stories with a purist earthen construction. What we can do is to develop cities on the urban structure that have up to five or six stories—in Germany, these kind of buildings were already buil[t] around 1835. Now, my company is building a factory that is 12 m high—the load of the roof constructions and indoor crane rests on the rammed earth walls. In Paris, I

was part of a team to work on a study for a multiple story house as a hybrid structure with concrete columns and rammed earth walls. From these kind[s] of studies and experiences, I would definitely say, it is possible to build big structures with earth. Since two years, we are conducting a lot of research on material values that will help structural engineers calculate parameters more easily. The big problem for earthen constructions is not that it is technically difficult to use, but that a large portion of societies worldwide do not trust the durability of the material. Also, that we do not have enough facts and calculations for it. We also need to develop and design the machinery if we want to scale up the volume of rammed earth. From my experience, I can say that if we elaborate the technology of prefabrication, this will definitely be the best path in using earth construction on a big scale.

AH: Actually, in terms of trust, the proof that rammed earth works, has existed since 500 years; if you look at places like the city of Shibam in Yemen, for example, with its earthen skyscrapers. If it was possible 500 years ago, then why, with all our technical know-how, should we not be able to do this today? A density like that of Paris—with such a height—is definitely possible with the current technological state of the art.

VEs: How would you bring your knowledge to the people searching concepts for sustainable, low-cost housing, that the construction industry has not reached?

MR: We are currently doing a project in Nigeria supported by the European Union. Here, we are setting up a production factory to produce prefabricated un-stabilized, rammed earth elements. This infrastructure ensures a long-term possibility to develop large-scale building volumes. We are also working with their architecture faculty on this. Together with them, we want to work not only in education—because it is not enough that the people know about how to use this material—but also how to develop the tools and the machinery, as well as the architectural design fit for the material. You cannot do one part without working on the others, and we have found that young architects are very excited to be involved in this process.

AH: From my experience in working in Bangladesh I can say if you have one or two trained people on site, then you can mobilize quite a number of unskilled or yet-untrained people, which is a good thing because it addresses the question: how do we find new mass labor? Earth is an inclusive material. It's great to see even older persons, or people with disabilities and school kids participating in building their own school, for example. This really contributes a lot to a strong sense of confidence in your own potential and in the community that you're building up at the same

time as the structure. This building of community aspect is something we're missing in the global north.

Elsewhere in Bangladesh, we visited a Rohingya refugee camp. It's sad to see that the material is brought in from external sources, also far away countries instead of bringing in the know-how to use the material that people literally sit on. There are also mental health issues and the trauma. People in these conditions have survived a genocide. Actually, some of the earthen techniques I believe are therapeutic. You ram the earth and get off your aggression, for example. Or techniques that are calming down, like Zabur technique, where you work more like a potter, shaping the walls with your hand or applying ornaments. And in the end of the day, you see the result of your own power again: that you can build something beautiful literally out of the dirt. That is empowering.

VEs: What other issues do you have to confront when working with earth construction?

AH: Land prices are going up all the time, and at the same time, more infrastructure is also going subterranean, and the excavation can be already the source of our building material for the future. In Paris, for example, they built a new Metro and it turned out that they had a lot of earth available, which normally is a problem—they don't know where to put it. What do you do with all these tons of earth? We would say that these are actually the materials that will be used to build the future cities.

VEs: What barriers exist in transitioning towards using earth as sustainable construction materials?

AH: It's just in our brains. It's the fear. The core problem of sustainability is always fear. If we really want to live in harmony with nature, we also have to accept decay and death, and that is a taboo in our society. That is the main issue that we notice: this fear of erosion. At the same time, the mainstream construction industry has pushed the idea that earth is a very weak and very vulnerable material. However, in fact, on the contrary, such structures have existed for hundreds of years in almost every continent and in almost every climate zone. The narratives are what need to be changed. We also need to realise that we can build with old materials in modern ways. That's our core capacity as designers: to meet the needs and the aspirations of the current society.

