

DOCUMENTATION

Climate-positive construction with circular materials

RECORDS FROM THE CONNECTIVE CITIES DIALOGUE EVENT
POTSDAM: 13–15 NOVEMBER 2023



35 experts



from 16 municipalities



from 6 countries

Partners of Connective Cities



Commissioned by



Introduction

Steel and concrete are the most widely used construction materials around the world, but their production and use in construction are very harmful to the climate. As one of the most energy-intensive industries, the construction sector contributes up to 40% of carbon emissions globally. Decarbonising the construction industry is therefore central to achieving global climate goals. Municipalities can make a significant contribution towards this, and using organic materials or recycling and reusing materials are promising approaches.

„In urban construction there is no contradiction between a good quality of life and protecting the climate.“

Mike Schubert, Mayor of Potsdam,
welcoming participants to the event

BACKGROUND

Demand for living space is growing around the world, particularly within cities, which makes the construction industry a major sector in every economy. However, producing and processing raw materials for construction are significant contributors to environmental damage and carbon emissions. The construction sector also uses a lot of energy (sometimes known as “grey energy”) not only when producing construction materials and during the building phase itself, but also while the building is operated for heating, cooling and electricity use.

Organic materials such as wood and bamboo could play a vital role in decarbonising the construction industry. They contain much less energy than concrete or steel, and wood is also considered an excellent natural insulator, providing better thermal capacity than other materials. Wood and bamboo are obtained from plants which absorb carbon dioxide from the atmosphere while growing. In addition they are self-renewing resources. Sustainable forestry practices such as responsible tree felling and reforestation can ensure that resources are used sustainably.

Reusing construction materials and using recyclable materials provide another significant lever. Indeed, the same can be said for whole buildings: Instead of demolishing old buildings, more should be renovated and modernised. This reduces sealing and encourages the protection of natural habitats. Municipalities have a key role to play here. By setting construction regulations, planning development and land use, and initiating innovative projects, they can advance the transition to circular and climate-positive construction. They can start with municipal buildings such as schools and administrative buildings.

THE DIALOGUE EVENT THEREFORE FOCUSED ON THREE KEY AREAS:

- technological innovations and new approaches to construction using organic or climate-neutral materials such as wood, bamboo, hemp, straw, clay, and earth, and recyclable materials;
- opportunities for municipal development by boosting regional organic value-creation chains to produce and process construction materials; and
- supporting organic construction through innovative legislation and financing.

Event overview

More than 30 representatives of municipalities, academia, business and civil society gathered at the Potsdam Institute for Climate Impact Research from 13 to 15 November 2023 for an event hosted by Connective Cities and the city of Potsdam to share ideas and experiences about the transformation to climate-friendly construction. They presented their experiences from Bhutan, Germany, Indonesia, Nepal, South Africa and Tanzania, and developed ideas for specific local projects. While in Potsdam they visited examples of good practice, such as a wood-built nursery school and the construction site of a pavilion which is being built with organic and recycled materials.

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Keynote speeches – a summary

CLIMATE-FRIENDLY CITIES: A CALL FOR SYSTEMATIC RESEARCH

Professor Dr Jürgen Kropp, Bauhaus Erde and Potsdam Institute for Climate Impact Research

Cities produce around 75% of greenhouse gas emissions. The construction industry plays a major role in this, using more materials and energy than any other branch of the economy. Every year, the industry uses 4.5 gigatonnes of cement and 40 gigatonnes of sand and gravel, while producing just one tonne of cement produces 590 kilogrammes of carbon emissions. In turn, climate change has a powerful impact on cities and is causing the number of hot days to multiply, for example. Cities already experience twice as many hot days as their surrounding areas. This means construction must become more climate-friendly in the future, and the construction industry must go greener. Building sustainably means reducing the resources and energy consumed across the whole lifecycle of a building, using sustainable materials, and re-using or recycling construction materials. Using organic materials in construction or external insulation can reduce dangerous heating in cities. It has also been shown that wood is not just a climate-friendly building material, but is also exceptionally stable and long-lasting.

“Buildings built of wood have proved to be very long-lasting and stable.”

