

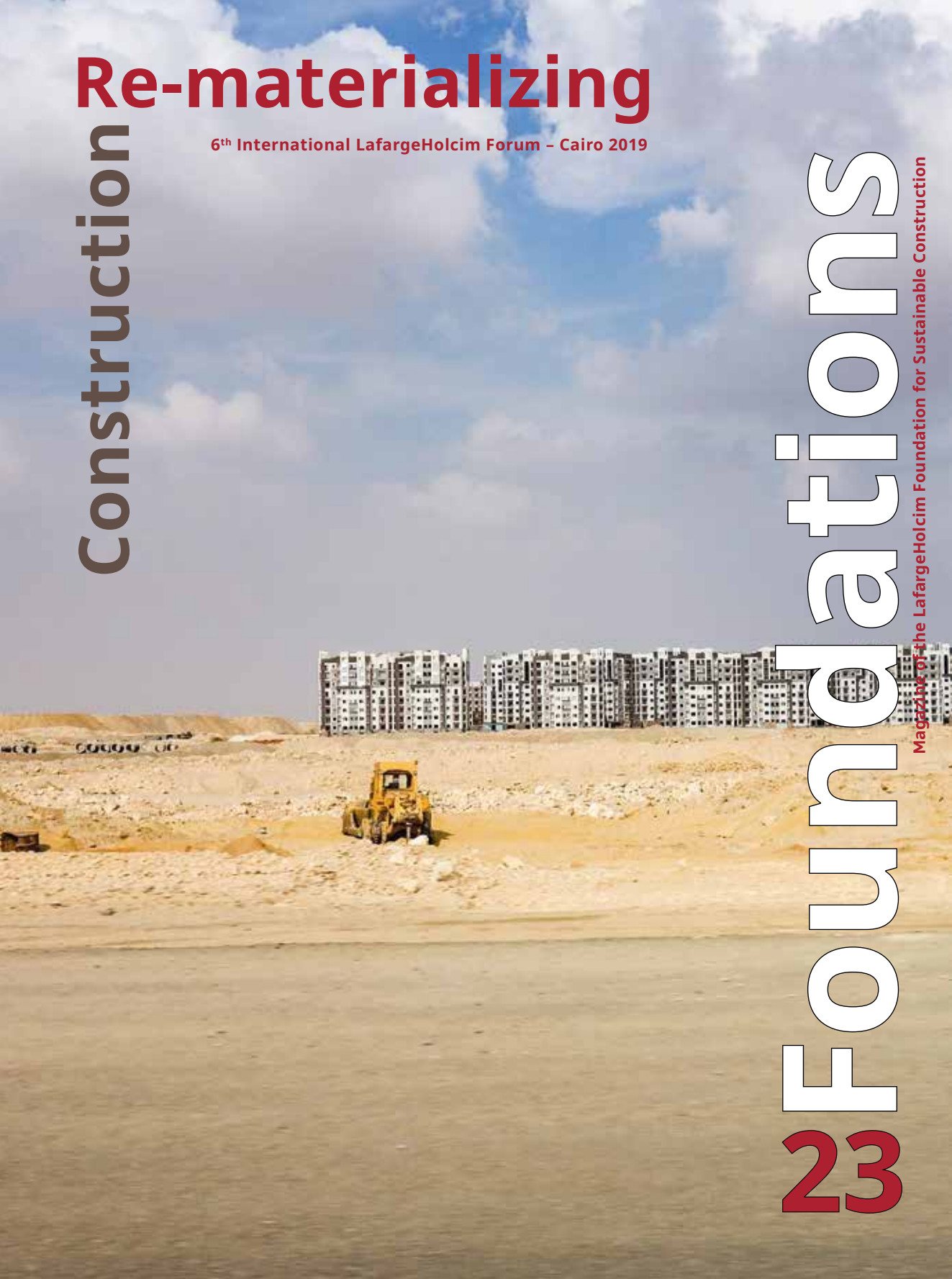
# Re-materializing

6<sup>th</sup> International LafargeHolcim Forum - Cairo 2019

Construction

Foundations  
23

Magazine of the LafargeHolcim Foundation for Sustainable Construction





# Re-materializing

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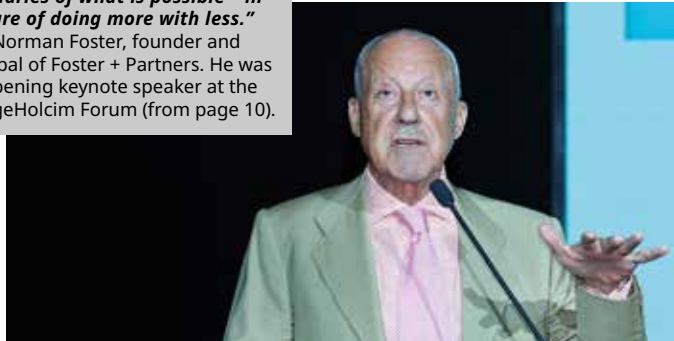
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# Rethinking materialization

***"Materials are forever stretching the boundaries of what is possible – in a future of doing more with less."***

Lord Norman Foster, founder and principal of Foster + Partners. He was the opening keynote speaker at the LafargeHolcim Forum (from page 10).



***"Follow a material's life cycle to get a better view of the industry."*** Kai-Uwe Bergmann, partner architect at Bjarke Ingels Group. He was a workshop respondent at the LafargeHolcim Forum.



***"It's important to talk about how to deal with materials in the future."***

Francis Kéré, principal of Kéré Architecture. He was a keynote speaker at the LafargeHolcim Forum (from page 18).



***"We have enough existing materials – we can improve them and make them more effective."*** Anne Lacaton, co-founder of Lacaton & Vassal architects. She was a keynote speaker at the LafargeHolcim Forum (from page 14).



***"We have to work together – building naturally or industrially."*** Anna Heringer, Honorary Professor of the UNESCO Chair in Earthen Architecture. She co-moderated a workshop at the LafargeHolcim Forum.



***"Bring all the knowledge to the political decision-makers."*** Rt Hon Simon Upton, former Environmental Director of the OECD and currently New Zealand Parliamentary Commissioner for the Environment. He summed up the findings of "Re-materializing construction" (from page 64).



***"From new construction to waste collection – re-materializing has many angles."*** Brinda Somaya, principal of Somaya & Kalappa Consultants in India and member of the Board of the LafargeHolcim Foundation.



***"We need to challenge the limits of materials."*** Jens Diebold, Head of Sustainable Development of LafargeHolcim and member of the Board of the LafargeHolcim Foundation.

***"Concrete is a very ecologically-friendly and local material - it must be improved and made more efficient."*** Karen Scrivener, Head of the Laboratory of Construction Materials at the EPFL Lausanne. She co-moderated a workshop at the LafargeHolcim Forum.



***"We can provide the supply but not the demand for the recycling of concrete."*** Cédric de Meeûs, Head of Public Affairs of LafargeHolcim.

***"It's important that we understand the processes behind the materials."*** Laila Iskandar, former Minister of Egypt. She was a keynote speaker at the LafargeHolcim Forum (from page 26).



***"It's too simple to say we need sustainable building materials - we need a systematic approach."*** Jan Jenisch, CEO of LafargeHolcim and member of the Board of its Foundation. He presented the LafargeHolcim Catalyst Award at the Forum (from page 34).



***"We need knowledge to address the built environment."*** Alejandro Aravena, partner architect of Elemental in Chile and member of the Board of the LafargeHolcim Foundation.



***"The better we understand the materials we've got, the sooner we can start to deal with their problems."*** Stuart Smith, director at Arup in Berlin and member of the Board of the LafargeHolcim Foundation. He moderated the concluding panel (from page 60).



***"The least resource consumption for a maximum use."*** Michael Scharpf, Lead Manager Sustainable Construction of LafargeHolcim.



The opening morning of the 6<sup>th</sup> LafargeHolcim Forum was broadcast live in a building adjacent to the Bassily Auditorium, reaching a total of 2,000 people. The Forum was hosted at The American University in Cairo (AUC), Egypt, during the centennial of this renowned institution.

Every three years, the LafargeHolcim Foundation for Sustainable Construction invites leading thinkers from architecture, engineering, planning, and the construction industry to a three-day forum. The 6<sup>th</sup> edition was hosted by The American University in Cairo and brought together 350 experts from 55 countries. They listened to lectures and panel discussions, exchanged ideas in workshops, and expanded their knowledge on excursions. This publication summarizes the most important statements and findings of the conference.



The New Cairo Campus of AUC was opened in 2008.



Khaled Tarabieh, Professor of Sustainable Design at the Department of Architecture at The American University in Cairo, coordinated the logistic needs of the Forum.



Ahmed Sherif, Chairman of the Department of Architecture at The American University in Cairo, welcomed Forum participants to the new campus of the 100-year-old university.

The consumption of resources around the globe is enormous – and it is steadily increasing. In 1970, 22 billion tons of material were extracted from the earth; now, we are at more than 70 billion, as a report by the United Nations shows. If things continue like this, we will need 180 billion tons of material every year by 2050. The UN report also shows that material efficiency has barely increased in the last 20 years. In many emerging countries, there is still little attempt to curb the overexploitation of valuable materials. The problem is not just the consumption of resources themselves – the processing of raw materials and the transport of materials also consume enormous amounts of energy.

Materials management must play a major role in our efforts to achieve a sustainable world. The construction sector in particular is responsible for this – because it is the largest consumer of materials. Sustainable construction requires a precise analysis of material flows and better use of what already exists. Radical and innovative solutions for the use of building materials are needed.