VEs: What can practitioners like you do to change that narrative?

MR: The most convincing is always to build large public structures that people can touch and walk in, to feel their quality. That is the most convincing experience and explanation. We need to build more pilot projects that are receivable to a large portion of a society. The more you see and touch such buildings, the more people start to get interested, the more people start believing in it. It also political will and talking about the truth of material costs. The effects of carbon emissions on our environment and the embodied energy costs in building materials need to be reflected in true market prices for constructions worldwide.

VEs: Do we need new legal, policy and financial frameworks to make such changes happen?

AH: In more and more countries (like Italy or Mexico), load-bearing earthen structures are illegal. This is not because the material is weak, but because there are no engineers and architects who know how to build with it. The education, the rules and the lobby are missing.

MR: It's not that we're saying that we should completely abandon concrete and we only build with earth. It will not work this way. We have to create a new thinking about construction, the use of earth, and design. For example, wood grows on the earth. What does this image suggest for construction? That we use earth to build walls, and wood to build ceilings. We know that you can build very tall buildings with wood construction, but the problem is that it does not have enough mass, and it will struggle in certain climates. But in the connection between earth and wood, in a system with prefabrication of earth blocks and wood, a new system emerges. Reinforced concrete is still indispensable for foundations, roads and bridges—which is why we cannot completely exclude it.

We must be aware that we use reinforced concrete so extensively today because it has been lobbied for over the last 100 years—without regard for the climate and natural capital. If we were to use only a fraction of the revenues from the concrete industry for the further development of rammed earth, rammed earth building technology would have long since become a natural and sustainable alternative for building.

AH: Fear goes into that, too. Out of fear, we implement much more safety than we need. And also because it's cheap, we just pour in more concrete with more reinforcing iron than is actually really necessary. This is a major issue and definitely something that has to change.

MR: In countries where wood is not available, we also have to find other solutions. Either we find the alternatives in shaping the form or we find new ways to use certain materials differently. It is also a question of efficiency—using materials in their local availability to their best potential.

Either the material—like wood—is available in sufficient form, locally—if not, a corresponding forestry must be established in parallel form.

VEs: There is a concern that earth construction would consume an abundance of water that competes with the necessity to deliver it to people in need of drinking water. What's your view on this?

AH: Different techniques exist. Certain techniques require only the water content that's already in the ground. Then there's also the question of the season, and that's a matter of staying in the rhythm of nature.

MR: There is also the question of scale. The bigger the scale, the more water is needed. In terms of the rammed earth technique, it's actually not a lot of water, though. About 15%–18% of water, so already less than concrete. But water is always an issue if you want to build. If you make adobe bricks, you need water; if you want to grow the tree, you need water. To say that we cannot build with earth construction where there is less water is wrong. It simply means that we cannot build there. In a specific project, where I had to consult on rammed earth possibilities in some secluded Nepal valleys, for example, there are three problems: the first is that their water is contaminated due to the amount of waste in the river; the second problem is that there is not enough building sand; the third is that there is not enough wood. What can you do there? Rammed earth really has a good potential here—it needs less water, the eroded material of the mountain is for the most part an ideal raw material—as the local historic constructions already show. However, to be fully convincing, there are sometimes deeper questions that need to be addressed beyond the building techniques.

VEs: Can you also use filtered grey water to build with earth?

MR: If not contaminated with chemical substances, it is definitely possible.

AH: Ultimately, the nature of nature is not a limitation—it is abundance. We have to learn to look at this abundance and have the sensitivity to see those natural resources that are given by nature for free. And we need to use our creativity to really make

the best out of them while also accepting the limits of these natural resources. And these limits are in fact also a great source of inspiration and a great source of cultural identity because every place has different soil. Every place has a different climate and vulnerability towards the climate. If you create your architecture out of these parameters, you also create a beautiful cultural diversity, identity and authenticity that is also enriching our planet, and not just in the sense of a more humane and more just implementation of human habitats, but also in the way that it's more beautiful.