Professor Jürgen Kropp, Bauhaus Erde and Potsdam Institute for Climate Impact Research

BUILD EVERYTHING OUT OF WOOD?

Dr Susanne Winter, WWF Germany, and Pete Heuer, Chair of Potsdam City Council

When consumer goods and building materials are made of regrowable materials such as wood, they are quickly considered sustainable. However, this often masks the fact that forests must be cut down to produce these materials. Over 80% of the world's land-based biological diversity spends at least part of its life in forests, and the planet's limit for biological diversity has already been exceeded. This means that global wood consumption is already too high. The goal must be to find a sustainable balance between protecting and exploiting forests. Wood for the construction industry must therefore come from sustainably managed forests, and benchmarks need to

be set for the amount of wood which can be felled sustainably. We also need to prioritise the primary use of wood.

In 2022, Potsdam set up the Potsdam Wood Construction Initiative to promote the use of wood as a regrowable resource to help protect the climate and encourage future wood building projects in Potsdam and Brandenburg. It also aims to increase the amount of renewable, recycled and recyclable materials used in construction.



Participants visited the construction site of a pavilion which is being built with organic and recycled materials.

USING MORE SUSTAINABLE BUILDING MATERIALS IN THE HIMALAYAS

Erica Udas, International Centre for Integrated Mountain Development (ICIMOD), Nepal

In the Hindu Kush region of the Himalayas, preferences for building materials have changed in recent years. Now, the “terrorism of concrete and steel” reigns. This was particularly apparent during reconstruction after the major earthquake which hit Nepal in 2015. Concrete and steel are displacing traditional sustainable construction methods and generating a large carbon footprint. An exodus from rural areas is also affecting the region, creating an urgent need for sustainable urban development planning. It is essential that local building regulations and national legislation promote traditional building methods and the use of local organic building materials. Tile production must also be made more sustainable, such as by replacing the coal used to heat ovens with biomass pellets and using more climate-friendly ovens.

Case studies

THE PARTICIPANTS GAVE PRESENTATIONS ON THEIR CLIMATE-POSITIVE CONSTRUCTION PROJECTS USING ORGANIC OR RECYCLED MATERIALS.

Banepa in Nepal is rebuilding its historic old town using traditional methods. The city hopes to preserve historic architecture and revive the old town. Local people and politicians must be convinced that traditional organic building methods are cheap, sustainable and safe, and can boost the local economy as a tourist attraction. A new old people's home is also being built in Banepa using traditional methods.



Banepa: The city wants to preserve traditional building methods.

The House of Statistics in **central Berlin**, built in the late 1960s, is being transformed into a community-oriented space for administration, art, culture, social projects, education and affordable housing. Politicians, administrators, municipal corporations and civil society are working closely together to develop the plans and are involving local people intensively in the planning process. The concept includes re-using existing materials.



Berlin: A new future for the Haus der Statistik at Alexanderplatz.

The **Kingdom of Bhutan** in the Himalayas is raising awareness for the value of sustainable indigenous building methods through a sustainably built model home. It aims to prompt a sustainable transformation to the building industry and promote the building industry to young people as a source of future-proof green jobs.

"We need to think about how best to motivate the construction industry to make use of previously used materials. Pilot projects offer a way of demonstrating the feasibility of this approach."

Moritz Bellers, Heidelberg City Planning Office

The **Munich** city administration aims to use as much existing material as possible for the construction of a new neighbourhood on the site of a former barracks. The challenges facing the project include a lack of space on the site for storing materials to be reused, and a lack of experience in using these materials for construction.

The City of **Cape Town** is developing the Potsdam Sustainability Campus, a new district, in which sustainability is the priority for buildings, mobility, environment, businesses and services. For this to succeed, however, it will require a change in mindset for many of those involved. The campus will become a sustainability classroom. The site also includes a



Munich: After the demolition of the buildings, as much existing material as possible should be used.



Cape Town: This site will be part of the Potsdam Sustainability Campus.

market and space for urban agriculture which offer local people opportunities to earn a living.

