Constructing a sustainable future
BY SAINT-GOBAIN

Saint-Gobain's sustainable construction magazine

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cooperation

the key to sustainable construction

#DECARBONIZATION #RENOVATION #CIRCULARITY #URBANIZATION #QUALITY OF LIFE #POLITICS & ECONOMICS

Saint-Gobain's
sustainable
construction
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INTRODUCTION

Developing more attractive and more resilient cities, reducing consumption of energy and natural resources, and ensuring accessible, comfortable, and decent housing for all... To meet these planet-wide challenges, the construction sector must transform itself.
In 2023, determined to play a key role in this transition, Saint Gobain launched the Sustainable Construction Observatory. Its aim is to listen, inform, and unite all stakeholders in a still-fragmented worldwide market, promote the sharing of best practice on an international scale, and work together to find solutions for accelerating change in the sector.
The digital magazine ***Constructing a sustainable future*** is one of the Observatory's central components. It demystifies the issues around more sustainable construction and its impact on climate and society, explores innovative solutions and inspiring projects, and gives a voice to everyone engaged in this transition.
We are convinced of the need to join forces to accelerate this movement, and so we dedicate this special edition to this essential spirit of cooperation.

Get all our articles, interviews, and podcasts in *Constructing a sustainable future* and by subscribing to our newsletter.

DISCOVER

the online magazine
Constructing a sustainable future

BAROMETER

Each year, the Sustainable Construction Observatory produces a Worldwide Barometer to take the pulse of sustainable construction in the real world: perceptions, barriers and progress levers, anticipated solutions, the most active stakeholders, and so on. It allows us to measure progress and identify action areas in which to focus our collective efforts. The 2nd edition of this international survey was conducted by the CSA Institute(1).

Discover the key findings.

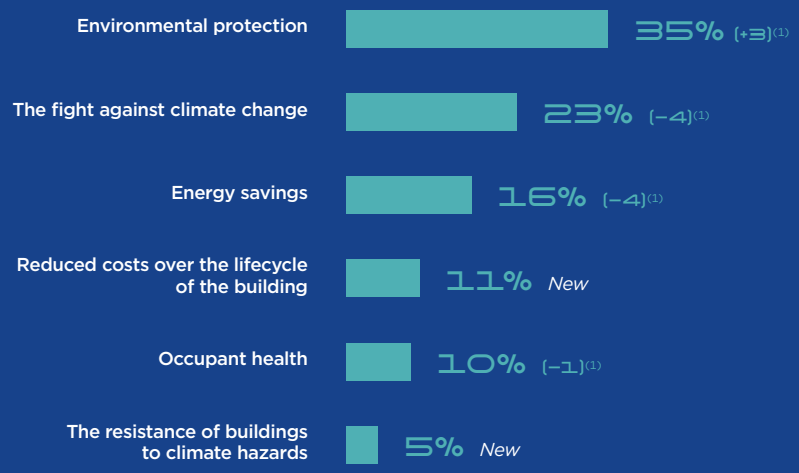
DISCOVER

the full results of the 2024 *Sustainable Construction Barometer*

(1) The Sustainable Construction Barometer 2024 took place between December 11, 2023 and January 31, 2024, with a sample of 1,760 respondents aged 18 and over, from 22 countries: Argentina, Brazil, Canada, Colombia, Czechia, Egypt, Finland, France, Germany, India, Italy, Mexico, Poland, Portugal, South Africa, Spain, Switzerland, Türkiye, United Arab Emirates, United Kingdom, United States, Vietnam.

SUSTAINABLE CONSTRUCTION, A CONCEPT MAINLY ASSOCIATED WITH THE ENVIRONMENT

What do you think should be the main goal of sustainable construction?



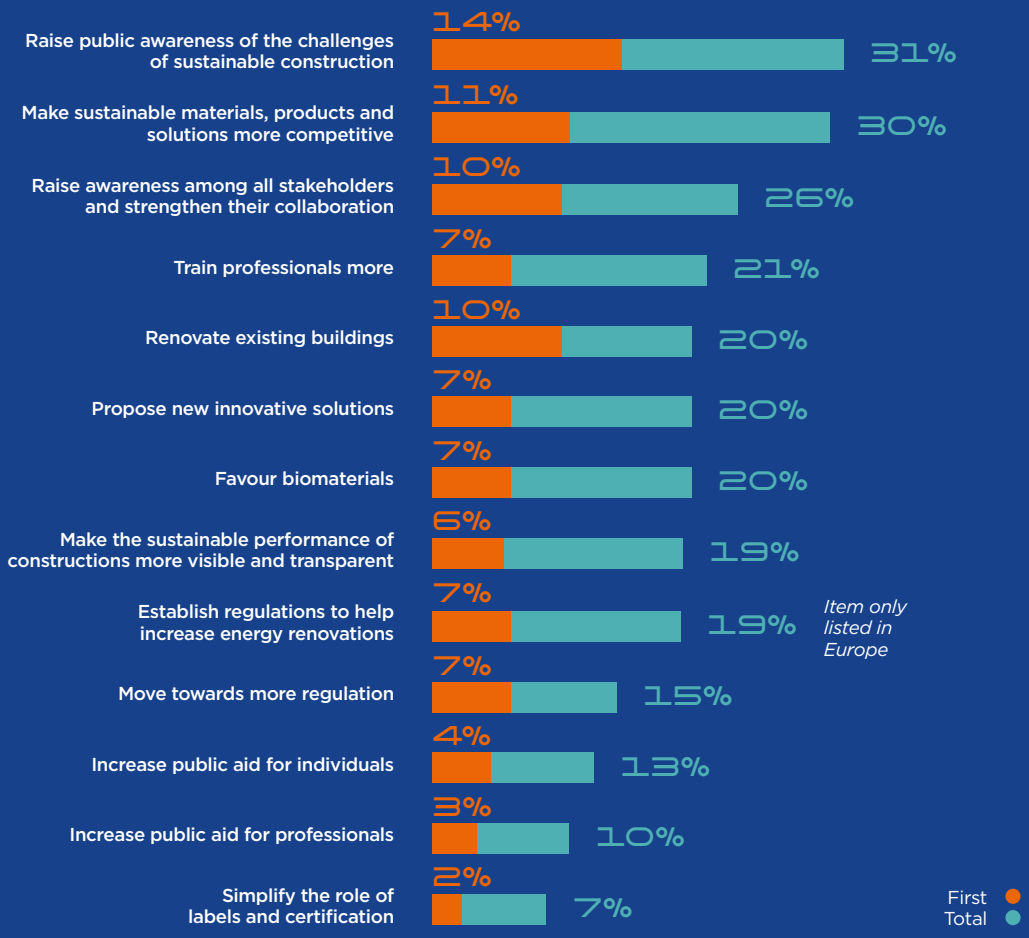
Base: all respondents – One answer allowed

(1) Evolution calculated on the basis of the 9 countries common to the two survey editions (2023 and 2024)

Although almost 9 out of 10 respondents claim to be familiar with the concept of sustainable construction, their understanding of it still seems limited to green construction, and less focused on the well-being of occupants. Environmental protection is perceived as the most important objective of sustainable construction, in every region around the world. Only 1 respondent in 10 links it to the health of inhabitants, even though its definition combines performance and sustainability: “throughout its life cycle, sustainable construction contributes positively to people’s health and well-being, has a reduced environmental footprint, and delivers superior economic value and quality.”

3 PRIORITIES IDENTIFIED BY INDUSTRY PLAYERS: RAISE AWARENESS, ACT ON COST PERCEPTION AND INCREASE COLLABORATION

In your opinion, which of the following actions should be put in place as a priority to accelerate the development of sustainable construction?

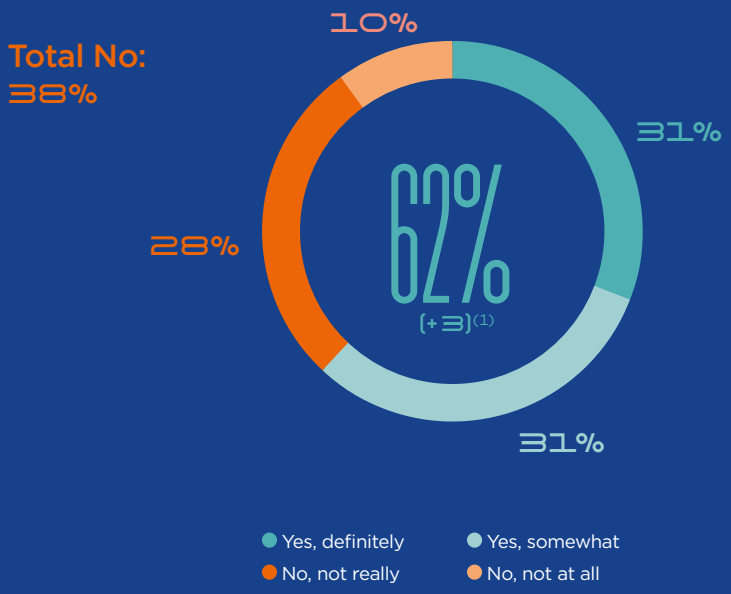


Base: all respondents – Multiple, ranked answers allowed

- One in three respondents consider raising public awareness to be a priority for accelerating sustainable construction, particularly in Africa and Asia.
- Energy renovation appears to be a priority in countries with a well-developed and established housing stock, such as France (39%), the United States (37%) and Germany (34%).
- The role of public initiatives (standards, aid and regulations), though fundamental, remains underestimated by those working in the field. There are interesting regional differences: Europeans are more inclined to request public assistance for private individuals. In North and Central America, the demand for regulation is stronger.

BETTER TRAINED, MORE COMMITTED...
PLAYERS' PRACTICES ARE CHANGING

Is the commitment of your suppliers and partners to sustainable construction a selection criterion for you?



Base: all respondents – One answer allowed

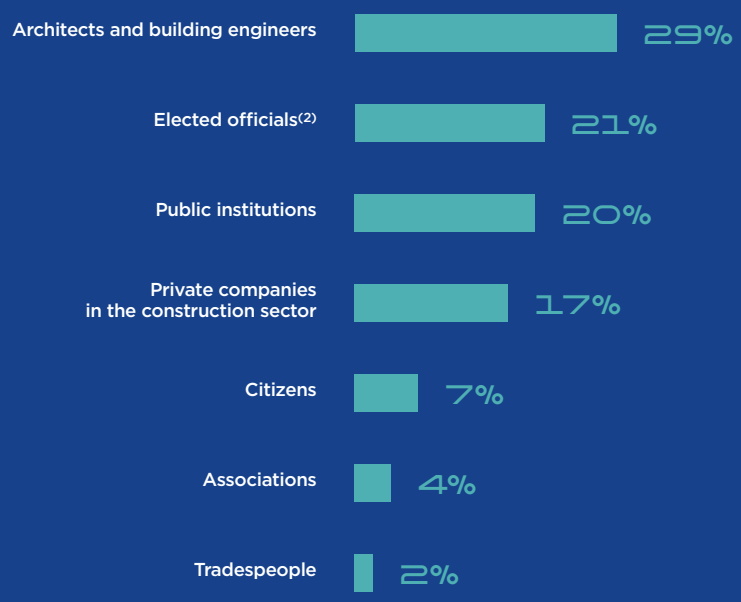
(1) Evolution calculated on the basis of the 9 countries common to the two survey editions (2023 and 2024)

More and more professionals (62%, +3 points compared with the 2023 Barometer, at constant scope) are considering their suppliers' commitment to sustainable construction as a factor in their selection. This is a strong indication of their willingness to become more committed to this type of project.
Other results from the 2024 Barometer are significant:

- 85% of professionals surveyed say some or all of their activity is in sustainable construction, and 92% expect this to be the case in the next five years.
- 51% say they have already benefited from sustainable construction training. This is up six points compared with the 2023 Barometer (at constant scope).
- Students in the sector say they are better informed and better trained now. Their feeling of being informed and having access to training shows an increase of 12 points compared with the 2023 Barometer (at constant scope).

AN IMPLEMENTATION OF SUSTAINABLE CONSTRUCTION THAT NEEDS TO ADAPT TO LOCAL REALITIES

Which of the following do you think are the most legitimate to advance sustainable construction? First?