Maria Atkinson (left) and Alejandro Aravena (right), both members of the Board of the LafargeHolcim Foundation, challenged the speakers in ad hoc discussion panels. Pictured are Anne Lacaton (second from the right) and Francis Kéré (second from the left).



Final preparations: Lord Norman Foster opened the LafargeHolcim Forum 2019 with an inspiring keynote address looking beyond architectural issues.



Khaled Abbas, Deputy Minister of Housing of Egypt, presented an overview of the vast infrastructure and housing projects that are being realized in the Greater Cairo area.



Roland Köhler, Chairman of the LafargeHolcim Foundation for Sustainable Construction, explained the rationale for selecting Egypt to host discussions on the re-materialization of construction.



Marc Angéll, Professor of Architecture and Design at ETH Zurich and member of the Board of the LafargeHolcim Foundation, moderated the Forum with plenty of vivacity and humor.

# The solution is the problem

**Huge cities are being built in the desert all around Cairo - in what amounts to a massive battle of material. That's why there is no better place than here for a forum on "Re-materializing construction." Cairo impressively shows the urgent need for new approaches to resource management.**

Cairo manifests many of the great challenges facing the global community today, and it does so on a colossal scale. One of these challenges is population growth. 20 to 23 million people live in the metropolitan area; 50 years ago there were only half as many. The reasons for this growth are on one hand the rural exodus and on the other the high birth rate, which also leads to a very young society. Urbanization, which is progressing rapidly especially in Africa and Asia, has led to the fact that today - for the first time in history - more people live in cities than in rural areas.







About half the population of Cairo's metropolitan region lives in informal neighborhoods. The district of Imbaba is now one of the largest in the world. Yet hundreds of thousands of apartments and houses in the city are vacant – for a wide variety of reasons. One is that the state has frozen rental rates of old buildings to the level of the 1950s. Rental income fails to cover maintenance costs, so many landlords simply let their buildings decay. Another reason is that real estate speculation is rampant: Those who can afford it invest their money, supposedly safely, in new apartments without living in them themselves or renting them out. This so-called “concrete gold” is considered a secure investment in view of the high inflation rate.

However, it cannot be assumed that the demand for these new apartments will increase in the foreseeable future. The supply of new housing for those who can afford it is virtually unlimited in the metropolitan region. For generations now, attempts have been





made to counter the density stress and inhospitality of Cairo's urban center by building "desert cities." After all, there is seemingly infinite space in the deserts, and hardly anything has to be destroyed when a new city is built on sand. Dozens of such cities have already been built or are in planning.

But often concepts that look impressive on paper are difficult to achieve in reality. In 2004 the project "New Cairo" was launched, a new city about 20 kilometers from the center. It is designed for five million people, but so far only about 300,000 live there. A key development driver of New Cairo is the new campus of The American University in Cairo, opened in 2008. The 6<sup>th</sup> LafargeHolcim Forum was held there, in the midst of this future city of millions, which today represents a strange mixture of gargantuan construction site, ghost town and bustling metropolis. Most Egyptians cannot afford a condominium there, and despite all the new cities, informal settlements continue to sprawl rapidly.

Farther eastward of the city's historic center, an even newer New Cairo is under construction: the new capital city, which doesn't have a name yet. Six million people are supposed to live there someday, most of them civil servants and foreign diplomats. Six- to eight-lane highways already lead there today. The infrastructure now being built is obviously laid out for a large city. This year, one of the largest mosques and one of the largest cathedrals in the Middle East opened there. The highest skyscraper in Africa and a financial district with 21 skyscrapers are planned. Responsible for building the whole city is a company held principally by the Egyptian Ministry of Defense.



One of the four mobile workshops of the LafargeHolcim Forum led through the new capital and to another of the so-called desert cities. On one hand, the participants were fascinated by the enormous scale and the determination of the Egyptian government to tackle the problem of overpopulation, a challenge that must some-

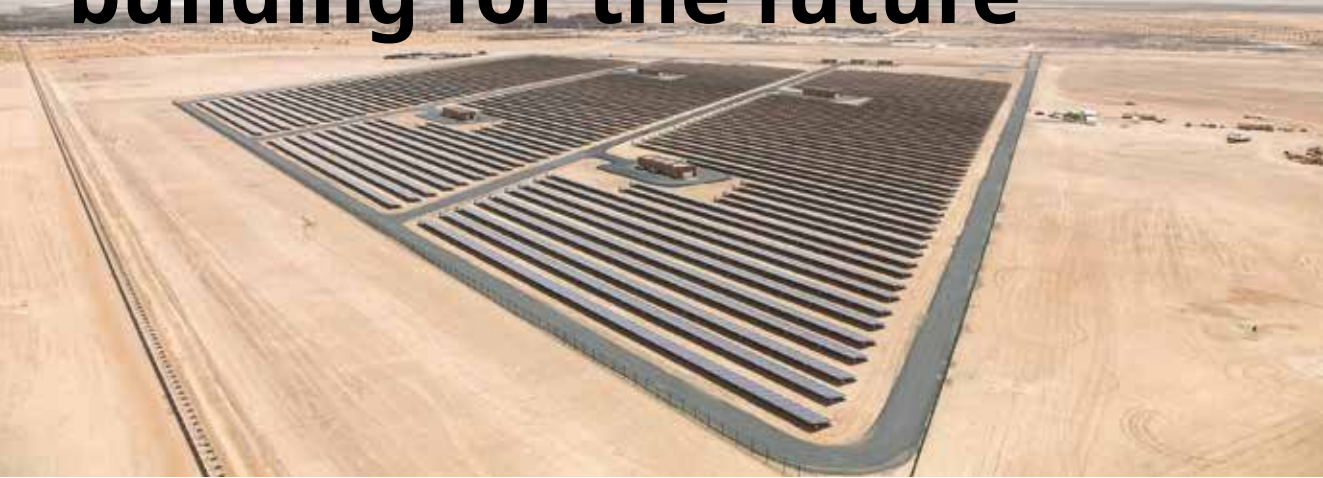
how be met. But on the other hand, many excursion participants could only shake their heads at the irony of the situation: More vividly than nearly anywhere else in the world, these desert cities show how resources are being misused. The envisaged expansive green areas will consume immense amounts of water, a particularly precious resource in Egypt. The buildings are being designed to Western standards, resulting in high energy consumption for cooling. Egypt is trying to solve an urgent problem with these ghost towns – but in doing so it is also creating new problems.



Sustainable construction requires holistic approaches. We need viable transitions between ambitions and reality, between old and new, between the interests and needs of present and future generations. Interdisciplinary collaboration is indispensable. Cairo clearly demonstrates just how vast and difficult the challenges of the future are. It thus proved to be an ideal location for the LafargeHolcim Forum, dedicated to the topic of “Re-materializing construction.”



# Learning from history – building for the future



This huge solar farm in the Abu Dhabi desert can supply a population of several thousand people with electricity around the clock.

**The British star architect Lord Norman Foster is one of the shapers and pioneers of sustainable construction. In his inspiring keynote speech, he pointed out approaches and ideas that are surprisingly simple – but require looking well beyond architectural issues.**



It looks like marble – but it's polished concrete.

***“If you want to look far into the future, first look far into the past!”***

How can we utilize materials optimally – and reuse them sensibly? How can traditional ideas be combined with modern technologies? Lord Norman Foster, chairman and founder of Foster + Partners in London (UK), investigated these and other fundamental questions in his opening keynote speech. His answers were often surprising – and surprisingly simple.

“Sustainability is inseparable from the process of recycling,” said the architect, presenting his project for Apple Campus 2 in California, USA, as supporting evidence. 24 buildings were already in place on the site. The buildings were demolished to make room for the new campus. The demolition rubble was recycled and used to

make concrete for the foundation of the new building. “Nothing would go into a landfill; 90 percent of the original constructions remained on site,” said the architect. Around 10,000 trees were planted to ideally integrate the grounds into the surroundings. They absorb around 200 tons of CO<sub>2</sub> per year and can also be easily recycled if needed.

“Sustainability is inseparable from energy.” Norman Foster impressively demonstrated this obvious connection with the urban development project for Masdar in Abu Dhabi, which is currently at a standstill. The project proves that a community of several thousand people can be powered exclusively by solar energy. In fact, the city’s solar field in the middle of the desert produces 60 percent more energy than Masdar needs.

***“By 2050 one in three individuals will live without access to clean water, modern sanitation or power.”***

Norman Foster’s Bloomberg headquarters in London is similarly impressive. Bronze elements set into the masonry facade act as “gills” for the building: they filter the air, attenuate road noise, and energy-efficiently serve to cool the building. Foster: “In most temperate climates, you don’t need expensive cooling and heating 70 percent of the time.” With its wooden floors, which are unusual for an office building, sound-absorbent ceilings equipped with energy-efficient lamps, an ingenious vacuum system, and many more sustainable elements, Bloomberg headquarters is today the most sustainable building of its type. It also gives the company an added bonus – because, as a study shows, people working in the fields of crisis response, information usage, and strategy perform significantly better in green and super-green buildings than in conventional ones.

The star architect then turned to the future. How will a city such as London look in 50 years? Will it simply be more modern – or will it become a green city with pervasive urban gardening? It makes



Existing buildings on the site were demolished and the rubble recycled to make concrete for the foundations of Apple Campus 2.



The giant Apple headquarters blends in with its surroundings thanks to the sophisticated choice of materials.



London today and as envisioned in 2050.



With magnetically fastened wooden flooring, sound-absorbing ceilings and integral lighting, Bloomberg headquarters in London is the most sustainable building of its kind.