The city of **Lörrach** is planning to turn a site formerly used by the textiles industry into Germany's first commercial area built using sustainable wooden construction methods. The project must take account of technical, legal and financial aspects and is strongly supported by the city council and the State of Baden-Württemberg. The surrounding area has more than enough wood for use as a building material. Businesses using the business park in future will have to adopt sustainable business practices.

A new neighbourhood is taking shape in **Heidelberg** across 100 hectares on the site of a former major US military base. The aim is to reuse as much of the building material already available on the site. However, challenges include legal limitations to reusing existing materials, and cost-effectiveness as regards demolition, refurbishment and re-use. Mass calculations are carried out to get a sense of the expected masses of the various types of materials.

The architect Popo Danes built a hotel on the Indonesian island of **Bali**. The aim was to boost the local economy and make better use of previously unproductive land. The construction project combined traditional and modern technologies. It was important to raise awareness among the local population about the fragility of the landscape and to promote acting in environmentally friendly and economic ways.

In **Potsdam**, experts from planning, building, manufacturing, technology, politics and administration have developed a memorandum for wooden construction as a basis to simplify the planning and delivery of wooden building projects. The city aims to promote building using wood. The initiative was prompted by the mayor and the city council.

The IBA'27 international construction exhibition in **Stuttgart** serves as a laboratory and knowledge platform for the use of recycled materials in the construction sector. Of the projects included in IBA'27, 80% involve existing buildings. In this there is a need to define what exactly is meant by "circular construction".



Lörrach: A former textile industry site will become a sustainable commercial area.

Challenges – solutions – project ideas

Initiating a sustainability transformation in a sector as large as construction is not easy, but there are many promising places to start. The first step is to ensure that organic raw materials are available in adequate quantities, such as wood from sustainably managed forests. It is not enough to consider the construction sector in isolation: consideration must always be given to traditions, legal frameworks, lifestyles, local attitudes, the interests of various stakeholders, and the resources which are available. There also needs to be end-to-end thinking about value creation chains. We need to convince people of the benefits of sustainable building methods, and work towards ensuring that legislation allows or makes it easier to re-use building materials.

Making the construction industry more sustainable requires forging new alliances and thinking outside the box. Examples of innovative practice can always lead the way in this regard and open doors.

“In Nepal we still have a tradition of building with wood. We must maintain this tradition and fuse it with modern building methods.”

Rabindra Puri, RP Foundation, Nepal

New business models:

Industry, politicians and administrators must adopt new sustainable business models to make use of regrowable and recyclable materials in construction, based on robust data and analysis. This demands new, creative approaches to cross-sector collaboration and attractive narratives to pique the interest of investors, for example.

Strategic approaches: In order to increase demand for using organic and low-emissions building materials, it would be wise to draw on existing projects to learn and develop approaches, and to latch onto established political strategies such as those aimed at creating jobs. What matters is developing narratives which are attractive to target audiences. An initial step should be to develop strategies for all key stakeholders on how best to reach out to them and bring them over to the idea of sustainable construction.

Testing in practice: For a business, it must be worth reusing building materials and taking on the extra effort of disassembly, storing the materials and preparing them for re-use. Pilot projects can demonstrate feasibility on a small scale and modelling can present successful processes which can be scaled.

A new mindset: People must also be convinced of the benefits of building in a more sustainable way, and the best way to do this is with tangible real-life examples. This includes breaking out of outdated ways of thinking, such as busting the myth that concrete and steel are always better building materials than organic materials.

Laws, regulations, environmental factors: Policymakers and administrators must be encouraged to update laws and building regulations to allow and promote the use of organic materials and the reuse of existing materials. There is also a need for clear guidelines on sustainable forest management.

Key takeaways

- Using organic materials or recycling and reusing materials are promising approaches to creating a sustainable construction industry.
- For all their differences, cities around the world are taking similar paths towards climate neutrality. The construction industry is playing a key role everywhere. Many countries in the Global South have great experience in building with wood, as well as with regard to heat and earthquake resilience.
- The extent to which wood can be used for building depends on the availability of sustainably produced wood.
- Regulations which permit and promote sustainable construction, combined with setting the right policy course are essential for bringing about a sustainability transformation in the construction industry.
- There needs to be a change of mindset in politics, business and society for organic and recycled building materials to find acceptance.

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