Base: all respondents – Multiple, ranked answers allowed

(2) "Government officials" listed for United Arab Emirates respondents

For every item studied, the results reveal geographical particularities. On the question of which players are perceived as the most legitimate for advancing sustainable construction: architects and building engineers top the list of players most often mentioned with 29% of responses as first intention, closely followed by elected officials (21%) and public institutions (20%). But there are clear differences between countries:

- In Europe, public institutions come second (with 24% of responses judging them "first").
- Whereas in Canada, the United Kingdom and Vietnam, elected officials come out well ahead (respectively 59%, 67% and 68% of total responses), even before building design professionals.
- On the other hand, in the United States and South America, the role played by private companies seems far more important (respectively 47% and 56% of total responses, i.e. +6 and +15 points compared to the whole sample).


interview

The transition to sustainable construction requires an industry-wide effort – a complex exercise in a sector where the global value chain is particularly fragmented. Irène Skoula heads the Energy and Buildings Programme at C40 Cities, an organization dedicated to bringing cities closer together to confront the climate crisis. In her view, cooperation is an essential component of a successful transition to sustainable building infrastructure. No single actor can achieve the scale and pace of this necessary transition alone.

IRÈNE SKOULA

Director of the Energy and Buildings Programme at C40

How can sustainable construction help accelerate the energy transition of cities?

I.S.: Cities are responsible for around two-thirds of energy consumption, and building construction is responsible for the lion's share. So sustainable construction is key to the energy transition – principles like vernacular architecture, low carbon materials, highly efficient fossil-free buildings, and zero emission construction machinery. People need to be at the center of a clean and just energy transition, and we know that urban clean energy action can drive employment as well. Data shows that investments in residential retrofits and solar PV will generate six times as many jobs as investments in fossil gas.

How does the C40 network facilitate cooperation between cities regarding sustainable construction?

I.S.: It's the core of our mission to bring cities together. Our Clean Construction programme supports more than 40 cities around the globe, working with partners and stakeholders to drive the transition towards decarbonized, resource-efficient, resilient, and just built environments. One key thing we do is raise awareness about the "invisible" impact of the built environment – embodied emissions, resource depletion, air and noise pollution, soil pollution – when sustainable construction principles are not taken into account. We bring cities together and talk to our peers in a trusted environment. We foster leadership with political commitments called "accelerators", such as our Net Zero Carbon Buildings Accelerator that sets concrete pathways for net zero carbon new buildings by 2030 and all buildings by 2050, and our Clean Construction Accelerator, which is our commitment to shift the global construction industry towards a more sustainable future. We focus on getting our mayors into the game and showing the world they are doers, not delayers.

“Collaboration is key. Using an exclusive approach for industry, workers, and the community can help deliver the sustainable construction we all want.”

Do you have examples of significant initiatives, in terms of collaboration between cities?

I.S.: In September 2022, New York City introduced a clean construction executive order which aims to reduce the carbon footprint of the construction industry by 2033 – one of the best executive orders in the world. New York did this because it was inspired by other cities, notably Los Angeles and San Francisco. After talking to them, learning what they were doing, they adapted it to their own state framework. Other cities, like Rio de Janeiro, last year purchased power for municipal assets from renewables because they had seen other cities do it and were able to follow that approach. In Melbourne, retrofit programs are also inspired by other cities.

How do you see the role of international collaboration amongst stakeholders in the transition towards sustainable construction practices?

I.S.: The building infrastructure sector is complex, global, and fragmented. No single actor can achieve the scale and pace of the transition required. Stakeholder engagement is essential, including unions. We develop policies, while workers deliver change. They need to be at the table to ensure their rights and decent salaries, because we cannot do this without them. C40 is also a founding member of the BuildingToCOP coalition, an initiative that brings together leaders from the entire value chain, to put the built environment at the forefront of international climate dialogue.

What are the most effective solutions to help cities transition to sustainable construction practices?

I.S.: There’s no one solution, but there are principles that can be universally applied, like prioritizing existing assets and reusing materials at the end of their life cycle. We need to plan, build, and design for the future. You cannot build here in Greece and neglect rising temperatures

– we get 45 °C in the summer, we need buildings that tolerate this heat. We must ensure safe construction sites and zero emission machinery. Cities can also lead by example. You cannot ask the private sector to take action if you're not taking action yourself. You need to use public procurement powers to develop the right market and make space for innovative technologies to develop.

What's the best way to empower cities to adopt sustainable practices?

I.S.: They need to be equipped with the right information to make sustainable decisions. It's important to dispel misconceptions – for example, that fossil fuels are cheaper, more secure, job creating, and provide economic development. In construction, retrofits have bigger job potential than fossil fuel jobs, as well as health benefits, with improved indoor and outdoor air. Renewables are cheaper and less volatile in terms of price than fossil fuels. So a transition to a renewable energy system delivers economic gains, clean air, green jobs, and secure energy. We need to give this data to our political leaders and dispel the myths, or we can't move forward with sustainable construction.

How can cities work with industry to deliver net zero roadmaps while still meeting demand for increased housing, urban services, and infrastructure?

I.S.: Collaboration is key. We need cities to join with industry to test solutions on municipal buildings before applying them to the private sector. Using an inclusive approach for industry, workers, and the community, this collaboration can help deliver the sustainable construction we all want.

Construction alone accounts for 37%[1] of worldwide CO_2 emissions. To achieve the target of net zero carbon by 2050 will require a rapid and fundamental transformation of the sector. What role will architects, manufacturers, constructors, and politicians have to play in making low-emissions construction projects the norm and accelerating the cultural and material transformation of the sector's ecosystem?

Acting together for a zero carbon world

decarbon

PART 1

iZation

(1) Source: Global Status Report for Buildings and Construction, 2022, p. 42.

SPOTLIGHT The race to decarbonize the construction sector means that priority must be given to the search for innovations and more sustainable alternatives, in terms of both materials and construction methods. Among them, "lightweight construction" is beginning to make its mark. Its growth in recent years has been even faster than that seen for so-called "conventional" construction. There is no doubt that it offers many advantages in meeting the economic and environmental challenges facing the sector.

LIGHTWEIGHT CONSTRUCTION takes off

In contrast to conventional methods, which favor structures with load-bearing masonry walls (made of stone, concrete or brick), lightweight construction uses lighter load-bearing structures in the form of wooden, metal or concrete "skeletons," to which non-load-bearing facade and partition systems are attached. And that changes everything! It significantly reduces the consumption of natural resources and the building's carbon footprint. Professionals see a dramatic reduction in construction time and an increase in productivity. Lastly, users benefit from greater comfort and flexibility when they take up occupancy.

DIFFERENT REALITIES AROUND THE WORLD

Lightweight construction varies greatly from one country to another, and this is its great strength. How and why it is adopted differs according to the availability and cost of materials, the level of training of professionals, the sustainability culture in the country and the market need for residential or non-residential buildings. In some countries where it is still in the adoption phase, lightweight construction is gaining ground based on the economic advantages it brings to projects, in particular through reduced transport costs for materials, shorter construction times and

In Brumunddal, Norway, the Mjøstårnet tower is one of the tallest wooden buildings in the world (85 meters and 18 floors). It is a model for light construction, designed by Voll Arkitekter.

the use of off-site construction. It also increases the market value of buildings by optimizing their energy efficiency and helping to limit maintenance costs. In countries where government initiatives encourage more sustainable solutions, or impose strict environmental standards, lightweight construction is chosen for its superior performance in terms of circularity (better planned and optimized consumption of resources, dismantlability, recyclability, re-usability) and for the reduction in embodied carbon and energy it provides. Lightweight construction also reduces building site waste by using less raw material, or by taking advantage of pre-assembled frameworks that can be manufactured and assembled more precisely off-site.

SHARE OF LIGHT CONSTRUCTION

Canada	91%
USA	89%
Sweden	75%
England	58%
Germany	48%
Netherlands	46%
Spain	39%
France	35%
Italy	32%
Chile	24%
Brazil	24%
China	20%
India	10%

Source: Study Ducker – September 2023

SOME LIGHTWEIGHT CONSTRUCTION PRACTICES USING WOOD, METAL OR CONCRETE

To achieve good thermal performance, lightweight construction materials must include insulation (glass wool, stone wool, wood fiber, etc.) to maintain comfortable indoor temperatures, reduce heating and air-conditioning requirements and cut energy consumption.

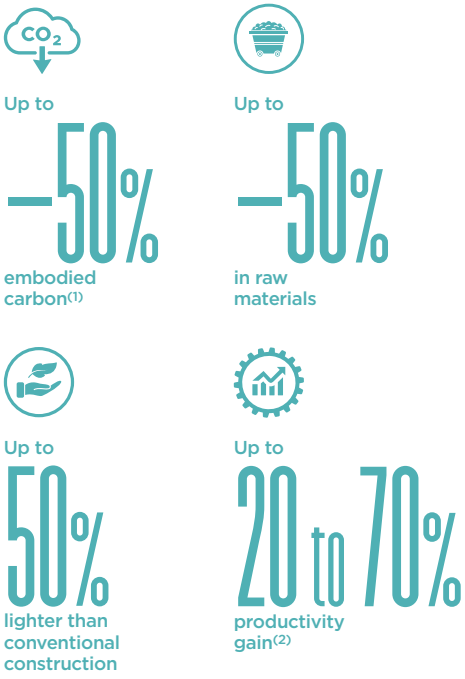
In terms of energy, the advantage of wood construction lies in the reduction of heat loss resulting from thermal bridges in the structure. Wood construction is popular in many countries in North America and northern Europe.

In these areas, wood is an affordable and readily available resource, and forest management has ensured the sustainability of the solutions used. Another popular lightweight construction technique is Light Gauge Steel Framing (LGSF), which is prefabricated off-site, then easily transported and quickly assembled, saving time and money over the entire project. This offers many environmental advantages.

As LGSF is often made from recycled materials, construction projects do not require the production of new steel. And, at the building's end of life, the same steel can be recycled again, promoting circularity and waste reduction.

Concrete also has a role to play in lightweight construction. While it is often disparaged, there are now solutions to make it more compatible with the requirement for decarbonization. The incorporation of materials to replace cement (a major factor in concrete emissions) has resulted in ultra-low-carbon concretes that meet the requirements for sustainable construction.

BENEFITS OF LIGHT CONSTRUCTION



(1) In the structure and envelope of the building over the entire life cycle of materials.
(2) Productivity gain at certain stages of construction (pouring screed, erecting walls or facades, etc.).

Deloitte's office building in Hyderabad, India. Its glazed facade required 76% less installation time than brick exterior walls.

WHAT DOES THE FUTURE HOLD FOR LIGHTWEIGHT CONSTRUCTION?

With its reduced environmental impact combined with increased circularity, modularity and flexibility, lightweight construction is set to make its mark on our cities. It could speed up the race to decarbonize construction and renovation, and make it easier to meet the growing demand for healthy, sustainable housing. The levers for its development depend on the reality in each country, but some common factors emerge. Above all, lightweight construction needs to be better known by all players in the construction sector, and better understood through the acquisition of the right skills. In addition, there are some obstacles to be overcome, with more incentive-based regulations, better cost control and more accessible LCA (Life-cycle assessment) data.

LISTEN

to episode 8 of our *Constructing New Wor(l)ds* podcast on Lightweight construction.

SPOTLIGHT Despite centuries of faithful service, concrete now displays an environmental footprint demanding a radical change. But does this mean it should be replaced entirely? Not if innovation can transform it into a more sustainable material.

Reinventing CONCRETE

Used for over 2,000 years, concrete is currently the most consumed material in the world after water, according to the Global Cement and Concrete Association. However, its environmental footprint is very high: it accounts for nearly 8% of global CO_2 emissions according to the think tank Chatham House.

UNRIVALED PROPERTIES

Faced with population growth and rapid urbanization, it seems difficult to do without concrete. There are very few other candidates capable of surpassing its strength, especially for large-scale construction, heavy industrial construction, and infrastructure. Many structures built with this material have been standing for at least a century. In this regard, concrete is undeniably durable. Concrete is also highly resistant, both to fire and natural disasters. Another advantage is its high thermal inertia. This thermal mass makes it capable of storing heat or coolness, gradually releasing it and reducing the need for air conditioning in summer. In this sense, it is superior to wood, for example.

CONSTRUCTION CHEMICALS FOR DECARBONIZATION

The main criticism of concrete stems primarily from the environmental footprint of its main ingredient: cement. Preparing concrete requires gravel, sand, cement, and water. Cement, or more precisely one of its components, clinker, is obtained by mixing crushed limestone and clay, which are then heated to very high temperatures. It's this step that emits CO_2 and consumes a considerable amount of energy, ultimately being largely responsible for concrete's carbon footprint. That's why research is focusing on reducing clinker usage in concrete. Several options exist. Firstly, by attempting to reduce energy consumption related to the calcination of raw materials, whether through renovating industrial processes or installing more efficient kilns. It's also possible to operate them using cleaner energy sources,

Lightweight construction significantly reduces concrete consumption.

sometimes from biomass, partly replacing fossil fuels. Furthermore, several levers exist to reduce concrete's carbon footprint: adding activators in cement formulation, allowing for a reduction in clinker quantity (with equivalent performance), and admixtures. Through this, companies like Chryso, for example, enable Hoffmann Green to deploy a cement with a carbon footprint divided by five. Alongside efforts to reduce the carbon footprint of concrete, we also need to use less of it. Light construction, by limiting its use to the load-bearing structure and foundations, can significantly reduce concrete consumption in new buildings...