***“How do we move from dirty, carbon-producing power generation to cleaner forms of energy?”***



The project in La Punt, Switzerland, is adapted to its specific context in every respect.

much more sense to bring agriculture into the cities, which significantly reduces energy and water consumption. The countryside, in turn, could then be transformed into a more natural environment. All experts agree that cities have an essential role to play in any sustainability scenario. It is estimated that by 2050 two-thirds of all people will live in urban environments. However, a third of them will live in informal settlements with no access to clean water, sanitation, or electricity. It is therefore also important to find solutions for this type of city – while simultaneously taking into account the social structures that have evolved there over time.

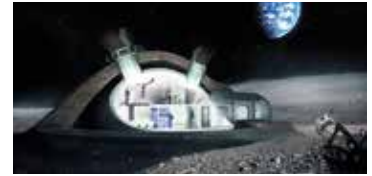
Norman Foster is not only an architect but also a designer, so he draws upon an exceptionally broad palette of materials. Borrowing technology from the marine industry, he designed the roof of Apple’s Steve Jobs Theater as a 70-ton fiberglass disc. It rests on a glass wall structure and thus appears to hover over the site. Some of the concrete elements at the Apple headquarters are polished to look like marble. At Masdar Institute in Abu Dhabi, Norman Foster employed aerospace technology concepts to achieve the most efficient protection against sun and heat.

Although the star architect has a penchant for advanced technical solutions, he emphasized that we need not reinvent the wheel: “If you want to look far into the future, first look far into the past!” The idea is to find out what we can glean from earlier civilizations that have created extremely pleasant living environments without light switches, air conditioning and so forth. To illustrate his point, Foster compared the temperatures of Abu Dhabi “with its tarmac and its typically Western response to a very specific climate” against those of Masdar, where the architects applied vernacular concepts. The findings: Street temperatures in Abu Dhabi are more than twice as high! Historically evolved cities and neighborhoods include shady areas and green inner courtyards which use evaporative cooling to help create a milder microclimate. “Those cities were

***“How could you regenerate an informal settlement from within, as an alternative to bulldozing? Could you respect the community fabric which exists within those settlements?”***

essentially scaled to the individual, not to the motor vehicle.” The architect then gave a corroborating overview of a project planned for La Punt, a Swiss alpine village. The planned multipurpose center for work, retail shops, gastronomy, and seminars employs time-honored massive masonry walls with recessed windows, an architectural feature that has proven to provide excellent thermal protection for many of the region’s historic buildings.

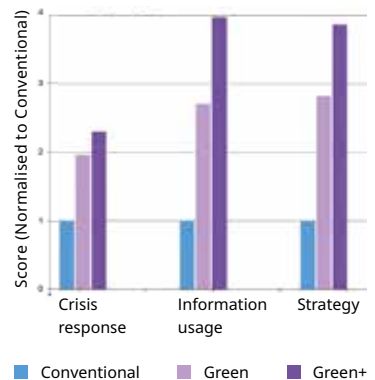
Despite being constantly mindful of the past, Norman Foster never loses sight of the future. It comes as no surprise that he is collaborating with the European Space Agency to design a lunar base – to be built using 3D printers, construction robots and plenty of local material!



Norman Foster also wants to work on the moon with a local material: moon dust.



The blue in the informal settlement in the lower part of the picture is not solar modules but plastic construction elements.



An experiment shows that people perform better in work in green or super-green buildings.

Norman Foster



Lord Norman Foster is Chairman and Founder of Foster + Partners, based in London, United Kingdom. Foster + Partners has an international reputation for pioneering sustainable approaches to architecture through a strikingly wide range of work. The firm’s projects include the New German Parliament, Berlin; Hong Kong International Airport; The Gherkin and Millennium Bridge, London; and Apple Campus 2, California. Since its inception in 1967, the practice has received more than 500 awards and citations for excellence and has won numerous international competitions. In 1999, Norman Foster was Pritzker Prize Laureate (considered the “Nobel Prize for Architecture”) and was honored with a life peerage taking the title Lord Foster of Thames Bank. He leads the “Droneport” project that featured cement stabilized earth Durabrick from LafargeHolcim at the Venice Biennale in 2016.

# Make do!

Shaping the world sustainably is a herculean task. For the French architect Anne Lacaton, however, it doesn't mean destroying everything old in order to create something new: It makes much more sense to use what exists as a basis for transformation into something better.



When old apartment buildings are to be modernized, they are usually torn down and replaced.

It's in human nature to reject whatever limits our creativity and productivity. Architects are no exception in this regard, assured Anne Lacaton at the opening of her keynote speech. She called for acceptance of existing conditions: "*Make do* is about making better use of what we already have. It is about considering the existing as a resource and as a value – and not about always seeing it as definitely unsatisfactory and too constraining." Every obstacle can be transformed into something positive. "Existing situations are the new materials for our projects."

***"Make do requires us to truly see the resources that are already there."***



Residential buildings like these can be found in suburbs around the world.

One of the first things architects should do in any project is to *make do* with nature. Instead of first demolishing and clearing the site in order to start from a clean slate, questions should be asked: How can I add something to what this place offers? How can I integrate the elements? How can I expand the scale? As an example, the architect presented a project in south-west France that she built with her partner Jean-Philippe Vassal 20 years ago:



a vacation home built on a sand dune overgrown with pine trees. They decided to neither change the dune nor cut down the trees. Instead, the house was elevated on a simple steel structure which was easily anchored.



Lacaton explained that the concept of *make do* works not only for individual buildings but also on a larger scale. It can give architects a practical approach for sustainable regional and urban planning. She cited the example of a small town in western France where a forest was threatened by an urban development project. 300 apartments were to be built on a certain plot. After inspecting the site, the architects proposed building only 200 apartments – elevated in the treetops so the forest could recover around them. Unfortunately, this proposal was turned down by the clients.

***“For us, the existing is the building material of today.”***

The concept of *make do* can also be applied to factors beyond one’s influence, such as climate. Especially architects who focus on sustainability can employ the concept to increase people’s comfort. “Every technical decision we make should also be a benefit for the user and for the quality of life and even for the pleasure of people,” said the architect. She presented a project executed in Floriac, France in 1993. The low-cost, easy-to-implement concept transformed the outdoor space into a sort of giant greenhouse. Shading and natural ventilation made for an ideal indoor climate.



New add-on sunrooms were a cost-effective, user- and environmentally-friendly solution for upgrading the buildings.

But what about the millions of buildings around the world that are abandoned and unused or simply no longer meet modern standards? “*Make do* with them to reuse them, to give them life again and to invent new uses,” demanded Lacaton. She showed how this can be done with an example from the French seaport of Dunkirk. A contemporary art center was to be built in a former industrial building. However, this would have destroyed the character of the huge hall, which is why the architects proposed the construction of a twin building. This was to look like the existing factory build-



Additional residential units were placed on the flat roofs.



Anne Lacaton and her team were determined to preserve the vast capacity of this old factory building (top). Her proposal: construct a twin building (right).



ing, but inside it would meet all the requirements of a modern art center. The existing hall – the void – was preserved and can now be used for special exhibitions or public events.

***“Every technical decision we make should also be a benefit for the use and for the quality of life.”***

When it comes to old buildings, Lacaton’s motto is: “It’s a matter of never demolishing, never subtracting or replacing things, but always adding, transforming, utilizing. Always try hard to do more and do better!” Using this approach, countless residential buildings from the 1960s and 1970s that failed to meet current residential standards have been upgraded in many French suburbs. The National Program of Urban Renovation was established in France to rehabilitate this aged housing stock. Between 2006 and 2015, 125,000 apartments were demolished under this program, but only 100,000 were built anew, due to changes in construction and housing requirements. That amounts to a loss of 25,000 dwelling units, a loss which cities cannot afford in the age of densification.

***“It’s important to change ways of thinking and to adopt a case-by-case strategy.”***

Lacaton and her team took a different approach for a large rehab project with three apartment buildings and a total of 530 apartments. Instead of demolishing and replacing the buildings, they transformed them simply by adding what the old apartments lacked. Each apartment received a four-meter-long extension on a new foundation, a sort of add-on sunroom that allows more natural light into the apartments. What’s more, this created what amounts

to a dual-skin facade that improves the insulation performance. The architects exploited the existing flat roof to add eight pent-house residential units. All the work was carried out without the residents having to vacate their apartments. And because financial performance is an essential aspect of every project, Anne Lacaton presented the key figures of her approach: a rehab cost of EUR 35 million versus an estimated cost of EUR 88 million for conventional replacement. 100% of the existing construction was retained; most areas required slight renovation only. Living area was increased by 53%. Primary energy consumption for the building operation was reduced by 60%. And since no one had to vacate their apartments, there was no loss of rental income during the construction period.

***“Always try hard to do more and do better!”***

Anne Lacaton is convinced that similar transformations would be beneficial in every city around the world – and this is possible if we are willing to accept what is already there and to work with it: “Every dwelling, every building, every plot can be enhanced for sustainable and qualitative densification, for the benefit of living space, uses and inhabitants.” But this requires a new way of thinking on the part of architects and the willingness to look at each project and each case individually.



Concepts for sustainable architecture can be derived from other industries such as agriculture.

