

Prof. Dr. Christof Ziegert completed an apprenticeship as a bricklayer and worked as a craftsman, before studying civil engineering at the TH Leipzig and completing his doctorate at the TU Berlin. He is co-founder of ZRS Architekten Ingenieure and an expert on damage in earthen construction, a board member of the Dachverband Lehm and chairman of the earthen building standards committee at DIN. He is an honorary professor for earthen building at the FH Potsdam since 2012 and co-author of the standard work on earth building *Lehmbau-Praxis*.



## Broad Impact Through Standardization

“The time window available is damn tight, and we now have to do a lot to turn the wheel around in time.”

### **Fabian Hörmann**

**If we are looking for ways to make construction more sustainable, we first need to understand the mechanics behind large construction projects. Financing, construction insurance and reinsurance are based, among other things, on risk assessments. Their criteria take into account relatively short timelines and observation periods—even though our current actions and their consequences are integrated into global contexts. Fundamental to a project’s “resilient” financing is its realization in compliance with every standard. There is a vacuum here: why has the construction and raw materials industry not promoted the standardization of renewable materials on an equal footing for decades?**

### Christof Ziegert

What is planned and built is always standardized. Building practices took place without clay and straw, or at least with only a small amount, and it is therefore only logical that these aspects were missing from standardization for a long time. Fortunately, some associations have taken it upon themselves to lead the way, such as the Dachverband Lehm, which made earthen buildings possible again, in principle, as early as 1998 with the *Lehmbau Regeln*, or “earthen building rules.” In Germany, these are generally accepted technical rules in all federal states and have been introduced by the building authorities. Because these incredibly lax rules are no longer sufficient for earth building, as they are developing today, we now have several renewed building material standards, as well as a new standard for earth block construction. We have always used architecture to create added value, and we’re convinced that good architecture and good economics are interdependent. And we have now extended this to sustainability. In the meantime, HORTUS has given birth to a new modus operandi for every upcoming Senn project.

**Does this have to do with the industrialization of construction, which in the post-war years developed a whole new dynamic for reasons of demand, but also for economic reasons: from a war economy to a consumer economy?**

Yes, in my opinion, quite clearly. There was a large-scale use of wood and clay after the Second World War. That was discontinued about 10 years later, because people were once again able to produce and transport more energy-intensive building materials. Today we find ourselves in a similar situation of scarcity: out of climate consciousness and now, once again, out of an energy shortage situation. Suddenly these solutions, born out of necessity after the Second World War, are being put to use and are taking effect once more.

**Standards can be an essential tool for planning, and everyone can agree on a common basis regarding quality. Standards also provide answers to questions of safety, liability, service life, etc. Time to take stock: what are the standards if we want to build with bio-based and rapidly renewable building materials such as straw, hemp, flax and bamboo, or with mineral building materials such as rammed earth, light clay, natural stone (solid construction) or with reused building components?**

There are a lot of things in the making. Tomorrow, for example, there will be a standardization meeting to advocate for the draft standard on load-bearing clay masonry. I am the chairman of the standards committee, so for me standardization is a highly positive tool for promoting natural building methods. All this is not about the partial interests of a manufacturer, or a planning office, but rather that this can be achieved on a broader scale, and can only be achieved through standardization.

With this draft standard, we achieve a level of standardization that is roughly equivalent to that of conventional masonry construction, and also comparable with timber construction. And in the case of other natural building methods, it's more a matter of approval from building authorities for individual products. So I was pleased that blow-in straw insulation has now received approval from building authorities in Germany. With materials such as hemp, flax, straw, etc., the biggest problem is fire protection certificates. This is where we're most likely to reach our limits, since the traditional building materials industry is leading the way when it comes to testing.

However, there are similar guidelines in straw construction as the *Lehmbau Regeln*. This set of rules was developed by the FASBA, the German Straw Bale Building Association, so that building straw can be processed as a product in the German construction industry, and in accordance with these rules.

**Research into what today are considered conventional materials and constructions have contributed to the establishment of standards and norms, giving them a head start, and leading to extreme upscaling, industrialization and an increase in reconstruction activity. How can we accelerate these processes for regenerative materials?**

It's not much of a head start. The fact that research into sustainable, ecological building materials was discontinued can be roughly linked to the date 1960. After the Second World War, they were massively pushed for a period of 10 years and already standardized in Germany. After that, a gap opened up when almost nothing was done. How can we now catch up? I am doing my part in the field of earthen buildings, and I hope that many other enthusiasts are also involved with structures in other areas.



The new working landscapes embraced by rammed earth walls offer 10,000 m<sup>2</sup> of floor area for 500 employees: Alnatutura Campus (Darmstadt, Germany, 2021).

Architecture:  
Haas Cook Zemmrich.

## **So there's no panacea?**

No, in my opinion this is truly personalized. However, there is a structural problem behind it. In Germany, we are in the fortunate position of having a very workable organizational structure in the Dachverband Lehm. Unfortunately, I notice that these structures in other countries cause a lot of internal friction.