WOOD AND BIO-SOURCED MATERIALS... WHY THEY CAN ONLY BE A COMPLEMENT

Should alternatives be sought from wood and bio-sourced materials? Wood, straw, hemp, and raw earth undoubtedly have their place in the mix of materials for more sustainable construction. But given the needs of the construction sector in terms of volume, cost and productivity, can we be sure of the feasibility of a total switchover to these solutions? Indeed, by 2050, an additional 2 billion humans will inhabit the Earth, and construction needs to be fast and not (too) expensive. Forests are fragile carbon sinks. The various uses to which soils are put, notably for human consumption, must also be preserved. Thus, these solutions are undoubtedly complementary, but in any case, cannot completely replace concrete. The future is more likely to lie in mixed use, for example with structures combining wood, concrete or steel. And to coexistence with traditional materials with a high recycled content and a very low carbon footprint.

LISTEN

to episode 11 of our *Constructing New Wor(l)ds podcast* on *Clinkerisation.*

SPOTLIGHT Air conditioning is at the heart of a global controversy, which is showing no signs of easing. Accused by some of aggravating global warming, it provides others with welcome – even vital – comfort. In the face of such antagonism and in a context of increasing greenhouse gas emissions, solutions are to be found in less energy-intensive equipment, better use of conditioned air, innovative technologies, and improved adaptation of our accommodation and living environments.

IS A WORLD WITHOUT AIR CON possible?

There are currently two billion air conditioners worldwide, with some 135 million new units being added each year. The International Energy Agency (IEA) predicts that this number will triple by 2050 with the increase in income in emerging countries such as India, China, and Indonesia, combined with the impending rise in temperatures. Half of the appliances will be concentrated in Asia alone. However, the Old Continent will not be left out: by the end of the century, there will be up to 100 days a year above 35 °C in Southern Europe, which will heighten demand. In France alone, the ownership rate could reach 50%.

LISTEN

to episode 12 of our *Constructing New Wor(l)ds* podcast on *Urban heat islands*

FOR BETTER OR WORSE

Air con has its good side. According to the IEA, it saves tens of thousands of lives each year, if only in residential care homes for the elderly or hospitals. In Japan, where 90% of households have access to conditioned air, 30,400 heat-related deaths were able to be prevented in 2019, compared to just 2,400 in India, where no more than 11% of households are equipped with air conditioning. However, air conditioning aggravates heatwave phenomena. To pump cold air inside, the same amount of hot air has to be emitted to the outside, which contributes to heating the ambient air and further increasing the need to cool living spaces. A truly vicious circle that encourages the appearance of heat islands in the urban environment (+1 °C at night in the city center) and, according to the IEA, is responsible for the emission of around one billion metric tons of CO_2 per year, out of a total of 37 billion. Not to mention the associated release of hydrofluorocarbon (HFC) refrigerant

Train Passive House City, the largest complex of passive houses in the world, is under construction in Gaobeidian (China), 100 km south of Beijing.

gases, whose greenhouse effect is 14,000 times more powerful than carbon. In terms of energy, air conditioning's projected development is also a source of concern. If India or China were to reach a 50% ownership rate, the annual production of a country like Norway would be required to provide the necessary electricity. Quite apart from any consumption peaks during warmer months, which are difficult to manage for electricity producers and lead to power cuts.

PASSIVE HABITATS, A REAL ASSET IN THE FIGHT AGAINST AIR CON

Passive buildings, with up to 80% lower energy consumption, are an effective alternative to the systematic installation of air-conditioning units. Reinforced thermal insulation, airtightness, balanced ventilation, orientation according to the cardinal points and winds, revegetation of the surrounding areas, installation of double or triple glazing with solar control, fitting of blinds or shutters, etc. All these options naturally reduce the indoor temperature. In Gaobeidian, 100 km south of Beijing, China is building the largest complex of passive houses in the world: Train Passive House City.

Materials play a leading role in passive houses. So-called "phase-change" materials used for the construction of "thermal walls" are offering new prospects. These paraffin substances have a melting point that can be adjusted, for example to 20 °C. As soon as the ambient temperature exceeds this level, the materials "melt", absorbing heat. When the temperature drops, particularly at night, they resolidify and release the latent heat. Meanwhile, a green or reflective white roof protects

housing, limiting the temperature rise indoors and cooling it in summer. When it comes to this principle of maintaining moderate temperatures, certain age-old architectural practices are also proving extremely pertinent, such as the construction of wind towers (natural ventilation system inspired by the Middle East), cross ventilation (creation of smart air flows), using terracotta with excellent thermal performance, etc.

TOWARD MORE VIRTUOUS AIR CONDITIONING

In parallel, innovation in terms of air conditioners themselves is continuing to make them greener. Many start-ups are working on more energy-efficient equipment whose temperature cannot go below 24 °C. Others are coming up with alternative cooling systems. Already tried and tested in Austria and Switzerland, the 22-26 concept (with an indoor temperature oscillating between

In New Delhi (India), air conditioners cover the façades of buildings, yet fewer than 11% of Indian households have air conditioning.

Up to 80% of the energy needed for heating or cooling can be saved by insulating. Here, an interior insulation project. © Isover

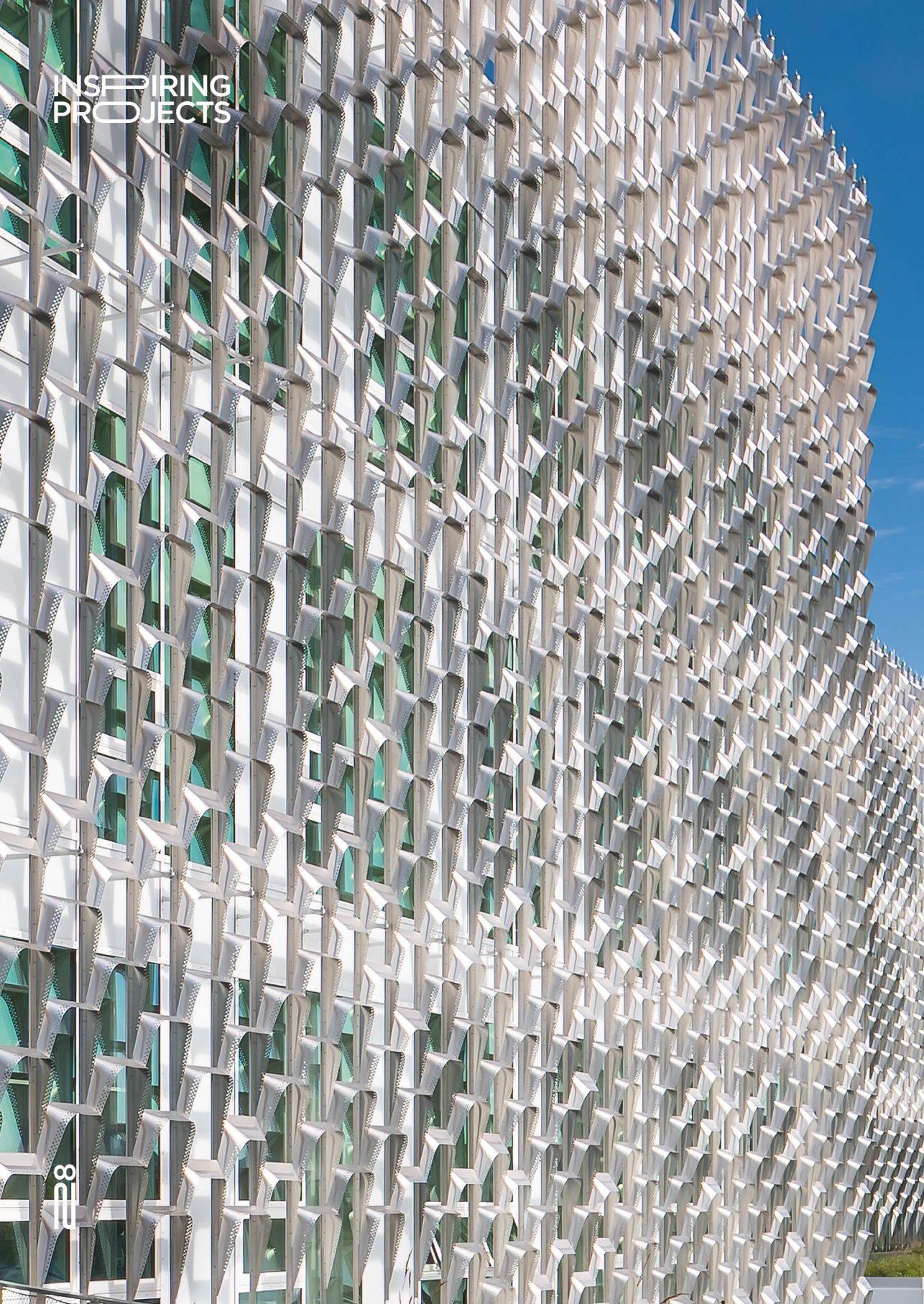
these two markers) from the firm Baumschlager Eberle Architekten (BEA) does not require a heating, ventilation, or cooling system. A first building with 24 housing units using this method will be inaugurated in Lyon (France) in 2025 in the Confluence neighborhood. For its part, “free cooling” cools down a building by using the temperature difference between the outdoor and indoor air or very cold water, harnessing shutters and ventilation. Seawater heating is a variant of this system, in which water is used to cool buildings.

LAWS GOVERNING PRACTICES

In fact, countries are not standing idly by in the light of the surge in air conditioning units and their consequences. In France, the government recommends setting the air conditioning no lower than 26 °C. In Italy, a law from 2022 forbids lowering thermostats below 25 °C in all areas. In parallel, renewable energies are encouraged in order to reduce the carbon dioxide emissions linked to the electricity consumed by air conditioners. Nonetheless, all the actions on an international scale are being taken without consultation, hence the need for genuine political will, strengthened legislation, and better regulation of practices. The few existing thermal regulations could one day serve as a helpful basis for a long-awaited global standard. While a world without air conditioners may be a utopian dream, solutions exist to stem their pernicious effects in the more or less short term. Manufacturing more energy-efficient air conditioners, adapting our buildings and environments to make them less vulnerable to heat, changing our lifestyles, developing innovative technologies, etc., with – in our sights – the challenge of a proactive policy to regulate their use on a global scale.

A building using an alternative cooling system will be inaugurated in Lyon (France) in 2025.

THE PLUS, MAGNOR (NORWAY) The plant belonging to Vestre, a Norwegian urban furniture manufacturer, was the first in the category of sustainable industrial sites to achieve the BREEAM standard's "Exceptional" level, which corresponds to the highest environmental certification. The glass façades have been designed to ensure maximum transparency and 60% less energy consumption than conventional factories. Their surface area exceeds 2,000 m^2. The Plus is also fitted with 900 photovoltaic panels (250,000 kWh/year), 17 geothermal wells, and heat pumps integrated into the walls to absorb excess heat from the machines required to manufacture the products.



HARVARD UNIVERSITY SCIENCE AND ENGINEERING COMPLEX, BOSTON (UNITED STATES) The Science and Engineering Complex (SEC) was designed to become the "most sustainable building on the Harvard campus." Its building, extending over more than 30,000 m^2, has received LEED Platinum and Living Building Challenge (LBC) certifications. The fin-covered façade protects the interior from overexposure to the sun in summer, while letting the sun's beneficial rays enter in winter. Heating and cooling expenses are thus reduced. By concentrating the technical infrastructure (heating/air conditioning, fluids, energy) at the center of the building, unlike conventional constructions that place it on the periphery, the architects wanted to give priority to natural light through large glass atriums combined with internal glazed partitions. A high-performance heat recovery system housed in the roof's mechanical enclosure captures more than 90% of heat loss.

INSPIRING PROJECTS

OSTRO PASSIVHAUS, KIPPEN (UNITED KINGDOM) This passive house built in Kippen near Stirling in Scotland is exemplary for its low energy consumption thanks to an original construction method known as a "box within a box." The building's inner box contains all the wet services (water and fluids), connections, and air flows. The rooms are designed as spaces between the inner and outer boxes. The outer box is a rain screen of timber cladding with triple-glazing openings that are vertically oriented and perforated along a north-south axis. The weathered wood cladding reflects the forest the house faces.