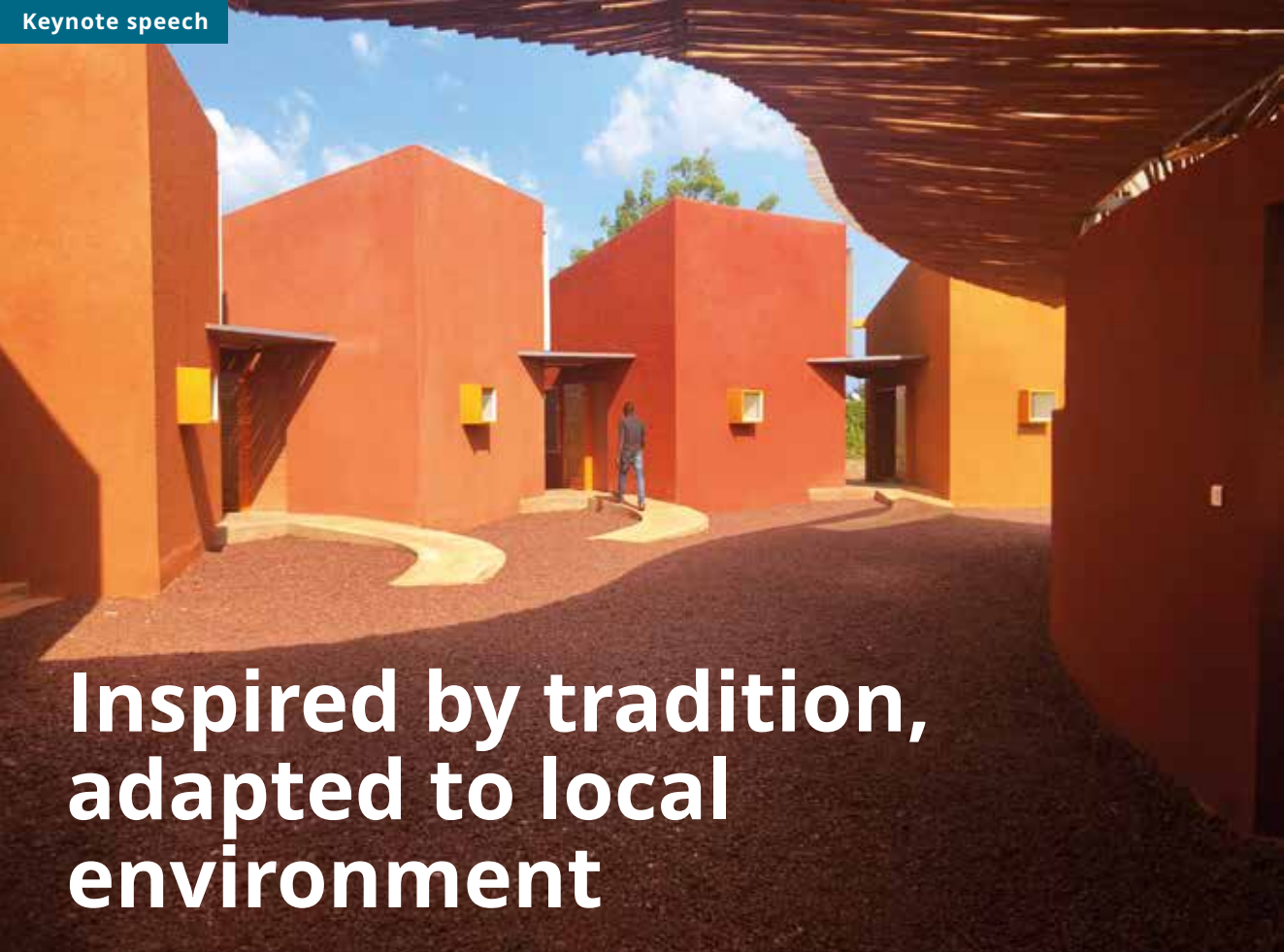


View from an apartment before and after transformation.

## Anne Lacaton



Anne Lacaton is Principal of Lacaton & Vassal Architectes, based in Paris, France. Formed with Jean-Philippe Vassal in 1987, the practice is recognized for its socio-political integrity and a visionary approach to architecture. Their work on reduced-cost constructions rejuvenates dialog with authorities and shows great consideration for residents in areas undergoing redevelopment. They designed the “bare bones” reclamation Palais de Tokyo gallery in Paris; and reshaped the Tour Bois le Prêtre 17-story housing tower with Frédéric Druot. The team cut away most of the thick façade panels, installing balconies and large sliding windows in their place for natural light and enlargement, and won the Design Museum’s Design of the Year 2013. Lacaton & Vassal received the French Grand Prix National d’Architecture in 2008.



# Inspired by tradition, adapted to local environment

The housing complex for employees of a hospital in Léo incorporates design strategies of traditional rural villages.

**In Burkina Faso, as in many African countries, architecture is still strongly influenced by European ideals – introduced during the colonial period. Francis Kéré opposes this. In his keynote speech, he showed how he promotes locally anchored, autonomous architecture using local materials.**



Laterite is a widely available and very practical building material.

“In Burkina Faso, urban planning was introduced through colonialism,” said Francis Kéré. This historical background is still relevant today. In the capital Ouagadougou, one can still see the intention to create a second Paris. Even in people’s minds, colonialism remains an influencing factor: The prevalent notion of what makes good architecture is still strongly influenced by European ideals.

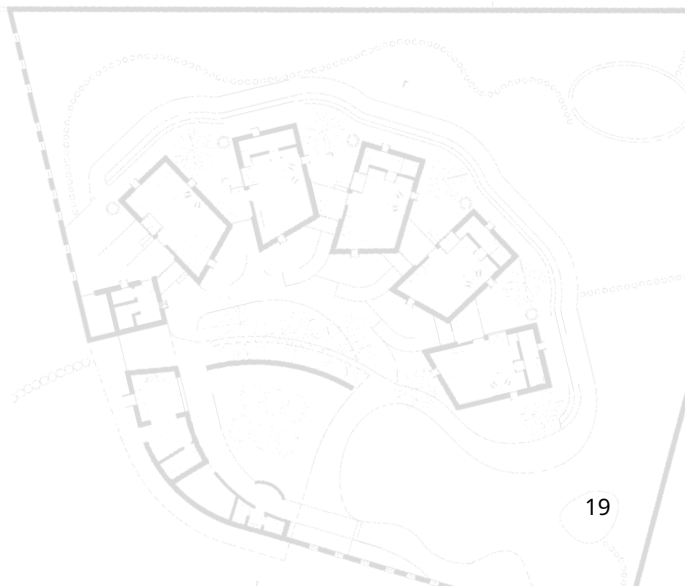


Francis Kéré explained that this was why his first building project in Burkina Faso met so much resistance. When he wanted to build a school in Gando after he finished his studies in Germany, everyone was initially proud. There was no school in the village at that time. But when the residents found out that the school was to be built of clay, they were disappointed. “Because in the eyes of the people of Burkina Faso, a schoolhouse is something from France,” explained Francis Kéré. “And it therefore has to be made of glass, concrete and steel.”

***“In the eyes of the people of Burkina Faso, a schoolhouse is something from France. And it therefore has to be made of glass and concrete and steel.”***

This is a big problem in Burkina Faso, the architect said. “We love Europe – but in the end, we’re just left with cheap copies.” Francis Kéré chose a different path. “I wanted to use the most widely available material.” So, despite the initial resistance of the population, he opted for clay as a building material, which was processed using the local workforce. Because many of the construction workers could neither read nor write, the architect deployed aids such as mockups. The building that thus arose is simple but effective. At a place where average temperatures of 40°C prevail, cooling is imperative. Francis Kéré relied on simple means of cooling such as many openings and a simple ventilation system. In the meantime, the local population has become convinced of the new schoolhouse – and the building is still in top condition. “This is the way we have to go,” said the winner of the Global LafargeHolcim Awards Gold 2012, “adapted to the local environment and inspired by tradition.”

This principle can be applied to more than choosing the right building materials. Burkina Faso also displays vernacular





Francis Kéré used mockups as guides for illiterate construction workers.



The primary school in Gando is built of clay, a material that no longer had a good reputation among the local population.

architecture that is not oriented toward Europe but instead is well adapted to local conditions – and has proven its value. This architecture must be rediscovered and further developed, and that is precisely what Francis Kéré does. For example, when he was commissioned to design a housing complex for the staff of a hospital, he studied the construction and design of traditional villages and applied the essential features to the new project: ample interstitial space, open roof assemblies, and recreational spaces between the individual components of the complex. This way of building is actually anchored in the tradition of the country but was largely lost through the course of colonialism. Today, the lessons of history and the use of local materials have led to “a renewal of the way we do things,” said Francis Kéré – emphasising the importance of this new old way.

Architecture is not an isolated discipline; the rediscovery of our own attributes is about more than just individual buildings. “I think we have to let Africa grow and go its own way,” stated Francis Kéré. His architecture is an expression of this conviction. “As technicians from this continent, we have a burden: Where to go? What to do? Should we create towers? Glass palaces?” he asked – of course rhetorically, because he does exactly the opposite. He is committed to doing his part to help Africa find its own way again.

***“As technicians from this continent, we have a burden.”***

This work essentially requires great persuasive effort, which Francis Kéré must expend again and again, for example, with the construction of Lycee Schorge High School in Koudougou. Laterite was to be used as a building material. This rock is widespread in large parts of Africa, including Burkina Faso. Laterite is highly ferrous. During mining it is soft and malleable but when it comes into contact with air it hardens. “It’s a miracle,” said Francis Kéré. The material is inexpensive, easily accessible, and ideal for the production of building blocks. “But, like clay, it is rejected by the local population because it is a poor people’s material.” Such prejudices

***“The key to making people believe is to make them see the positive result.”***

must be overcome. “So what I did was cutting it while everyone was watching,” said Francis Kéré, “and this way people were convinced. The key to making people believe is to make them see the positive result.”