**Is our time window, until 2030, at all sufficient to advance sustainable construction via tried and tested processes? Or do we have to take a disruptive shortcut and simply do it, true to the motto: "Better to ask for forgiveness afterwards than permission in advance?"**

That is a fascinating question! There are some experimental building projects. For example, we have received approval for research buildings in Bad Aibling on a case-by-case basis. In my experience the Bauaufsichtsbehörde, the building supervisory authority, is extremely cooperative and progressive, especially in opening up to such new ideas and helping to consciously design and accompany the necessary changes. But the available time window is very narrow, and we must do a lot to get it done in time.

**Approvals in individual cases are usually considered an additional risk in the planning process. Is there a recommended procedure to convince the decision-makers in such a case?**

The procedures can be carried out at relatively short notice and with minimal financial scope. For the Bad Aibling 2.0 research houses, we wrote the report in a fortnight, and within a week the building supervisory authority granted the permit—faster than with a typical building permit.

**For example, could the test procedures be generalized or even modified? And could the construction methods thereby be licensed multiple times and thus become cost-effective?**

If enough building projects have been carried out with approval in individual cases, then in principle, this is already a proven technique. It can then be quickly standardized. The next stage will be standardized construction methods, emerging from experience gained with the experiment. And this could be accelerated, perhaps through some generalized pathway, such as a building category for "experimental construction," so that this would acquire a positive kind of normality.

**Does it need start-up money from politicians or venture capitalists so that we could feel like we're in Straw Valley instead of Silicon Valley?**

Well, at the moment, I see that change taking place, and that the big and small players are either consciously shaping this change or are forced to go along with it, more or less successfully. An incredible amount is happening at the moment, much more than is publicly perceived, but still too slow for the window of opportunity we have left. So the support is happening in many areas, but it would have to be stepped up a notch.

**Building certificates and labels represent added value for marketing and lull clients into a false sense of security, leading them to believe they're doing the right thing. However, international certificates are not necessarily adapted to specific regions and/or only define minimum requirements. In most cases, gray energy is weighted much too low, and some target values and framework conditions are no longer sufficient in the current situation. Even the new version of the Building Energy Act in Germany, which was passed in July 2022, doesn't take gray energy into account. To what extent can the various certification bodies now raise the requirements and thus put the real estate industry on the right track?**

I really do see it as the politicians' duty to intervene and guide the way. I know people in the relevant specialized bodies who are prepared for all possible scenarios. But the political decisions must be aimed in the right direction—and taken very courageously. I assume that gray energy will be included in the energy performance certificates before the end of this legislative period in Germany. That has to happen! And then building materials like straw, wood and clay will get another boost. That's the logical outcome.

**With certification and labels, we only put a fraction of building projects on the right track. How can we tackle the rest?**

In my opinion, the solution clearly lies in the preservation, conversion and appropriate modernization of the existing building stock. That preserves gray energy and gives it a new quality. Only in this way can we raise the necessary potential savings.

**Sufficiency—actually using fewer resources and energy, and thus emitting fewer greenhouse gases—will be our new agenda. So will there be a binding set of standards for this, as there is for efficiency?**

I am experiencing contradictory things at the moment. In Germany, the German Institute for Standardization wants to include aspects of sustainability in all standards. On the other hand, we are supposed to remove the chapter on "deconstruction and recycling" from our standard on clay

masonry, because it's not included in the other masonry standards either. We argued: "We have a new standard and are ahead of the curve. The others have to follow suit!" But the Deutsches Institut für Bautechnik argued that this would prevent it from being introduced by the building authorities. I have an appeal hearing tomorrow and will try to get our point of view accepted, because I know that I'm on the right side.

**The deconstruction of conventional brick walls is feasible. There are examples where walls have been cut up and moved. At the same time, this also has to do with how the bricks are connected. In the past, you could just tap off the mortar. So to what extent does reuse also belong in these standards?**

We have included this in our standard for clay masonry in precisely the same way. It's possible to separate the clay block from the mortar. We can knock off the mortar, soak it in and reuse the clay block in its shape. And we have a remarkable degree of so-called cross compatibility in earthen buildings. Stonewall, mortar and plaster are very similar in composition. Therefore, you could stir everything in a big pot and form new products out of it. The clay minerals in the loam have this fantastic property: their binding energy can be reduced by adding water but also restored by drying, without using any energy, and this process can be repeated an infinite number of times. We don't have that with any other building material in the construction industry.

**How much resistance is there from the traditional building industry, the authorities and builders? Are there any noticeable changes?**

In the standardization of earthen building materials there is actually hardly any resistance, in fact the doors are open. That is why we were able to bring standardization in earth construction to a good level within a very short time. I can only encourage everyone who works in this field to follow standardization when it comes to natural building methods. Now is the time!

The traditional use of local seaweed in roofs has been proven to last for centuries, so rediscovering the material and combining it with a timber construction—fully prefabricated and designed for disassembly—can be considered a valuable temporary CO<sub>2</sub> storage: Seaweed House (Læsø, Denmark, 2013).

Architecture: Vandkunsten.