SPOTLIGHT AI, BIM, digital twin, IoT... Digital technologies have penetrated the construction sector to drive new ways of designing buildings and controlling their environmental impact. How? By making them smarter!

When Tech meets the CLIMATE CHALLENGE

AI FOR BUILDINGS WITH OPTIMIZED CONSUMPTION

Already implemented in the construction sector, for example to simulate real estate projects or monitor construction work in real time, artificial intelligence (AI) systems are now integrating buildings to encourage a reduction in their carbon emissions. Thanks to smart meters and sensors, AI relies on precise and detailed data on how the building is used in order to suggest optimizations. Moreover, turning to AI helps anticipate energy needs according to past consumption models, weather conditions, and other factors in order to optimize energy production and distribution. A system of this kind was put in place in 2020 in two high schools in Bergneustadt near Cologne (Germany), by Vinci Facilities Solutions and Dabbel, a company specializing in self-sufficient building management. 20% to 30% savings on energy costs have been noted.

BIM TO MODEL ENERGY EFFICIENCY

Building Information Modeling (BIM) is a construction project management methodology based on a 3D digital model with structured data. It promotes collaboration and optimizes the analysis, simulation, and control of various aspects such as the project's design, construction, logistics, and environmental footprint.
Widely adopted in the United States, BIM is mandatory in certain countries such as Chile, South Korea, and Denmark, and is growing in Europe, especially France. It may evolve toward RIM (Resource Information Modeling), which ensures the

20% to 30%
energy savings thanks to AI in two high schools in Bergneustadt near Cologne (Germany).

Inaugurated in 2018, Istanbul Airport (Turkey) used digital technologies in its design and construction, to limit its environmental impact.

traceability of materials, calculation of their carbon impact, and planning of their deconstruction and recycling. In recent years, BIM has been used in the construction of major infrastructure such as Istanbul airport (Turkey), one of the largest in the world and Baku National Stadium (Azerbaijan), entirely designed using BIM to be as energy-efficient as possible.

DIGITAL TWINS FOR REAL-TIME PERFORMANCE OPTIMIZATION

Digital twins are virtual models of objects designed to accurately reflect a physical object, such as machines or buildings, created using precise and continually updated data. Fed by Internet of Things (IoT) sensors installed on equipment, they collect direct information from their use. Integrated into the BIM process, they offer a virtual representation, a real "living" parallel version of the project in real time throughout its life cycle. Sustainable construction players use them, among other things, to optimize resources, monitor energy efficiency, predict maintenance needs, and reduce GHG emissions. Ranked at the top of IMD's(2) Smart City Index in 2020 and 2021, the city-state of Singapore has created its "Virtual Singapore" digital twin in collaboration with the French software company Dassault Systèmes, to obtain real-time information about temperature, humidity, sunshine, traffic, or noise levels, that is useful for optimizing the city's functioning.

DISCOVER

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(1) Barometer on the use of digital technology and BIM by construction professionals.
(2) The International Institute for Management Development is a management school based in Lausanne (Switzerland) and Singapore.

In Europe, almost 75% of existing buildings are energy inefficient and require large-scale renovation[1]. On the European continent, and indeed in every geographical zone with highly developed building stock, the challenge is considerable. How best to create momentum in this market and in energy renovation projects? It will be a question of organization and collective planning, to which the sector must respond.

Taking up the challenge

renovatio

PART 2

(1) Figure obtained from the Council of the European Union website, February 2024.

SPOTLIGHT The energy renovation of buildings is THE 21st-century undertaking that will make it possible to achieve the goal of zero net carbon emissions. A key issue at stake in the EU's Green Deal for 2050, it is a major lever in this initiative, delivering concrete solutions to the challenges of the climate emergency, accelerating innovative solutions, reducing energy consumption, and eradicating insecurity.

What is the purpose of ENERGY RENOVATION?

A CLIMATE PRIORITY

The opportunities for energy renovation in the European Union are as vast as the territory of its 27 Member States. At present, more than 97% of the buildings inventoried must be modernized to meet energy-efficiency criteria. According to the European Parliament, they account for 40% of the EU's final energy consumption, 36% of its CO_2 emissions, and 55% of its electricity consumption.
The stakes are enormous. So much so that in 2020 the European Commission defined its "renovation wave strategy", with a view to doubling the annual renovation rate by 2030. As well as reducing emissions, these renovations will improve the quality of life of those living in and using the buildings and are set to create many additional green jobs in the construction sector.

NO TO DEMOLITION, YES TO RENOVATION

To launch the sustainable mass roll-out of energy renovation in Europe, several avenues are being explored to launch a massive and sustainable energy renovation program in Europe... On the European continent, support and incentive policies by the European Union and its Member States have accelerated significantly in recent years. Alongside the regulatory aspect, initiatives are being taken to finance renovation, including the additional effort made by the Union as part of

Avoiding the need to demolish in order to rebuild: this is the aim of a massive and sustainable energy renovation program in Europe.

its NGEU (Next Generation EU)[1] program to help certain member states make environmentally-friendly investments. Elsewhere in the world, renovation is a must. In the United States, the State of New York thus implemented its ambitious Climate Mobilization Act in 2019 – 50,000 large-sized buildings to be renovated, an €18 billion market by 2030, and the creation of 141,000 local jobs, becoming the sixth American state to adopt a "zero carbon" goal, after Hawaii, California, New Mexico, Nevada, and Washington.

REDUCING OPERATIONAL EMISSIONS

Successfully achieving these goals relies on the trio of energy efficiency, conservation, and decarbonization. To this end, insulation (indoor and outdoor) is an essential starting point, primarily concerning a building's envelope and glass surfaces. This is followed by installing a controlled ventilation system and high-performance heating and air conditioning equipment. All these measures sustainably reduce the cost for occupants while providing comfort, summer and winter alike. The results can already be seen, with energy consumption reduced 5.5-fold and CO_2 emissions down 12-fold on average.

(1) European Commission economic recovery program to help EU member states recover from the Covid-19 pandemic.

A question of public health

In Toronto, for example, a study of the impact of exposure to fine particles demonstrated that making residential buildings (ventilation, etc.) compliant with the Building Code would allow savings of up to $2.3 billion/year in healthcare costs[2]. In France, the Ministry of Ecological Transition[3] calculates the health and social gain generated by renovating just one of the 1.3 million housing units considered to be the country's worst "heat-leakers" at €7,500/year on average. Is there still a need to stress the health and economic benefits of building energy renovation? While the issues at stake and solutions are now known, action remains to be taken on a wider scale.

(2) Impact of residential building regulations on reducing indoor exposures to outdoor PM2.5 in Toronto – Zuraimi, M.S. and Tan, Z, 2015.

(3) Study "Renovating homes for energy efficiency: significant health benefits", Ministry of Ecological Transition, March 2022.

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INSPIRING
PROJECTS

DISCOVER

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HOUSE OF MUSIC, BUDAPEST (HUNGARY) Inaugurated in 2022 in Budapest, Hungary, the House of Music is an ambitious urban renewal project that gives a new face to the Hungarian capital. The Japanese architect Sou Fujimoto envisioned it as "a sound wave suspended at the treetops". The building and the landscape intertwine in perfect osmosis, despite the 9,000 m² of this exemplary building in terms of energy transition, using geothermal energy and sustainable materials. The boundaries between interior and exterior are blurred thanks to huge solar-controlled thermal glass panels, which form a true translucent curtain.

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QUAY QUARTER TOWER, SYDNEY (AUSTRALIA) Quay Quarter Tower in Sydney's business district (Australia), built in 1976, epitomizes the possibility of recycling a high-rise tower (206 m) using innovative solutions. Rather than demolishing the 45-floor building, the project drew on a host of innovations, keeping 98% of the original structure and adding nine extra floors. The unique design of Quay Quarter Tower's facade with high-performance glazing and sunshades improves occupants' thermal comfort at the same time as reducing energy consumption for air conditioning.


DOLCE&GABBANA
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CITIC SQUARE
中信泰富广场

SHANGHAI

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CITIC SQUARE, SHANGHAI (CHINA) Citic Square shopping mall in Shanghai's Luwan district (China), built in the 1990s, had aged over the years and become less attractive, leading to the implementation of a renovation project completed in 2017. This multi-faceted initiative included the complete refurbishment of the building's exterior, with the creation of a new facade made of high-performance glass and stainless steel. The restoration of Citic Square's interior spaces paid particular attention to creating an airier, more luminous environment with LED lighting for energy conservation and an airflow functioning as a large-scale heat pump.

In 50 years, worldwide consumption of natural resources has tripled. And it continues to grow by, on average, 2.3% a year[1]. The construction sector is responsible for 50% of this consumption and must accelerate its transition to a circular economy across the entire value chain, from raw materials management to buildings' end of life.

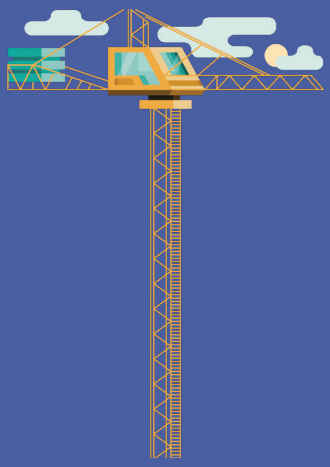
Resource preservation: a shared necessity

circularity

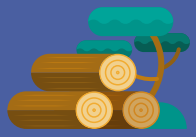
PART 3

(1) United Nations Global Resources Outlook, 2024.

DATAVIZ In light of the exhaustion of certain natural resources and the limited utilization of others, the building sector has to make a change in its procurement practices, prioritizing renewable materials or those from recycling streams. What are these resources? In what quantity and how are they utilized worldwide?



From the raw to the final MATERIAL



Wood

Production: 4 Gm³/year (resinous trees, deciduous trees, and tropical timber).
Use: half serves to produce energy (80% in emerging countries), the other half is used as lumber (packing, construction, carpentry) and industrial wood (panels, furnishings, and papermaking pulp).

Clays

Production: Specialty clays **17 Mt/year,** china clays **25 Mt/year.**
Use: clay is used (raw) to manufacture sustainable insulating aggregates or concretes. It serves (once fired) to produce ceramics, concrete, bricks, paints, insulation, fiber glass.

Aluminum

Production: 69 Mt/year of primary aluminum (2022) **37 Mt/year** of recycled or secondary aluminum (2021).
Use: due to its growing use in low-carbon technologies, aluminum is used in construction (25%), transport (23%), electricity (12%), equipment (11%), sheets (9%), and packaging (8%).

Gypsum

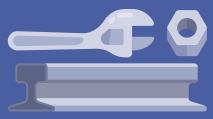
Production: 150 Mt/year, in 2022
Use: gypsum serves to make plaster: gypsum board and primers (40%), specialty concretes (57%). There is a synthetic gypsum, desulfogypsum (139 Mt worldwide) obtained by the desulfurization of flue gas from burning coal. After processing, this gypsum is reconditioned into plaster.

Plant Fibers

Production: 128 Mt/year of bamboo (estimate), **26 Mt/year** of hemp, flax, and cotton.
Use: bamboo is used for construction (32%) and furnishings (33%). Hemp (245,000 t in 2021) serves as an additive or covering material. Flax (1 Mt in 2020) is used as insulation or a structuring element for panels. Cotton (25 Mt in 2022), primarily destined for the textile (60%), automobile, and furnishing (35%) industries, is also a component of insulation and construction materials.

Animal fibers

Production: 1,8 Mt/year of wool.
Use: wool is used in construction (7% to 15%) for insulation and floor coverings and filtration (industry). Other animal fibers such as duck and goose feathers are appreciated for their extremely effective thermal performance.



Iron

Production: 1,6 Gt of ore. 1,885 Gt of steel (2022).
Use: iron and steel are primarily used in construction and for infrastructure (52%), followed by mechanical equipment (16%), automobiles (12%), and metal objects (10%). In the EU, 37% of the iron is used for construction. Worldwide, 50% of steel is destined for the building sector and transport infrastructure.

Natural silica

Even if natural silica forms 28% of the earth's crust, it is a critical material. It makes up three of the most important raw materials: sand, industrial silica, and diatomaceous earth.

Industrial silica

Production: 380 Mt/year worldwide (2022).
Use: 15% for glass manufacture (which contains over 65% of it), around 5% for foundry operations, 3% for mineral filler (paints, plastics, resins, etc.), 3% for construction products. Over half of the industrial silica in the United States is used for hydraulic fracturing and concreting hydrocarbon extraction wells. It also serves to produce metallurgical silicon (3.5 Mt/year) for electrometallurgy (electronic and photovoltaic components) and synthetic silica production, including silica fume (1.8 Mt/year worldwide) injected into high-performance concretes.