After initially being rejected, his buildings are always ultimately accepted by the population – sometimes even to the surprise of his clients, told Francis Kéré. His approach is gaining influence. His persuasive efforts are effective – on one hand because of the commitment of the architect, and on the other because the advantages of local, traditional ways of building are plainly obvious.


***“Even the richest nation cannot afford to waste a lot of material.”***

This approach applies not only to Africa, Francis Kéré added. He presented one of his latest projects: the pavilion of the Serpentine Gallery in London. Here, too, tradition is at play. His design drew on London’s traditional textile patterns and masonry-bond patterns. Francis Kéré opted for a local, widely available building material: wood – because “even the richest nation cannot afford to waste a lot of material.”



The pavilion of the Serpentine Gallery in the UK is based on the same principles as the buildings in Burkina Faso.

**Francis Kéré**



Francis Kéré is Principal of Kéré Architecture, based in Berlin, Germany. His material-sparing school design, using cement-stabilized clay and lightweight steel frames, is often built by unskilled labor with an elegant economy of means. Born the son of the village chief in Gando, Burkina Faso, he saw it as his duty to give back to his community after pursuing a scholarship which led him to Germany, and then studying architecture. He raised funds via an association he created to build a primary school in Gando that received the Aga Khan Award for Architecture. The follow-up secondary school received the Global LafargeHolcim Awards Gold 2012. Francis Kéré’s works include the Center for Earth Architecture, Mali; ICRC Museum, Geneva; and the masterplan for the new Assembly Building of the Burkinese Parliament in Ouagadougou.

# Serving many masters



Work on the summit station of the gondola cableway at Chäserrugg, Switzerland, was executed under special conditions and restrictions.

**Architects are service providers: They must fulfil the tasks entrusted to them by their clients. Swiss architect Christine Binswanger believes that architects furthermore bear the responsibility to convince clients concerning relevant matters of sustainability.**

Christine Binswanger has realized many challenging projects during her career as an architect. She addressed an aspect that often receives too little attention in the sustainability discussion. "We need to make cities and we need to make buildings that people love, that people want to use, that people want to take care of, that

***"We need to make cities and we need to make buildings that people love."***





people want to transform rather than throw away and rebuild,” she stated emphatically – because the truism persists that the most sustainable approach is to build nothing at all in the first place.

Of course, this is much easier said than done, as the architect knows from her own experience. After all, architects today make sure that existing resources and construction materials are used as sparingly as possible while at the same time meeting the requirements of the client, because architects are in fact service providers. And as such, said Binswanger, we must put forth the extra effort to meet all the requirements and demands: “We need to convince clients to believe in the need for this complex balance. Because if they don’t finance it, it’s not going to happen.”

***“If the clients don’t finance it, it’s not going to happen.”***

The easiest way always seems to be to make things extremely palatable to the client. Sometimes this can be done with a small touch like a special color, as Binswanger illustrated with one of her early works. Sometimes special materialization can be the decisive factor. This was the case with a building for the Swiss herbal lozenge producer Ricola. The project was designed in collaboration with Martin Rauch, a leading expert for clay construction. Clay, which performs outstandingly in terms of environmental properties and indoor climate, was the ideal building material – albeit not the most obvious one – for the planned herb storage building.



The concrete that was needed was produced locally: on the mountain itself.

Even when it comes to projects that must incorporate existing structures, designs can be elaborated in alignment with sustainability criteria. Christine Binswanger impressively illustrated this with the example of a renovation of the summit station of an aerial cableway in the Swiss Alps. The challenge: Neither the work nor the materials used were allowed to leave any trace in the natural surroundings. So the architects opted to use wood as the primary building material, where necessary supplemented with concrete, which was produced directly on site. All other materials and tools



Many small elements combine to create the cozy ambience.

Full-scale mockups are a good way of convincing clients of a sustainable concept.



were transported to the high Alpine site via the existing cableway, which remained in normal operation. The wooden furniture was crafted by local cabinetmakers – to enhance acceptance of the project by the local population and to provide the *gemütlichkeit* and ambience that visitors appreciate at such a place.

***“We very strongly believe that hospitals should be flat buildings, low-scale buildings.”***

Christine Binswanger also demonstrated that wood, a renewable resource, can be used as a building material on a larger scale, citing the example of the Children’s Hospital at the University of Zurich. “We made an effort to make a combination of concrete and wood, where the wood plays a predominant role in the experience of the building,” explained the architect. Here, too, the focus was



The Ricola herb center in Switzerland was designed in collaboration with the rammed-earth specialist Martin Rauch.



The underground and the three-story above-ground loadbearing structure of the new Zurich Children's Hospital consists primarily of concrete.



on the ambience, which is particularly important for children in the unfamiliar environment of a hospital. "We tried to create a child-friendly atmosphere without making everything colorful or painting animals on the walls." In order to realize the project, the wishes and requirements of dozens of departments had to be integrated into the overall concept. And finally, hygienic requirements also had to be taken into account. The design, which is currently under construction, respects the full range of requirements – despite the fact that most hospital operators reject wood per se, as the architect well knows. ***"There is a huge number of criteria that we are trying to fulfill."***

#### Christine Binswanger



Christine Binswanger is Senior Partner at Herzog & de Meuron based in Basel, Switzerland. Jacques Herzog and Pierre de Meuron were Pritzker Architecture Prize laureates in 2001, and the firm is renowned for its imagination and virtuosity. Works include the new Tate Modern, London and Elbe Philharmonic Hall, Hamburg. Christine Binswanger has led museum projects including Pérez Art Museum expansion, Miami, USA; Musée Unterlinden extension, Colmar, France; and Kolkata Museum of Modern Art, India. She has also led urban development and civil planning projects in Lyon, France and Burgos, Spain. The REHAB Basel Centre and new Children's Hospital (Kinderspital Zürich), Switzerland, are notable examples of hospital projects she leads. She received the Meret Oppenheim Prize in 2004 in recognition of her active leadership in the architecture and art community.



# Materials science is social science

Waste is money. To simply dump it somewhere is unthinkable for the Zabbaleen.

**Garbage is a valuable resource because it is easy to recycle. Today, however, systems are set up in such a way that most of it is simply discarded – so rethinking is necessary. In her keynote speech, former Egyptian Minister Laila Iskandar pointed out what needs to be done in terms of sustainable management of materials.**

*“Rethinking is absolutely necessary.”*

Garbage City. That’s what Cairo’s district of Manshiet Nasr is called by outsiders. The name was given due to the rotten stench that hangs in the air there. The neighborhood residents live in the midst of the trash. They are the so-called Zabbaleen, the garbage collectors of the Egyptian capital, one of the most populous cities in the world. And the garbage of others is their livelihood. From early morning until late evening, the narrow streets are bustling with activity. The Zabbaleen go from door to door in Cairo with



their carts, collecting garbage and taking it to Manshiet Nasr and several other districts where there are places for each material to be cleaned, broken down, and stored.

The Zabbaleen process several thousand tons of garbage every day. They can recycle up to 80% of it – that’s one of the highest rates in the world. “Most waste systems are set up to eliminate waste,” said Laila Iskandar, Egypt’s former Minister for Urban Renewal and Informal Settlements, in her impressive keynote speech. But valuable resources are present in waste flows, they just have to be harvested. Iskandar has been working intensively with the Zabbaleen and the informal waste sector since the 1980s. She is an expert on waste management, has promoted countless projects and joint ventures, and has received several awards for her work.

***“Without the work of the Zabbaleen, the whole of Cairo would be Garbage City.”***

It’s unthinkable for the Zabbaleen that garbage could simply end up in landfills. “Waste is money,” Iskandar explained. But, unlike the garbage collectors, the formal recycling industry has no access to these valuable resources. “Nor will it ever gain access to them if waste continues to be simply discarded.” Although the Zabbaleen play an important role, they are spurned and discriminated against by the rest of the population. Many of them are Coptic Christians, a minority in predominantly Muslim Egypt. They keep pigs that



In the informal sector of Cairo, up to 80% of waste is recycled – one of the highest rates in the world. The garbage of others is the livelihood of the Zabbaleen communities in the Greater Cairo area (map).



In Manshiet Nasr there are places for each material to be cleaned, broken down, and stored.

eat the organic waste. However, most animals were slaughtered in 2009 by order of the government. An understandable precautionary measure due to the swine flu – but one with catastrophic consequences for the Zabbaleen.

“The government has not yet realized how valuable the work of the garbage collectors is,” Iskandar said. “Instead of integrating the Zabbaleen into the formal sector, the government hired international waste management companies.” The costs were covered by the citizens through their electricity bills. That was a hard blow for the Zabbaleen. But the new system functions poorly. The garbage trucks are too large to pass through the narrow alleys, and the containers provided are constantly overfilled – or not even used at all. “The garbage collectors continue to do their job,” Iskandar noted. And that’s fortunate – because “without their work, the whole of Cairo would be Garbage City.”

***“The government has not yet realized how valuable the work of waste collectors is.”***

Iskandar hopes that the informal garbage collectors can be integrated into the formal waste sector by means of contracts and thus be withdrawn from their shadowy existence. “Materials science is social science,” Iskandar insists: “Rethinking is absolutely necessary. Informal recyclers should be compensated for their work.” This would relieve the burden on local authorities and reduce the cost of handling municipal waste. And ultimately, the streets and neighborhoods would also be cleaner. There is no need for a new waste system; rather, the shortcomings in the existing system should be rectified. “This requires reverse engineering of the payment system.”

“With the establishment of a legitimate recycling industry, the reclaimed materials could also be used for the construction sector,” said Iskandar. In Egypt alone, around 11 million tons of building materials were waiting to be processed and recycled in 2015. Laila Iskandar proposes that low- and middle-income countries introduce an extended producer responsibility system, a system for product responsibility in waste management. This would make manufacturers responsible for the entire life cycle of their products – in particular, for collection, recycling, and elimination. “It’s important that we understand the processes behind the materials.”