Diatomaceous earth

Production: 2,5 Mt/year in 2022
Use: for filtration (50%), manufacturing cement (30%), mineral filler (paints, 15%), insulation, abrasive materials, absorbents (5%).

Sand

Production: 50 Gt/year of which **6 Gt/year** is coastal and marine sand.
Use: for construction (2020), 2/3 of which is for concrete, and the rest for roads and backfilling.

SPOTLIGHT What if, to encourage more sustainable construction, all we had to do was look under our feet? Excavated earth, the subsoil traditionally discarded as waste on building sites, turns out to be a valuable resource once we start thinking circularity. This innovative, ecological and economical construction solution deserves to be recognized.

CIRCULARITY

Is soil the new construction goldmine?

Subsoil offers the construction industry a hybrid solution; not only does it help reduce our reliance on natural resources – like sand and aggregates – but it also holds natural properties that can contribute to building efficient and comfortable environments – thermal inertia, hygrometric regulation, heat storage capacity, to name a few. Think about it this way: we can build walls, and floors, that keep our spaces cool in the summer and warm in the winter, regulate humidity levels, and purify the air, all while achieving significant carbon reductions.
This durable product can be used for new constructions and renovations, and, at the end of its lifecycle, broken down and reused, or sent back to nature. Cost-wise, this alternative is in the end comparable to traditional blockwork construction.

10 TIMES LESS CARBON EMISSIONS THAN CONCRETE BLOCKS

The embedded carbon associated with producing the blocks – extracting the soil, transporting it to a manufacturer, transforming it into a block, and taking it back to the construction site to be implemented into the building – is one-tenth of the embedded carbon of concrete blocks.
However, changing the practice of an entire industry will not happen overnight. This requires adaptation by all stakeholders, trained in construction techniques using concrete, steel and glass.

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DATAVIZ

The transition to more responsible water management represents a challenge as well as an opportunity for the construction sector, which is one of the most water-intensive industries: 42% of the water used on a building site is wasted. From mixing concrete through wetting dry surfaces to washing equipment, water is a crucial resource at every step in the construction process.

WATER

The 5 habits of an exemplary building site

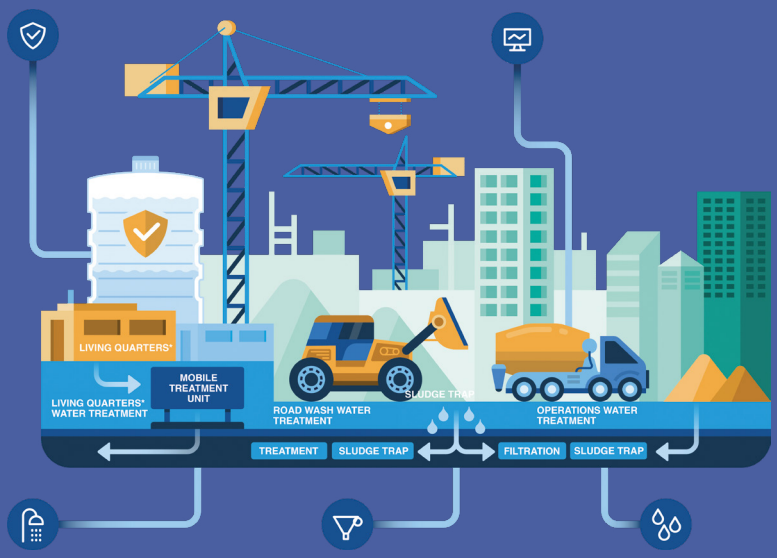
Save the resource

Consider the impact of the climate and weather on operations (e.g., do not pour concrete in hot weather, so as not to have to spray it too much to prevent cracks).
Provide containerized equipment to obtain drinking water from raw water as well as rain barrels for the site's needs.

Monitor consumption

Sets targets in the program of requirements.
Place meters (drinking water and harvested rainwater) in the living quarters1 and equip the highest-consumption (fixed or mobile) devices with water meters.

Identify areas of overconsumption by monitoring the ratio between rainwater consumption and drinking water consumption.
Communicate with workers on the site, displaying the site's consumption.



Manage the living quarters(1) wastewater

If it is not possible to connect to the sewage system, wastewater must be treated on site via a mobile treatment unit before being released into the natural environment.

Treat road wash water

Rainwater is managed according to its pollution potential and then treated in different steps (sludge removal, hydrocarbon treatment, sedimentation, filtration, etc.).

Re-use operations water

Full of aggregates, sand, concrete, and fine particles, it must be treated before being re-used, to clean equipment for example.

(1) Temporary construction to accommodate and protect workers and supervisors throughout the building project.

SPOTLIGHT Reusing and recycling substances and materials has become a must over the past several years, to the extent that it now represents a sales argument among mass retail consumers. However, in the construction field, has the use of secondary materials (diverted from the dumpster) really reached its full potential? The example of gypsum, the construction industry's uncontested champion, shows that the road is long, but that the sector is making great strides.

GYPSUM RECYCLING on the right track

Light, cheap, and modular, a thermal and acoustic insulator, and offering excellent fire protection, gypsum has established itself as a must-have in the construction industry all around the globe. In most European countries, as well as the United States, Canada, and a number of Asian countries, recycling streams have been put in place for gypsum-based products.

A WORLD ON THE MOVE

Because the recycling chain requires the involvement of many players, establishing a partnership approach between construction professionals and collection and processing companies is essential (see infographic). In Norway, a partnership between Saint-Gobain, the waste collection company Ragn-Sells, and the reprocessing equipment provider GRI offers actors working on building sites a service that handles the recycling of their gypsum waste and plays a role among decision-makers (architects, social landlords, etc.).

In other countries, we are seeing the introduction of regulations that promote the circular economy for gypsum. In England, Germany, and the Canadian province of British Columbia, it is forbidden to send gypsum-based waste to landfill. All around the world, the costs and constraints in this regard are increasing, which is encouraging a circular approach. In Italy, a decree stipulates a minimum recycled content for construction materials used in public projects: it is 5% for plasterboard. In France, since the Anti-Waste for a Circular Economy Law (Agec) in February 2020, the introduction of Extended Producer Responsibility (EPR) for construction materials – a world first – economically supports recycling streams and sets ambitious recovery targets per stream. With this in mind, in 2022 Placo® launched the world's first plasterboard made from 50% recycled plaster.

To give a gypsum board a second life, it must be properly dismantled and remain in excellent condition.

THE RE-EMPLOYMENT CHALLENGE

On the other hand, the re-use of plasterboard is virtually non-existent at present. The primary obstacle: the dismantling of a plasterboard by the book and the excellent condition required to give it a second life in a similar condition.

In the Netherlands, the company Juunoo is behind an innovative mounting system, guaranteeing clean dismantling thanks to a self-adhesive joint strip and grouting that come off easily after use. After removing the strip, the screws are completely visible, which facilitates dismantling from the wall without damaging the boards and encourages re-use elsewhere at a later date.

But it's above all upstream of projects that the re-use of gypsum needs to be considered. This is the case, for example, for the Athletes' Village of the Paris 2024 Olympic and Paralympic Games: the 60,000 m^2 of interior partitions have been specially designed to be dismantled, and most of the materials will be re-used. They will enable the athletes' rooms to be easily converted into accommodation and student rooms after the competitions. So, re-use is well on the way!

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Almost 70% of the world's population will live in urban areas by 2050[1]. Increasing urbanization is feeding considerable demand for construction and poses major questions in terms of housing, comfort, accessibility, and environmental footprint. How best to shape urban spaces that are both sustainable and pleasant to live in?

Co-building an attractive urban future

urbaniza

PART 4

tion

(1) Source: World Bank.

SPOTLIGHT Rolling out sustainable construction in the countries of the Global South is vital, as there is set to be a dramatic increase in urban expansion there. Attitudes, practices, and methods are already changing. However, final obstacles must still be removed, from the proper application of construction standards to a shift in mindset.

REDUCING CONSTRUCTION'S environmental consumption in the countries of the South

Our planet is becoming increasingly urbanized and cities keep on expanding. This phenomenon is particularly visible in the Global South[1] (also known as the countries of the South). According to the United Nations Human Settlements Programme (UN-Habitat), their surface area will increase by 34% within 50 years (compared with 2020 levels) in high-income economic areas and most importantly by 141% in low income areas. Faced with the imperative to house significant flows of new citizens and create or resize tertiary real estate, a great many construction projects must be launched in the Global South. The priority is to make them as low-carbon as possible.

PLAYING THE LOCAL CARD

Ideally, sustainable construction materials should be sourced locally to prevent transport-related emissions. According to Bundit Pradabsook, Commissioner of the Association of Siamese Architects under Royal Patronage, using drywall materials in Thailand, such as gypsum in high-rise buildings, can save their occupants up to 27% on their air conditioning bills: "If you compare it per square meter, the transport cost of drywalls is lower, because they are six times lighter than prefabricated concrete walls."

South African building performance specialist Mlondolozi Hempe is also convinced of the upsurge in light and sustainable materials such as wood. All the same, he points out that there would need to be a change of mindset before sustainable construction is fully accepted and applied.

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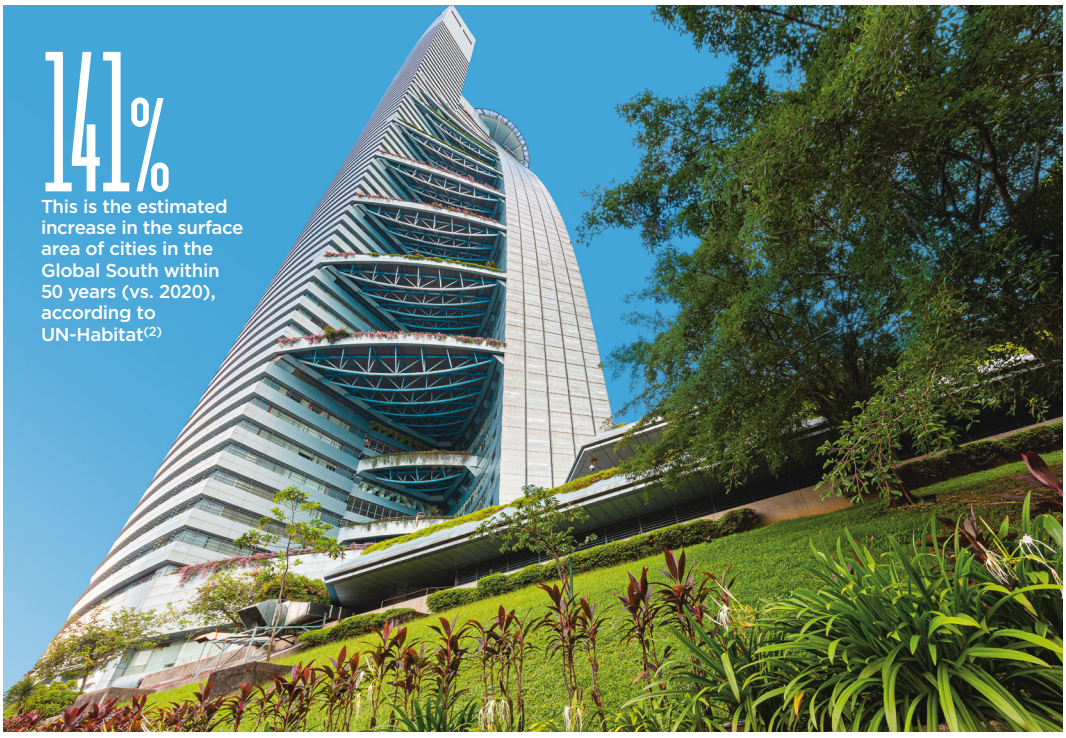


With its self-sufficient air conditioning system, TM Tower in Kuala Lumpur (Malaysia), completed in 2003, illustrates the awareness of countries in the South of the need to build sustainably.

"There is growing interest in sustainable construction, and the practice is crescendoing."

DARIO IBARGÜENGOITA,
founding president of Sustentabilidad para México

SOUTH AND NORTH JOINING FORCES

The sustainable construction solutions developed in countries in the South are often shared with neighboring nations facing similar problems. This is true of eco-friendly technological innovations designed in Colombia and shared with Brazil, states Sustentabilidad para México's Founding President Dario Ibargüengoitia, for social housing programs with high environmental performance criteria. While the same approach has been attempted between African and Asian countries, he laments a lack of intercontinental collaboration across the Global South. With one exception: *"Despite specific regulations, India is taking astonishing action and is open to a kind of hybridization of its achievements."* In an age of globalization, ideas from the Global North very quickly reach the Global South and vice versa, generating inspired innovation or even a reinterpretation of technological solutions using local resources.

(1) The definition of the term "Global South" remains vague insofar as it refers to an extremely heterogeneous group of countries: India, Brazil, South Africa, Saudi Arabia, Indonesia, Egypt, Mexico, Argentina, etc. To depict it on a world map, we could draw a line that runs between Mexico and the United States, separates Africa from Europe, surrounds the south of the Middle East (except Turkey), then runs below Kazakhstan and Russia before diving to avoid South Korea, Japan and Taiwan, along with Australia and New Zealand." (source: RFI, September 2023).
(2) UN-Habitat.

PROMOTING THE USE OF SUSTAINABLE SOLUTIONS

Less financially well-off than countries in the North, countries in the South are less able to invest in eco-friendly materials and passive mechanisms, which are often more expensive to buy. Where unsustainable construction materials are less expensive or easier to obtain, such as illegally logged timber, encouraging the most environmentally-friendly option proves difficult. Solutions such as Environmental Product Declarations (EPD) and the Climate Bonds Initiative (CBI) exist. Crucial for sustainable construction certifications “such as LEED, BREEAM, HQE, etc., EPDs are increasingly popular with investors and developers. The only organization dedicated to mobilizing a bond market

In São Paulo (Brazil), green spaces help to cool the building, thus improving thermal comfort.

of US$100,000 billion for sustainable projects, CBI supports and encourages the green economy throughout Latin America," according to Dario Ibargüengoitia.
And what if the building costs were covered by a charity or NGO? One such example is the Kuyasa project in the suburb of Khayelitsha, Cape Town's largest township, in South Africa. Since 2006, the city's authorities and the NGO SouthSouthNorth have begun renovating 2,300 houses in the Reconstruction and Development program (RDP), installing solar water heaters and energy-saving lighting systems and insulating ceilings. The results include an expected reduction in CO_2 emissions over a 21-year period (2.85 tCO_2e/house/year), improved sanitary conditions through the prevention of respiratory diseases, and an almost 40% drop in energy expenses. It provides a real boost for the local economy with the annual creation of 100 jobs to install the infrastructure.

A QUESTION OF TRAINING

Sustainable construction is arousing a growing interest and being increasingly practiced, as Dario Ibargüengoitia highlights. In his view, even if Latin American society has not yet entirely taken on board the idea of decarbonization, the trend is for healthier, well-ventilated, energy-saving spaces offering good thermal comfort. Particularly in Central and South America and large cities such as São Paulo, Buenos Aires, and Mexico City.

Earth and adobe (or compacted earth) or terracotta bricks form an alternative to concrete for individual housing. They account for half of houses worldwide.

In future, raising greater awareness of sustainable construction will involve more investment in training populations in the Global South. While countries of the South still have few architects and engineers in the building sector(3) trained in a project's social sustainability, bodies such as the Sustainable Architecture Training Center in Argentina and the Training Center for Sustainable Construction in Morocco are attempting to remedy this. Building with earth and wood, the latter looks to combine traditional know-how with modern technologies. Meanwhile, the Peru-based Ella Network has a learning community devoted to best practices and methodologies to create cities capable of withstanding climate change.

(3) Improving Socially Sustainable Design and Construction in Developing Countries (Procedia Engineering, volume 145, 2016, p. 288-295).

POINT OF VIEW

GEORGE BENSON
Senior Manager, Economic Transformation
at Vancouver Economic Commission (VEC)[1]

"The model that propelled Vancouver to become one of the greenest cities in the world is replicable."

"With the Greenest City 2020 Action Plan (GCAP), a challenge initiated by the mayor at the time, Gregor Robertson, to make Vancouver the greenest city in the world in which to live, work, and play within the space of a decade, Vancouver's greenhouse gas (GHG) emissions have dropped by 10% compared to 2007's baseline that we had established. They are probably the lowest in the country and among the smallest per inhabitant in North America.
The outcomes I'm most proud of are those associated with the economic objectives of the plan, which looked to double the number of green jobs. With an 87% rise within a decade, the results exceeded our expectations. As far as we know, no other city in the world has seen this kind of growth. Another of these aims was targeting an increase in the number of companies involved in a sustainable development process. Their number quadrupled (from 5% to over 20%).
We have also noted positive effects on health. Vancouver is the only North American city with such a high rate of soft mobility (walking, cycling) and public transport use, which represent more than 54% of intramural trips.
Vancouver's model of setting bold targets and measuring them in fine detail is replicable. Without necessarily drawing up a plan like Vancouver did, other cities could take inspiration from our approach and measures, such as our sustainable building code. The principle of sharing is also exciting, extremely powerful, and useful."

DISCOVER

the full interview with George Benson in our online magazine *Constructing a sustainable future*

(1) Vancouver Economic Commission: This Climate Smart-certified external agency tasked with the city's economic development is responsible for defining and monitoring the GCAP's actions.

SPOTLIGHT The energy transition is at the heart of the smart city paradox. Initially considered a paragon of virtue, the smart city and champion of energy conservation can also prove to be extremely energy-intensive and sometimes lose sight of its human dimensions.

SMART CITY

cornerstone of the energy transition?

Our habits have caught up with this technological invisibility all around the world. What could be more normal than having France-wide urban transport or road traffic information on your cell phone?
In this respect, in searching for better environmental performance, the smart city has been confronted with urban realities in terms of sense of space and governance. This urban development concept cannot replace the need to insulate buildings, transport materials or dig trenches to install networks.
This co-production of the city is based on intelligent cohabitation between traditional and innovative technologies, not forgetting humans, the main resource.

SENSORS AND ALGORITHMS

Digital technology's contribution is indisputable for a better grasp of energy questions, for example, in building design and urban planning and the use of infrastructure. As it has flourished, the smart city has harnessed sensors for its running and algorithms for its use. On the one hand, connected objects (IoT), of which there were estimated to be 12.3 billion in 2021, are used for the optimized management of energy, fluids, and infrastructure. These performance levers provide a solution to increasing productivity demands; so much so that they will represent almost US$1,077 billion in expenses in this sector by 2024. On the other hand, the strong growth in digital technologies (7% on average over the past decade) has been underpinned by the algorithmic power of information and communication technologies (ICT). They have enabled more efficient use and an adaptability of the city that has now become standard in transport and services, with notable repercussions on energy control.

THE LIMITS OF THE SYSTEM

All the same, the smart city has its limits at the bounds of its physical and financial capacities and governance. Not all cities are the same and

In Songdo, a district in the port city of Incheon to the west of Seoul, the ambition is to reach zero CO_2 emissions.

the hoped-for ubiquity of digital technologies crumbles when faced with urban realities and the constraints of the energy transition. Firstly, because digital technologies are themselves energy-intensive. They are said to consume between 10% and 15% (according to studies) of global electricity production and their carbon footprint is higher than civil aviation, i.e., 4% to 5% (still according to studies) compared with 2% for the air sector. Electronic data processing, when possible, is also energy-intensive. Then, all computers and equipment

for processing, storing and remotely communicating by electronic means, in addition to their limited lifespan, are not exempt from failure or fragility, particularly in the event of climate change. Cities are so dependent on these systems that one might fear for their reliability in the event of heat spikes or flooding. For this reason, the trend is to redirect smart cities toward a combination of digital technologies and biodiversity development.

TOWARD EQUAL ACCESS?

The high financial cost involved in infrastructure maintenance, the substantial size of informal economies, and various governance challenges are curtailing government idealism regarding smart cities. Moreover, the demographic question and consequently unequal access to the lavish riches of ICT, particularly between the cities of the Global North and South, counterbalance the virtuous aspect of smart cities in the field of energy.

From Santiago to Paris

Santiago de Chile has a "green" subway 60% powered by wind and solar energy, with operational agility provided by smart grids. Barcelona (Spain) is aiming for energy self-sufficiency by 2050 through the use of renewables – solar photovoltaic, biogas and geothermal energy. The Catalan capital is a European smart city leader through its management of office real estate, connected street furniture, 100% electric transport, predictive elevator maintenance, and water network management. Europe thus features prominently in the top 10 smart cities worldwide. In France, Lyon is at the cutting edge with the implementation of its La Confluence district, the first positive energy block.

DISCOVER

the full article in our online magazine *Constructing a sustainable future*

SPOTLIGHT Owing to galloping urbanization, the soils in large cities are subsiding. This phenomenon is all the more striking in large coastal cities threatened with flooding due to rising sea levels. Without waiting for the necessary global response to this problem, many municipalities are already successfully implementing tried-and-tested technical solutions.

When soils are putting up RESISTANCE

The findings are unanimous: hundreds of big cities around the world are sinking. And the phenomenon can only worsen given urban development trends: by 2050, almost 70% of the world's population is set to live in mega-cities.
This prospect could almost be insignificant if, at the same time, rising sea levels were not causing coastline erosion problems, endangering constructions. According to the World Economic Forum, several cities, including New York (United States), Dhaka (Bangladesh), London (United Kingdom), and Bordeaux (France), could be partially or totally submerged by 2050-2100. In the first part of their sixth report, the IPCC's(1) experts drove the point home: no fewer than 570 cities are facing this threat.

THE EXCESSIVE WEIGHT OF BUILDINGS

To what can this phenomenon be attributed? Two words provide the answer: urban growth. The older the city, the more it gains weight.
The pressure has reached critical levels due to the ever-growing size of buildings and the increase in built-up areas in the middle of the 20th century. All the more so as groundwater pumping to supply the inhabitants and economic activities with water contributes to the weakening of the bedrock of large cities.

TOWARD ZERO LAND TAKE?

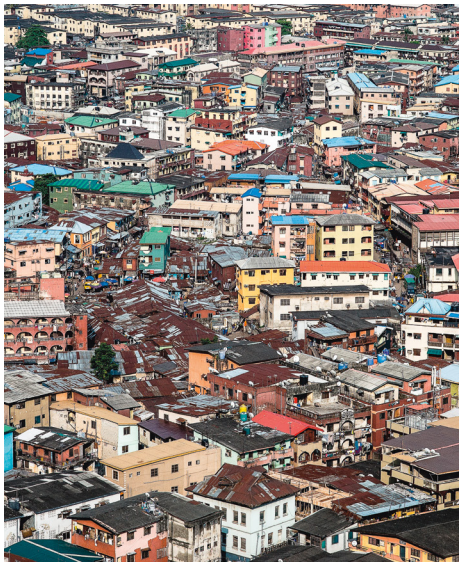
While rampant urbanization contributes to these kinds of geological disturbance, it has an impact on soils weakened both by storm water runoff and repeated floods with their string of infiltrations.
Aware of the need to act, scientists, industrialists, and local authorities have already come up with solutions. The most obvious consists in combating land take in cities and urban sprawl, responsible for the disappearance of natural areas. However, we should be wary of the obvious, because building on the outskirts of cities helps regulate their weight!

(1) Intergovernmental Panel on Climate Change.

To preserve the soil of coastal and inland cities from the vagaries of the climate, municipalities are already applying promising techniques: artificial recharge and deep soil mixing.

Ultimately, it is about re-establishing a virtuous water cycle, making soils capable once again of absorbing and then returning storm water, removing bitumen from the perimeters of buildings, municipal land, and schoolyards, and increasing the number of green spaces. Many experts, including Italian architect and urban planner Paola Viganò[2], are also calling for urban planning incorporating the concept of "living soil". She even goes further, examining the case of "diffuse cities" – which describe urbanization without planning or consultation, where housing has been placed on top of the previous agricultural function without completely erasing it.

Lagos (Nigeria) falls by 2.87 millimeters every year.



CONSOLIDATING THE SUBSOIL

To preserve the soil of coastal and inland cities from the vagaries of the climate, municipalities are already applying promising techniques. Two of them seem particularly pertinent. The first is artificial recharge, which consists in injecting water into depleted aquifers (geological formations permanently or temporarily containing water), to replenish them and prevent new collapses. The method has been successfully used in various areas of the world, such as the El Carracillo district (Spain), Hilton Head Island (South Carolina), Perth (Australia), and Beijing (China). The second, less sustainable technique is deep soil mixing. In concrete terms, stabilizing agents such as cement, lime, biodegradable materials, etc. are injected deep down, improving the soil's bearing capacity and reducing its sensitivity to settlement. It has been widely used in China and Europe for various construction projects.