With better infrastructure and a fair waste management system, recycled materials could also be used in the local construction sector.

***“Most waste systems are designed to eliminate waste instead of harvesting it.”***

Waste is first sorted by hand before being cleaned and broken down. The materials are then sold to intermediaries who sell them to companies and factories. Better infrastructure is needed in order to sort waste more efficiently and to ensure work safety. Smaller companies should be given the opportunity to become more professional. Only in this way can valuable waste resources be returned to the market. “This would strengthen our resource efficiency and support sustainability in the construction sector.”

**Leila Iksandar**



Laila Iskandar is former Minister of Urban Renewal & Informal Settlements in the Egyptian national government. She has worked as researcher and consultant with governmental and international agencies in the fields of gender, education and development, environment, child labor and governance. She has worked with the informal waste sector for over 30 years and has designed, developed and implemented community-based solid waste projects. She was named “Social Entrepreneur of the Year” at the 2006 World Economic Forum by the Schwab Foundation. She is Chairperson of holistic growth CID Consulting, and a trustee at Alfanar, the Arab region’s first venture philanthropy organization. She is an internationally recognized expert and advocate for the informal waste sector in policy analysis, national strategy and global aid programs.



# Design against extinction

**The New Yorker architect Mitchell Joachim is a pioneer of environmental design. He is convinced: If we don't want to die out, we must redesign our cities.**

The facade of a New York building becomes a vertical garden where endangered monarch butterflies can find refuge.

“If I were some kind of alien I would think that cities were designed to create waste,” said Mitchell Joachim, Professor of Architecture and Urban Planning at New York University, in his keynote speech. Cities are in fact giant garbage machines: In New York alone, 36,000 tons of waste is produced every day. “This has to stop,” demanded Joachim. “Our planet is facing enormous environmental challenges, including climate change with rising sea levels, overpopulation, and food shortages. The global population is projected to grow to 11 billion by 2100.





To address these challenges, Joachim founded the interdisciplinary think tank Terreform ONE. The nonprofit organization brings together experienced architects, scientists, and artists who apply visionary concepts and ideas to develop solutions to our pressing environmental problems. Whether air quality, intelligent mobility, renewable energy, infrastructure, food, recycling, or clean water – Terreform ONE shows how the merger of technology, science, and design can lead to sustainable solutions.

***“Socio-ecological design recognizes that engineering and science can produce solutions.”***

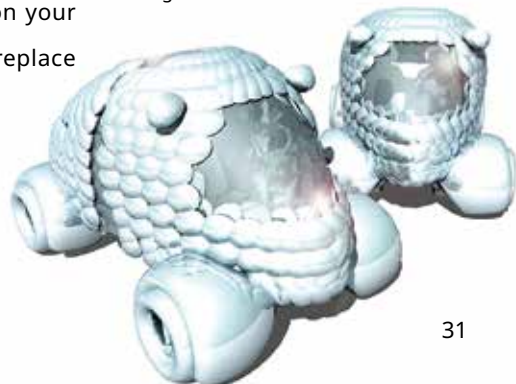
Joachim calls what he does socio-ecological design. “The term is very terrible for branding. But it is accurate. It recognizes that engineering and science can produce solutions.” The architect used concrete examples to show what these solutions could look like. “We have to think about how we move around in cities,” he said. Joachim was part of the team at the Massachusetts Institute of Technology that developed the CityCar, a foldable electric car. “Conventional vehicles are designed to be parked most of the time,” explained Joachim. The CityCar, which is now being produced under the name Hiriko, tackles this problem: A special folding mechanism allows the car to be shortened to a length of 1.5 meters for parking. This allows three cars to fit into one parking space. Another futuristic prototype is the Hug-and-Kiss-Lamb-Car, a vehicle made of soft and light material that travels in a sort of herd. “We call it gentle congestion. It doesn’t need to move fast. It’s OK to bump up against another car.” You wouldn’t really be driving the car yourself anyway, but could read a book. “And if you do bump into someone, you just say ‘Ciao!’ and continue on your way.” Joachim hopes that this sort of vehicle will eventually replace the large and wasteful cars that characterize cities today.

If the world population rises as predicted, one particular question comes to mind: What will all these people eat? According to the UN Food and Agriculture Organization, food shortages will



The Hiriko, an electric car specially developed for cities by the Massachusetts Institute of Technology, folds up so that three cars can fit into one parking space.

Heavy metal boxes are yesterday: The Hug-and-Kiss-Lamb-Car is made of soft and light materials.





occur unless we see mass dietary changes. For Joachim it's clear: "We can't continue to eat the stuff that we eat." So he and the Terreform ONE team sought alternatives to resource-intensive meat production – and found it in the form of insect farming. Joachim knows that insects are not particularly appetizing: "I don't want to eat a bug face with wings and hairy legs. It would never appeal to me. So why eat bugs?" Because insect farming requires 2,000 times less water per gram of protein than cattle farming, and because it creates around 300 times lower greenhouse gas emissions. Another advantage is that insects, unlike cattle, don't require large areas and can therefore be farmed within cities. The modular farm for edible insects developed by Terreform ONE has received several awards, including a LafargeHolcim Awards prize 2017.



In itself it reminds you of a giant insect: The modular cricket farm by Terreform ONE. It was awarded a LafargeHolcim Awards prize in 2017.

One of Mitchell Joachim's prime concerns is biodiversity. "Every seven minutes we lose a species," he said. Since the 1970s, the animal world has shrunk by 50 percent. This has catastrophic effects on the environment. "If they go extinct, we go extinct." That's why he developed a maxim for his work: Design against extinction. He aims to create living spaces that are good for both people and nature. He has plenty of ideas for this: The facade of a building in New York City becomes a refuge for threatened butterflies. A designer chair



Don't build your home – grow it! Within ten years you can grow an entire village that integrates symbiotically into its ecosystem.

***“Human imagination is our most powerful tool.”***

is made entirely of natural materials so that when it is no longer needed it can simply be put out in the garden where it will then serve as a new home or food for countless creatures. Using the ancient technique of grafting, houses can be grown from native trees. The living structure is formed with prefabricated computer-designed reusable scaffolding. This makes it possible to grow an entire village within a decade – one that not only fits well into its surroundings but is also part of the environment itself. “Human imagination is our most powerful tool,” Joachim insisted. Within the walls of Terreform ONE, there are no limits.

***“If they go extinct, we go extinct.”***

Mitchell Joachim



Mitchell Joachim is Co-Founder of Terreform ONE and Associate Professor of Practice in the Gallatin School at New York University, USA. Terreform ONE [Open Network Ecology] is a nonprofit architecture and urban design research and consulting group that promotes smart design in cities. The group develops innovative concepts and technologies for local sustainability in energy, transportation, infrastructure, buildings, waste treatment, food, and water. Mitchell Joachim won a LafargeHolcim Awards prize in 2017 for “Cricket Shelter in New York” – an exuberant architectural expression calling attention to the possibilities of insect farming. He received a Fulbright Scholarship; ARCHITECT R+D Award; Time magazine’s Best Invention with MIT Smart Cities Car; and was selected by Rolling Stone for “The 100 People Who are Changing America”.



# Be good – not less bad!

**The LafargeHolcim Forum in Cairo had room for a premiere: For the first time, a LafargeHolcim Foundation Catalyst Award was presented. It went to the sustainability thinker Michael Braungart, who expressed his gratitude with impressive spontaneous words.**

*“We don’t need to own the stuff; we need the service of using it.”*

Sustainable construction is not just an issue for architects and engineers. Shaping the future in a sensible way is an interdisciplinary task. The Foundation is underscoring this with the non-monetary LafargeHolcim Foundation Catalyst Award. This accolade for experts who have made a substantial, outstanding, and lasting contribution to the advancement of sustainable development was awarded for the first time. Jan Jenisch, CEO of LafargeHolcim, presented it – not to an architect, engineer, or urban designer – but rather to the chemist Michael Braungart for his work “Cradle to Cradle” and the associated principle that “being less bad is simply not good enough.”

***“Even if we would minimize our carbon footprint by 50 percent here, it would be irrelevant.”***

Braungart explained what he means by this bold statement: “We think it’s environmental protection when we destroy a little less.” But in view of the masses of people living today, that approach is simply doomed to failure. Braungart: “Even if we would minimize our carbon footprint by 50 percent here, it would be irrelevant.” It would be tantamount to trying to save the Titanic from sinking by bailing out water one teaspoon at a time. Why, he asked, are we so busy trying to be less bad – why don’t we just try to be good? “Let’s make architecture which supports life instead of minimizing the damage!”

***“We think it’s environmental protection when we destroy a little less.”***

This sort of rethinking also means discarding some concepts we may have grown fond of. As an example, Braungart repeatedly cited the notions of energy and material efficiency that are often discussed and claimed to protect the environment. “But I can tell you a country like Rwanda has been protecting the environment so much better than we ever did,” said the chemist: “They couldn’t destroy all the space because the system was inefficient.” In general, it is very helpful to look beyond the Western horizon. Then we would see, for example, that the first ban on plastic bags was not imposed in Germany, but in Rwanda. In any case, Braungart questioned whether we in the Western world are really engaged wholeheartedly when it comes to solving problems: “As long as we have problems, there is funding. So we keep problems alive and we

#### **Cradle to Cradle**

Cradle to Cradle (C2C) is a design concept developed in the late 1990s by Michael Braungart and the American architect William McDonough. It postulates a circular economy that goes beyond recycling as we know it today. Under C2C no waste is generated that must be discarded; rather, all resources used, production materials, and products are kept in a continuous cycle. C2C requires rethinking at all levels. All the energy needed comes exclusively from renewable sources. Production is done using either organic materials that can be returned to the biological cycle at the end of their useful life or non-organic or synthetic materials that can be completely returned to the technical cycle. In this way, no waste

is generated, and further natural resources need not be exploited to replace discarded materials. The Cradle to Cradle Association was founded in 2012 and has hosted the International Cradle to Cradle Congress every year since 2014. C2C certification has been in existence since 2010, awarded by the Cradle to Cradle Products Innovation Institute, based in San Francisco, USA.