LIGHTER CONSTRUCTION

Reducing the weight of buildings is part of the range of solutions, prioritizing lighter materials such as wood, gypsum, steel, carbon fiber, bamboo, etc. In Sweden, the city of Skellefteå thus inaugurated the highest wooden skyscraper in the world, culminating at 80 meters, in 2021. Innovative technological solutions also offer an encouraging outlook, such as alloys and blends based on innovative composites and polymers, nature-inspired systems such as honeycomb structures... or light construction

The torrential rain that fell on September 29 and 30, 2023 paralyzed New York, which could be partially or totally submerged by 2050-2100.

materials such as wood panels, metal frames, and glazing, which also make up prefabricated materials.

SOIL SCIENCE

Groups of researchers around the world are working on rolling out techniques combining numerical modeling and experimentation. Thanks to the development of geotechnical investigation, observational methods will find new openings. Scientists could also count on unexpected and unprecedented allies, particularly bacteria, which are already used to improve the load-bearing capacity of soils. Like the technique of biocalcification, in which bacteria injected into sea walls, for example, lead to calcite formation.

However, direct intervention in soils alone will not suffice. We must act on the causes of their degradation – beginning with reconsidering the extent of artificial surface areas in urban projects – and move toward a significant reduction in the GHG emissions behind global warming, itself responsible for rising water levels. Last but not least, it is a matter of turning to subsurface engineering, capable of meeting the challenge of heavy civil engineering work that impresses the whole world with its daring and technical expertise. The issue of soil subsidence therefore appears to be a complex challenge, involving so many different approaches and stakeholders. Once again, cooperation between all players appears to be the only way forward.

LISTEN

to episode 9 of our *Constructing New Wor(l)ds* on Resilience.

(2) Paola Viganò, professor at the Swiss Federal Institute of Technology in Lausanne, received the Grand Prix de l'Urbanisme award for urban planning in France in 2013 and won the 2022 Schelling Award for Architectural Theory.
(3) 6th IPCC report.
(4) The "Mass of Human-Made Materials Now Equals the Planet's Biomass" study, Nature journal, December 2020.

People's well-being must be central to the sector's efforts. However, in the 2024 Sustainable Construction Barometer, only 14% of people surveyed associated well-being with sustainable construction. How best to combine performance and sustainability while contributing positively to people's health and well-being? An update on this collective priority.

Putting people first

quality of

PART 5

life

SPOTLIGHT Building sustainably means taking care of people's living environment. Their planet, of course, but also their housing, workplace, school, etc. How can we build spaces that take the health and well-being of their occupants into consideration? This approach involves occupants and professionals alike. An overview.

HEALTH & WELL-BEING

The other major issue at stake for sustainable construction

Since the 19th-century hygienist movement, questions of health, well-being and comfort in terms of habitat have remained to the fore in the modern age, with varying degrees of success. Old housing, which is sometimes poorly designed or unsanitary, can prove to be a hostile environment, even though it is supposed to protect us. When you bear in mind that we spend more than 80% of our time in enclosed spaces, the consequences are decidedly alarming. "The main pathologies associated with housing are respiratory diseases and, far behind, skin diseases linked to a lack of hygiene due to insufficient access to water," explains Dr. Christine Delebarre-Sauvage, Head of the Allergology Department at Saint-Vincent de Paul Hospital in Lille (France) and ARCAA (Association of Clinical Research in Allergology and Asthmology) member. Four million people are thought to be asthmatic in France alone.

However, health and well-being in housing are not limited to combating pathogenic agents. Many other irritants have an impact on our physical and mental health. Heading the list of urban concerns, noise,

DISCOVER

the full article in our online magazine *Constructing a sustainable future*

“The main pathologies associated with housing are respiratory diseases.”

Dr CHRISTINE DELEBARRE-SAUVAGE,
Head of the Allergology Department at Saint-Vincent de Paul Hospital in Lille (France)

for instance, may be responsible for cardiac complications or nervous disorders. A lack of natural light may disturb sleep patterns. An unsuitable temperature in our homes may increase the risks of cardiovascular, respiratory, and rheumatoid diseases, as well as mental illness. Housing that is too

hot or too cold may also, in certain cases, directly increase the morbidity rate. How can we respond to these different challenges? Through sustainable construction, which looks to care not only for the planet but also its inhabitants with four key aims: improving indoor air quality, acoustics, access to natural light, and thermal comfort.

The Passive House Los Angeles (PHLA+) is the first “certified passive house.” This light construction combines comfort with high indoor air quality.

THINK ABOUT WELL-BEING FROM THE DESIGN STAGE...

While specific solutions exist for each aim, certain more general best practices must be an integral part of considerations when designing and then constructing a building. As always in the realm of real estate, location is a key point. A well-situated building will make it possible not only to control the light or heat gain but also, conversely, any loss due to shade or wind. Taking into account environmental noise linked to infrastructure such as airports, highways, and rail corridors is also a clearly essential prerequisite. Then, work must be done on the envelope to protect our home or workplace from the effects of too much humidity, wind, unwanted air infiltration, excessive sunshine, indoor air pollutants or noise, while avoiding a confined space that is also harmful. In concrete terms, this involves designing an envelope impervious to air and water, combined with natural (window) and/or mechanical ventilation, making it possible to control the temperature, humidity, and noise environment and ensure air exchange with the exterior. When it comes to the envelope, the battle plays out on two fronts: glazing and insulation. The layered construction of solar control glass lets sunlight in and either radiates or reflects heat away, as necessary. For the insulation of opaque walls, reducing losses and limiting thermal bridges through the use of high-performance insulation combined with vapor barriers and waterproofing membranes, with or without air spaces depending on the situation, is generally the best option.

... AND CHOOSING THE RIGHT MATERIALS

Maintaining air quality is also a matter of choosing the right materials. Construction and interior design products must demonstrate low formaldehyde(1) and VOC (Volatile Organic Compounds; top rating of A+) emissions. Certain “active” materials even have a directly positive impact on indoor air quality: plasterboard permanently removes up to 80% of the formaldehyde in indoor air, while wall coverings have an antimicrobial and antifungal action. Previously neglected, acoustic comfort has also become a priority to reduce noise pollution with acoustic ceilings and baffles and high-performance partitions and linings.

(1) Formaldehyde is a colorless, flammable gas at room temperature. It is often marketed in liquid form as formalin.
(2) Indoor Air Quality Observatory.

The air we breath can be

5 to 10 times

more polluted indoors than outdoors(2)

POINT OF VIEW

While the major sustainable development policy lines are defined on a governmental scale, local players have room for maneuver in steering the creation and implementation of projects designed to make their city more sustainable. What action can mayors and drivers of projects on the ground take to make progress on the two fronts of the environment and social issues? How can we ensure that no one is excluded? Here are a few examples around the world of initiatives championed by four sustainability-conscious mayors.

ALBUQUERQUE

(United States)

Tackling the housing crisis

In Albuquerque, the largest city in the state of New Mexico with its 565,000 inhabitants, economic prosperity and quality of life act as a magnet attracting an ever-increasing number of new arrivals, although the housing available is limited. This has led to a shortfall that is driving real estate prices skyward: in 2021, the cost of housing thus rose by 20% on average for buyers and renters alike. According to the municipal authorities, Albuquerque has a shortfall of 80,000 houses, including 30,000 for people on a low or modest income. In light of this – in his view, untenable –situation, the Mayor of Albuquerque has launched an initiative called Housing Forward. It comprises a set of complementary actions, such as converting commercial buildings, offices, hotels, or motels into housing with services at affordable prices and creating zoning areas for smaller-sized housing units (known as casitas) with a view to increasing the residential density. Through this combination of measures, Tim Keller has the goal of creating some 5,000 new homes at market price over the next two years. With Housing Forward, he is also aiming to reduce crime by converting spaces that currently attract drug dealers, people traffickers and armed violence into housing.

“Creating some 5,000 new houses at market price by converting commercial buildings and offices.”

TIM KELLER,
Mayor of Albuquerque (United States)

MADRID
(Spain)

Turning urban wasteland into a new-generation neighborhood

Madrid Nuevo Norte is one of Europe's current major urban renewal projects, conducted by Distrito Castellana Norte, which is looking to develop 2.5 km² located along the railroad tracks in the north of Madrid. This sustainable district intends to draw on all fronts and exclude no one. The creation of over 10,500 new energy-efficient homes will thus include 20% state-subsidized housing, i.e. double the regulatory requirements for new real estate programs. They will be offered to people with a low income at prices below those of equivalent properties on the market. Therefore, 25 hectares of real estate will be dedicated to setting up public facilities (health centers, seniors' facilities, schools, sports facilities, etc.) to meet the needs of its future inhabitants, as well as those of the neighboring districts, which are short on public facilities.
In Álvaro Aresti's view, being poles apart from a dormitory town also means ensuring local employment: Madrid Nuevo Norte intends to generate over 130,000 jobs by creating shops and offices. Prioritizing modes of transport for all, the redevelopment project is planning to extend and modernize Chamartín train station and create a metro line, a regional transport hub, and a high-capacity priority bus line. Soft mobility routes will link the different residential areas via a 40-hectare continuum of green spaces.

"A 100% sustainable city in which you will be able to both work and live. You will get around it on foot, by bike or public transport, and housing, offices, commercial premises, public facilities, green spaces, and public transport will combine so that activities can take place there at all times, seven days a week."

ÁLVARO ARESTI,
Chairman of Distrito Castellana Norte, Madrid (Spain)

SÃO PAULO
(Brazil)

More sustainability, less precarity

Appointed Municipal Secretary of Economic Development, Labor and Entrepreneurship for São Paulo in 2017, Aline Cardoso has devoted her entire career to developing Brazil's leading city. *"Doing politics means transforming the city in order to transform society,"* she states. *"And while we need sustainable buildings, we are just as much in need of sustainable cities."* Cities capable of creating employment and raising their residents' living standards. To achieve this, Aline Cardoso places professional qualification and collaboration between the public and private sectors at the heart of her action. She does not hesitate to go to every neighborhood, including the most disadvantaged, in search of skills and talents to be connected with companies. *"We must also create partnerships between the public and private sectors to get things moving: the public through regulations and incentives, the private through investment."* Accordingly, in addition to an urban renewal program providing for the construction of 700,000 homes, public services, and soft mobility routes over a 15-year period, the Municipality of São Paulo is planning to create new metro lines and reinforce its bus network. However, the needs remain vast and there is a long road ahead.

"We must redefine the world of work to adapt it to the era of sustainable construction."

ALINE CARDOSO,
Municipal Secretary of Economic Development, Labor and Entrepreneurship for São Paulo (Brazil)

QUELIMANE
(Mozambique)

Combining sustainability and quality of life

Since his election as Mayor of Quelimane in 2011, Manuel De Araújo has striven to make Mozambique's fourth-largest city a model of sustainable development, with the construction of climate change-resilient housing, community centers where residents can carry out community activities, public fountains, etc. Quelimane's 350,000 citizens have seen their quality of life improve over the course of his terms of office. But in his view, it requires a more global vision to positively impact the local economy and combat poverty. Manuel De Araújo has, for instance, tarmacked various thoroughfares to make them accessible for bicycles and created new roadways, in order to link up two districts that were not previously connected, such as Sangariveira and Icidua. The construction of these transport routes should facilitate residents' mobility and have a positive impact on the local economy, particularly in the small-scale fishing sector, which is important for Quelimane.

"The construction of new transport routes must benefit the mobility of local residents and have a positive impact on the local economy."

MANUEL DE ARAÚJO,
Mayor of Quelimane (Mozambique)

The 2024 Sustainable Construction Barometer reveals that elected officials and public institutions are among the stakeholders most often mentioned in terms of advancing sustainable construction. How can climate finance, harmonization of legislation, and political dialogue accelerate the transition to a more sustainable future? Here are some answers.

politics &

Harmonizing the rules of the game

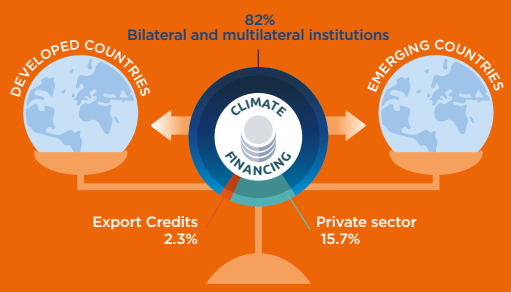
PART 6

economics

DATAVIZ Only US$89.6 billion was collected in 2021 (83.3 in 2020) out of the 100 per year promised at COP15 in Copenhagen (2009) to help emerging countries reduce their GHG emissions and adapt to climate change. How does this financial assistance work?

FINANCING CLIMATE ACTION

1. Who finances and how?



2. What sums have been mobilized?

In **2020** $**83,3**bn $**100**bn

The target of mobilizing $100 billion/year set during COP15 in Copenhagen for 2020 – reiterated during COP21 in 2015 and extended to 2025 – has not been reached.

3. For which beneficiaries

Destination regions of climate finance

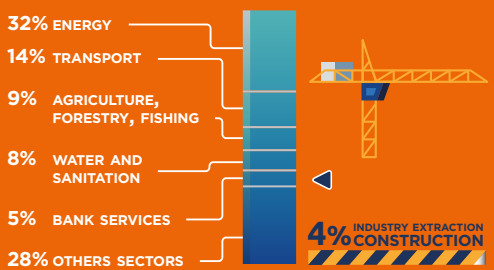
(Total funding, in billions of dollars, annual average 2019/2020)

Transregional	$**11** bn
Western Europe	$**105** bn
USA & Canada	$**83** bn
Latin America & Caribbean	$**35** bn
Middle East & North Africa	$**16** bn
Sub-Saharan Africa	$**19** bn
Eastern Europe & Central Asia	$**33** bn
East Asia & Pacific	$**292** bn
Oceania	$**9** bn
South Asia	$**30** bn

4. For which sectors of activity?

Distribution of climate financing provided and mobilized

(%)



SPOTLIGHT Energy performance, environmental footprint, quality of materials, ergonomics, comfort... Every little aspect of construction is now codified by a maze of standards with different geographical scopes. What is at stake in terms of this standardization on the chessboard of international exchanges? How does it contribute to progress in construction and building renovation? Some answers.

STANDARDS: speaking the same language

A standard makes it possible to define and/or measure a set of performances regarding the design and development of products and services. The purpose of standardization is to encourage the actors in a profession to comply with set performance targets. In a sector like construction, which involves many different players, norms help move a whole profession forward fairly and coherently, establishing a common language and rules of the game. Whether it involves reducing greenhouse gases, using finite resources or managing waste, they help everyone reach the objectives set by regulations, often within tight timeframes. This is because standards often serve as a basis for drawing up regulations, whose role is to make them a legal obligation (see box). This applies, for instance, to European standards (EN), which take precedence over national norms and form the basis of statutory instruments.

A POWERFUL LEVER OF INFLUENCE IN INTERNATIONAL RELATIONSHIPS

Standards arise from a consensus between actors keen to harmonize the rules of the game in a given sector of activity. While these actors represent a minority of those involved in the sector, they are highly motivated to act as leaders in implementing best practice and to demonstrate that it is possible to do better and act differently. At the same time, they send a signal to politicians, encouraging them to raise the level of regulatory requirements. For instance, this was the case in France with the Effinergie label in the field of thermal performance, or in the United States with the LEED (Leadership in Energy and Environmental Design) norms for eco-friendly building design. Reflecting political will expressed at different levels (global, regional, national...), standards prove to be a powerful lever of influence in international balances of power. Complying with them is therefore a real competitiveness issue for companies. Moreover, by avoiding favoring the lowest bidder in international trade, a required performance level represents a guarantee of fairness and reliability for stakeholders (producer, distributor, user, public authorities...), whatever the sector of activity concerned.

OFFERING THE SAME FRAME OF REFERENCE FOR ALL

Over time, the world of construction has seen a proliferation of international (ISO), European (EN), and national – even infranational – standards. Today, several thousands of them set guidelines for the profession. There are over 1,500 international standards (I-Codes) drawn up by international standardization bodies with the support of the International Code Council. This number continues to rise in step with the progress made by the building sector in terms of sustainable and environmentally friendly practices. However, these standards must be sustainable and easy to understand, so that professionals perceive them not as constraints, but as real levers for development. At the cost of such a profusion, one of the great merits of standardization is encouraging people today to consider the life cycle of a structure and its different impacts, from its design, through its construction, operation and renovation, to its end of life. Another contribution it makes is to cause the profession to view a project, whatever it may be, in its complexity through a systemic approach. This takes into account different aspects, such as the interoperability between those in charge of the building's engineering and that of the implemented information systems, modeling the building's life cycle, designing it using a collaborative approach… The extension to Oslo's international airport (Norway) in 2017 is an example of the key role that interoperability standards play in a project. By imposing the use of the digital model on all those involved in the project and demanding that deliverables be submitted in IFC (Industry Foundation Classes) format, the contracting authority avoided wasting thousands of hours' work manually converting over two million single items such as doors, walls, sprinklers, lights, etc. Another example: a universal collaborative program such as Open BIM relies on open work processes and norms to improve a building's design, construction and use.

STANDARDIZED RENOVATION?

Standardization is becoming increasingly specialized in terms of requirements for areas such as decarbonization, energy transition and use of materials. On a tried-and-tested foundation of generic ISO or EN standards, an edifice has gradually been built of specific norms, which are often competing against each other as they are largely inspired by national regulations. This is true of the British BREEAM (Building Research Establishment Environmental Assessment Method) and the American LEED (Leadership in Energy and Environmental Design) standards, which both concern construction's environmental impact, and the French HQE (Haute Qualité environnementale) norm, which is more user-focused and includes project management. However, the most significant change of direction is undoubtedly linked to the rise in renovation. 80% to 90% of buildings that will certainly still be in operation

The Qatar National Convention Center (QNCC) in Gharafat Al Rayyan, Doha, was built according to the US Green Building Council's LEED certification standards.

in 2050 have already been constructed. As a result, renovation is becoming a major issue, both in terms of saving materials and getting people out of fuel poverty. In this respect, we are thus seeing the emergence of a regulatory framework that sets – particularly in a rental context – minimal requirements for renovation, aiming to fight heat-leaking structures, for instance. However, when it comes to reusing materials, the normative gap remains an impediment, as the current standards only concern new products. This obstacle to initiatives by stakeholders in the profession – confronted, for example, with questions of responsibility in the event of a quality problem – should soon be removed thanks to a new CE mark applicable to materials for re-use.

In light of the issues at stake for sustainable construction, we are currently seeing many standards and rules being updated or created. The profession will have to assimilate all these regulations, with a view to ensuring that the efforts made to this end are profitable, which could take one or two decades. For, in this long-cycle activity, stakeholders need the normative framework to remain relatively stable in order to invest, for example, in skills training for tomorrow.

"The ecological transition has to be profitable or it won't happen at all"

"Let's be realistic: the ecological transition has to be profitable or it won't happen at all. From our point of view, it's the best way to make it attractive to this world's decision makers, who think in terms of job creation and industrial profit. The consumer's point of view also counts. When you insulate your house to reduce your heating bills, you pay off your investment in a few years. It perhaps takes a bit more time with non-pollutant materials, which are a bit more expensive, but equally you will obtain a benefit.

It's the combination of economic and ecological criteria that creates a smart solution. Between ideas that are fantastic ecologically but unattainable and low-cost but ecologically harmful ideas, there is a broad scope of possibilities. This is the space where it's effective to position yourself and where our labeled solutions are found. Taking the demands of profitability into account provides an answer to the question so often raised against the ecological transition: how are we going to pay for all this? Well, just like any investment that meets needs by generating a profitable return that will pay it off. It is a basic of economics, which distinguishes between investment and expenditure."

BERTRAND PICCARD,
Chairman of the Solar Impulse Foundation

DISCOVER
the full interview with Bertrand Piccard in *Constructing a sustainable future*

“We know why we need to act, so let’s stop talking and start acting!”

“Many organizations are struggling for structure scalable actions (...) By involving these organizations’ members of staff and communities in this questioning, change is much more concrete. Concentrate on action. We know why we must act, so let’s stop talking and take action! The time is short to significantly decarbonize, so take a practical rather than a theoretical approach, not forgetting that sustainable development concerns not only the climate but also biodiversity and social issues.”

DR SALLY UREN,
Chief Executive of
Forum for the Future(1)

DISCOVER

the full interview with Dr Sally Uren and Lena Hök in *Constructing a sustainable future*

“The innovations implemented in a project can be replicated on a large scale”

“By definition, construction is already a local application. The innovations implemented in a project can be replicated on a large scale. This was the case for the electrification of heavy machinery, which began on an experimental basis in Stockholm (Sweden) before extending to other areas and countries. The analogy of a puzzle is a pertinent one: it is a matter of creating a whole picture by matching each piece.”

LENA HÖK,
Executive Vice President of Skanska Group

(1) Forum for the Future is an international organization created in 1996 in the United Kingdom to promote sustainable development, also present in the United States, India, and Singapore. It works with companies, governments, and civil society to accelerate the transition to a just and regenerative future in which people and the planet can thrive.

DATAVIZ

To make more sustainable construction or renovation choices, professionals can turn to databases listing the environmental impacts of building materials. But before becoming an aid to decision-making, published data follows a path that depends as much on technical requirements as it does on political will.

MEASURING TO MAKE BETTER DECISIONS

the great data journey

Step 1

Collection of product life cycle

Step 2

Input into the Life Cycle Assessment (LCA) tool and performance of calculations

Step 3

Standardized and audited declaration (EPD)

Step 4

The EPD is published in the database of a program operator accessible to all

Step 5

Construction and renovation professionals are able to make more sustainable choices

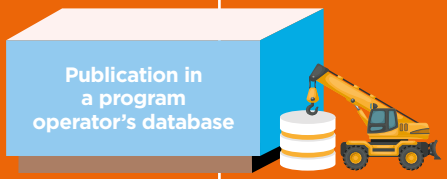
LISTEN

to episode 9 of our
Constructing New Wor(l)ds
on Building Life Cycle Assessment

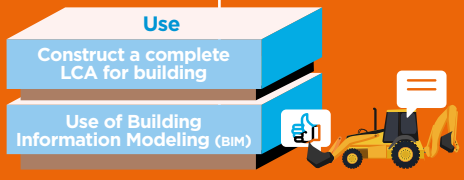
A wide range of data is collected for each stage in the product life cycle, including raw material extraction, raw material transport, manufacturing, distribution, installation, use, end-of-life and recycling. This data should be as specific and precise as possible.

The Life Cycle Assessment (LCA) tool is used to determine the environmental impact of the product over its entire life cycle. These calculated according to European or international standards. This establishes the product's environmental profile.

The EPD is audited by an independent third party to ensure that the data is robust.



There are national operators such as INIES in France, IBU in Germany and EPD Norge in Norway, international operators such as EPD International, or european operators such as Ecoportal. On these platforms, the data is public and can be compared.



Architectural and engineering firms can research product EPDs and carry out full LCAs of buildings. They can also use Building Information Modeling (BIM), which is inked to the data.

FOCUS TALKS

1.

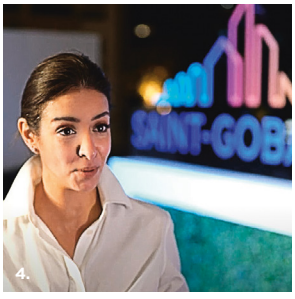

2.

Sustainable Construction TALKS BY SAINT-GOBAIN

PARIS

July 4, 2023


3.



4.

September 20, 2023

NEW-YORK

DUBAI

December 6, 2023


5.

“There is an investment demand of around €270 billion/year.”

TALK PARIS
JULY 4, 2023

TATIANA BOOSTEELS,
Senior Economist at the European Investment Bank (EIB)

DISCOVER
the full interview in
Constructing a sustainable future

“Even the definition of green buildings is different from country to country.”

TALK NYC
SEPTEMBER 20, 2023

OMMID SABERI,
Lead of global program Climate Smart Buildings

DISCOVER
the full interview in
Constructing a sustainable future

“Someone needs to drive demand for resilient housing.”

TALK NYC
SEPTEMBER 20, 2023

ELIZABETH HAUSLER,
founder and CEO of Build Change

DISCOVER
the full interview in
Constructing a sustainable future

“The one thing that will salvage architecture is the reconnection with people.”

TALK DUBAI
DECEMBER 6, 2023

SARAH EL BATTOUTY,
Architect and Global Ambassador UNFCCC High Level Climate Champions

DISCOVER
the full interview in
Constructing a sustainable future

“Sustainable construction can certainly contribute to industrialization and growth in Africa.”

TALK DUBAI
DECEMBER 6, 2023

ELIZABETH WANGECI CHEGE,
Board Secretary Member of the World Green Building Council and Energy Efficiency and Cooling Specialist at SEforALL

DISCOVER
the full interview in
Constructing a sustainable future

Because cooperation
is the key to
more sustainable construction

JOIN US

at our next talks

Sustainable Construction TALKS BY SAINT-GOBAIN

to share our thoughts
and solutions, and
implement their deployment.

NEW YORK	BRUSSELS	DAVOS
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