Michael Braungart is the first recipient of a LafargeHolcim Foundation Catalyst Award. Jan Jenisch, CEO of Lafarge-Holcim (left), handed over the prize.

look for regulation instead.” In effect, the regulations are nothing more than indications of inherent problems. Braungart: “If you make a quality building, then you don’t need to regulate it.”

In his sweeping criticism of the attitude of simply being less bad, he also questioned the concept of recycling. After all, this simply means not taking a step forward. “And when you think about zero waste, you still think about waste,” he said of the many years of efforts to minimize waste. We humans are too many to be able to try to live virtually invisibly. “So I say: Let’s celebrate our human footprint, make it a big footprint – but make it one that counts!” After all, ants and termites, whose biomass is four times greater than that of humans, are not a burden on the environment.

***“Let’s make architecture which supports life instead of minimizing the damage!”***

The path to a positive footprint will require some paradigm shifts. For example, Braungart said that, strictly speaking, it is not nec-

*“If you make a quality building, then you don’t need to regulate it.”*

essary to own computers, washing machines, and such. “We don’t need to own the stuff; we need the service of using it.” We also need to stop trying to optimize the wrong things – such as indoor air, which is three to eight times worse than outdoor air. Why don’t you just ask yourself what good air is before you start optimizing it? Buildings should also have material passports, so that buildings



Recognition for his contribution to the advancement of sustainable development: The participants of the Forum honored Michael Braungart in the Ewart Memorial Hall of AUC on Tahrir Square – a cultural hub of downtown Cairo since it opened its doors in 1928.

can become usable material banks. “So we know what it is and we can use it again and again. Then we can enjoy materials.” And finally, it is also crucial to get away from finger-pointing, accusations, and causing guilty consciences. “Then we can look at people and say: ‘How nice that you are here!’ and not: ‘Could you please be ten percent less evil?’”

Michael Braungart



Michael Braungart is Professor of Process Engineering at Universität Lüneburg, Germany. He is the founder of EPEA International Umweltforschung, and co-founder of MBDC, with architect William McDonough. Together they developed the “Cradle to Cradle” design concept that mimics the regenerative cycle of nature in which waste is reused. He co-authored *Cradle to Cradle: Remaking the Way We Make Things* and has received numerous awards for his work in the field of ecology and sustainability. His commitment to environmental protection included supporting the establishment of the Greenpeace office in Germany. He held the Academic Chair of Cradle-to-Cradle for Innovation and Quality at Rotterdam School of Management, Erasmus University in the Netherlands (2009-17). He received Germany’s oldest environmental protection prize, the “Goldene Blume von Rheydt” in 2019.







Re-materializing  
Cairo, April 4 - 6, 2019  
**6<sup>th</sup> International  
 LafargeHolcim Forum**  
 LafargeHolcimForum  
 THE AMERICAN UNIVERSITY IN CAIRO

<b>A</b>		Ambrosi José, Mexico		Batayneh Maani Meisa, Jordan		Boisgontier Chantal, Australia		Chaouni Aziza, Canada		Duparc Kadidja, Côte d'Ivoire		Gamil Reem, Egypt		Haake Kathrin, Switzerland		Intrachooto Singh, Thailand		Khalil Inji, Egypt		Lahlou Khalid, Morocco		Mazari Hiriart Marcos, Mexico		Novakovic Stefan, Canada		Popescu Mariana, Switzerland		Sani Catherine, Malawi			
	Aachati Samy, Morocco		Amer Mariam, Egypt		Bates Donald, Australia		Boivin Sandra, France		Choudhary Ruchi, United Kingdom	<b>E</b>		Gandhi Bhavya Hemant, Singapore		Habert Guillaume, Switzerland		Iurrah Daniel, South Africa		Kharoudy Meryem, Morocco		Lamb Stephen, Switzerland		Mehrotra Nondita Correa, United States	<b>O</b>		Ochoa Foster Elena, United Kingdom		Sani Catherine, Malawi		Schalcher Hans-Rudolf, Switzerland		
	Abdelhalim Khaled, Egypt		Andersen Marilyne, Switzerland		Bayskar Shubham, India		Boulanger Heidi, South Africa		Chuah Stephanie, Switzerland		Eitel Bernd, Switzerland		Garcia Laia, Italy		Hahn Thorsten, Germany		Iskandar Laila, Egypt		Khonje Chimwemwe, Malawi		Lee Gabriela, Mexico		Melikh Karima, Morocco		Ochoa Foster Elena, United Kingdom		Raipure Satish, India		Schalcher Renata, Switzerland		
	Abdel Kawi Amr, Egypt		Aney Paul, Côte d'Ivoire		Bekhouche Salima Nour, Switzerland		Braide Tonye, Nigeria		Cimperman Katja, Slovenia		Elamawy Sara, Egypt		Gasparelo Lima Eduardo, Brazil		Hamza Ramy, Egypt		Khorshed Mirette, Egypt		Lemaitre Christine, Germany		Mendoza Edward, United States		Mennu Thibaut, Switzerland		Orr John, United Kingdom		Scharpf Michael, Switzerland		Schlueter Arno, Switzerland		
	Abdellaoui Najib, Morocco		Angéilil Marc, Switzerland		Bellucci Fábio, Brazil		Braungart Michael, Germany		Cortazar Eduardo, Mexico		El Bardi Laila, Morocco		Gavozdea Alexandru, Romania		Han Wonjoon, South Korea		Jeon Jungho, South Korea		King Bruce, United States		Leutenegger Marius, Switzerland		Merx Luc, Egypt		Orr John, United Kingdom		Schmid Carmen, Switzerland		Scholl Manuel, Switzerland		
	Abdelmonem Mohammed, Egypt		Aravena Alejandro, Chile		Bennani Dounia, Morocco		Breahnea Simona, Romania		Brito Diego, Brazil		El-Husseiny Momen, Egypt		Gavozdea Maria, Romania		Hanaki Keisuke, Japan		Joachim Mitchell, United States		Kishnani Nirmal, Singapore		Levy Christophe, France		Mendoza Edward, United States		Merx Luc, Egypt		Palacios Armando, Mexico		Raich Martin, Austria		Schmid Carmen, Switzerland
	Abd El-Monheim Nancy, Egypt		Archer Francis, United Kingdom		Bennani Fatima-Ezzahra, Morocco		Brito Diego, Brazil		Dahal Samir, Nepal		Elkady Amr, Egypt		Gelinas Marion, Canada		Hansch Marcella, Germany		Jones Kevin, Australia		Köhler Roland, Switzerland		Li Wenyue, China		Mikalo Armel, Côte d'Ivoire		Orr John, United Kingdom		Raich Martin, Austria		Schmid Carmen, Switzerland		
	Abdelaal Waleed, Egypt		Arens Robert, United States		Bennett Laurien, Lebanon		Bucci Angelo, Brazil		Dax Michael, Germany		El Kerdany Dalila, Egypt		Ghodbane Dalila, Belgium		Hartenberg Sylvain, Netherlands		Joseph Michael, Australia		Kopylova Larisa, Russia		Loftness Vivian, United States		Miller Bhaady, New Zealand		Pande Priyanka, India		Raich Martin, Austria		Schmid Carmen, Switzerland		
	Abo Dahab Ahmed, Egypt		Arram Riham, Egypt		Benzakour Abdelmajid, Morocco		Bucher Alain, Switzerland		Delluc Mona, Switzerland		El Mahdy Deena, Egypt		Gielen Maarten, Belgium		Hartman Hattie, United Kingdom		Kamte Hermann, Cameroon		Kreimer Eleonora, Argentina		Lohaus Ludger, Germany		Mobin Syed, India		Patara Shrashtant, India		Robertson Hannah, Australia		Scott Lloyd, Ireland		
	Abou Samra Mohammad, Egypt		Arsano Alpha, United States		Bergmann Kai-Uwe, United States		Buehrer Stephan, Switzerland		de Meeûs Cedric, Belgium		Elsinbawy Ali, Egypt		Giorghis Fasil, Ethiopia		He Mengyao, China		Kazanowski Emily, Canada		Küffer Christoph, Switzerland		Mader Malgorzata, Poland		Mourad Rayan, Lebanon		Patterson Brent, Switzerland		Rocks David, Germany		Scrivener Karen, Switzerland		
	Abramovici Stephane, Martinique		Atkinson Maria, Australia		Berodier Elise, Switzerland		Calvo Barentin Cristian, Switzerland		Diebold Jens, Switzerland		El Zein Leticia, Lebanon		Göswein Verena, Portugal		Hebel Dirk, Germany		Kazanowski Emily, Canada		Kulshreshtha Yask, Netherlands		Mader Malgorzata, Poland		Mourad Rayan, Lebanon		Paugam Laure, France		Romagnoli Stefano, United States		Serafini Juan Cruz, Argentina		
	Achiba Lamiae, Morocco		Audergon Laurent, Switzerland		Berrada Sounni Soumia, Morocco		Capestuto Rita, Italy		Diez Fernando, Argentina		Endo Kenya, Japan		González Piris Fernando, Spain		Heffernan Michael, Australia		Keane Katy, United States		Kypfer Céilia, Switzerland		Maharaj Vedhant, South Africa		Mourad Rayan, Lebanon		Pérez José Ricardo, Mexico		Romagnoli Stefano, United States		Sewilam Hani, Egypt		
	Afra Hamid, Algeria		Auth Felix, Egypt		Binswanger Christine, Switzerland		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		Graham Sarah, United States		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
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	Banda Harrison, Malawi		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
	Ballim Yunus, South Africa		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
	Bach Max, Germany		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
	Bahri Youssef, Egypt		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
	Bastien, France		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
	Baudouin, Belgium		Block Philippe, Switzerland		Castro Paulina, Chile		Capuzzo Rita, Italy		Dillenburger Benjamin, Switzerland		Endo Kenya, Japan		González Piris Fernando, Spain		Heisel Felix, Germany		Keane Katy, United States		Kuo Jeannette, Switzerland		Maity Soumen, India		Mourad Rayan, Lebanon		Petrova Marina, Germany		Ross Philip, United States		Shata Ahmad, Egypt		
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Sobek Werner,  
Germany



Somaya Brinda,  
India



Srivastava Rahul,  
India



Steiner Francis,  
Switzerland



Stengel Heiner,  
Egypt



Streich Leonard,  
Germany



Surana Rajesh,  
Bangladesh



Szczelina Marcin,  
Poland



Taipale Kaarin,  
Finland



Tarabieh Khaled,  
Egypt



Tian Weijia,  
China



Upton Simon,  
New Zealand



Valkanova Ina,  
Bulgaria



Van Gahee,  
South Korea



van Buren Diane,  
United States



Van Damme Henri,  
France



Van Paassen Leon,  
United States



Vasourek Yvette,  
Czech Republic



Vázquez Carlos,  
Mexico



Vetterli Isabelle,  
Switzerland



Villaseñor Roberto,  
Mexico



Violich Frano,  
United States



Viray Erwin,  
Singapore



von Butler Maximiliane,  
Germany



Wallbaum Holger,  
Sweden



Walter Urs,  
Egypt



Weber Carmino,  
Switzerland



Weidner Stefanie,  
Germany



Weintraub Deborah,  
United States



Wernick Jane,  
United Kingdom



Woegerbauer Clemens,  
Switzerland



Wolff Solène,  
Germany



Wolhoff Alexander,  
Switzerland



Wood Graham,  
South Africa



Wu Wanying,  
United States



Yuk Shookhee,  
South Korea



Yu Wangzai,  
China



Zachary Ernest,  
United States



Zaky Hana,  
Egypt



Zhang Yamei,  
China



Zhang Yang,  
China



Zhang Yue,  
China



Zhu Shida,  
China



Zhu Yichen,  
China



Zutter Marc,  
Switzerland



# So much material on material

At the heart of the LafargeHolcim Forum are the four parallel workshops on selected aspects of the main topic. At the beginning of each workshop, experts present current projects and case studies from their research, which are then discussed by the group. The workshop topics are then developed further through brainstorming sessions, group work, thought experiments, or panel discussions. The workshops are conducted at a fixed location during two half-day sessions. The mobile session lasts a full day, during which the participants are taken on an excursion. The participants are free to choose which workshop they will attend. They are also allowed to switch from one event to the next – and this option was appreciated by the participants, because “Re-materializing construction” includes a great many stimulating aspects.

Changing paradigms:  
Materials for a world  
not yet built

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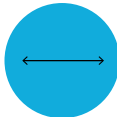
Shifting the flows,  
pulling the strings:  
Stocks, flows, and  
their dynamics

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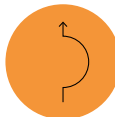
From manual to  
digital and vice versa:  
Digitalization, labor,  
and construction

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Catch 22: Material  
needs versus material  
impact

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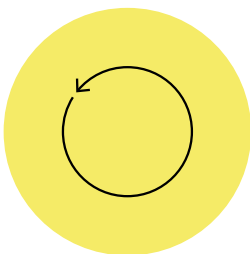




# Opening new doors

Practical application of Urban Mining and Recycling: Dirk Hebel, Felix Heisel and Werner Sobek are experimenting at the NEST (Next Evolution in Sustainable Building Technologies) campus at Empa, Switzerland.

**In the workshop Changing paradigms new models for the creation of a sustainable built environment were examined. The main discussion topics included new approaches to materials, water and energy supply, waste management, and alternative construction methods – all aimed at fundamentally redefining our relationship with resources.**



Today, in the typical scenario, resources are taken from the earth to use as construction materials, and these materials are disposed of after the building has served its purpose. The resources are consumed in the most literal sense of the word. If our built environment is to become sustainable, it must also become a supplier of resources itself – through circular economy: materials from end-of-life buildings must be reclaimed and reused.

“Where shall we get the materials we will need to build in the future?” asked co-moderator Dirk Hebel. The circular-economy model is one possible answer to this question. Another option is the use of new, sustainable building materials. Visionary ideas and innovative approaches are essential, because rethinking is ultimately needed. Instead of taking materials from the natural environment, they could be planted or cultivated. Hebel: “Maybe it will become possible to build with fungi or bacteria in the future.”



Co-moderator Dirk Hebel is Professor of Sustainable Construction at the Karlsruher Institut für Technologie (KIT) in Karlsruhe, Germany.

“We are facing a material problem in a dimension never seen before,” co-moderator Werner Sobek summarized. “We need to understand and to speak clearly for everyone.” Only in this way can we make real steps forward in the sense of progress. In order to meet the challenges our environment poses, we have to think unconventionally and open new doors. Sobek quoted the philosopher Elbert Hubbard: “The greatest mistake you can make in life is continually fearing that you’ll make one.”

This requires, for instance, a different way of looking at buildings. “We need to design buildings for disassembly.” Because we don’t build for eternity, when we design and construct buildings, we have to pay attention to how the materials can later be reclaimed and reused in subsequent construction projects. With BIM (Building information modelling), for example, we can determine how old a certain component is or how much stress it has been subjected to – and thus whether it is fit for reuse.

The construction industry is a large, enormously diverse sector. “And its biggest problem is communication,” Sobek insisted. We need better exchange of information, more backflow. And, above all, it is indispensable that “industry responsibility goes beyond profit.”



Co-moderator Werner Sobek is the Director of the Institute for Lightweight Structures & Conceptual Design (ILEK), University of Stuttgart in Germany, and founder of the Werner Sobek Group.



# Maximum benefits for humankind and the environment

**Buildings offer protection, provide security, and generate income. Sociologist Thomas Gieryn stated: “Buildings do all that, and much more.” Today though our built environment is widely perceived as problematic: The construction and operation of buildings and infrastructure are typically resource intensive and pollute the environment with considerable emissions.**



Co-moderator Guillaume Habert is convinced that this need not necessarily be the case. “We see the built environment as an interface of the natural and social environments.” Cities, for example, are complex systems in which natural and human processes interact to create an environment. Presently, the construction industry tends to promote buildings and cities that minimize economic costs and environmental concerns. The green workshop aimed to change the direction of this thrust: “We will explore pathways for



cities to maximize environmental and social benefits.” The workshop consisted of two sessions. First, the experts gave insight into their current projects, and the participants discussed the presentations. In her summary, co-moderator Marilynne Andersen pointed out that there had been eight mind-opening lectures. “They brought us from the very large macro-scale to the inner working of certain technologies in buildings.”

The overriding theme was the need for a circular economy in the sense of urban metabolism and the question of which technologies are needed to collect the data for the associated resource flows. Ideas were also discussed on how to avoid recurring mistakes and preserve resources. “We have reached planetary boundaries,” Andersen explained, “yet we are investing 99% of our energy in making things worse.” It is precisely because the various processes and flows are closely interlinked and interdependent that political action is needed.

Later, the participants broke out into four groups, each of which debated and brainstormed on a specific aspect: “Circularity in resources and energy flows”, “Urban mixity: liveability, social quality”, “Resource and behavior monitoring” and “Pilot experiments as catalyst”.



Co-moderator Guillaume Habert is Professor of Sustainable Construction at ETH Zurich, Switzerland.

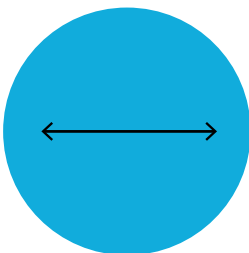


Co-moderator Marilynne Andersen is Professor of Sustainable Construction Technologies and Dean of Architecture, Civil & Environmental Engineering at the EPFL in Lausanne, Switzerland.



# Global know-how meets local material

**The negative effects of construction activities on the environment – including CO<sub>2</sub> emissions, waste generation, resource depletion, and others – are well known. To improve the situation on all fronts, new approaches are urgently needed. Not just innovative technologies but above all a multidisciplinary approach. Solutions can no longer be general – the premise of this workshop – but must be adapted to different economic, geographic, and political contexts.**



The co-moderators of this workshop, Philippe Block and Anna Heringer, come from very different backgrounds. "I'm excited to bring different research cultures together that typically would not interact with each other," said Block: "I'm expecting that we might have much more in common than we think." "We not only need to talk to each other but also to work together," stated Anna

Heringer. That's why they considered it so important to convert the workshop findings into a pilot project – and not just to record the results in a recap presentation.

Whether manual or digital, by hand or machine, prefabricated or manufactured on site – “There’s no right or wrong,” insisted Heringer. Rather, it’s a matter of looking at each situation individually and asking: “What is appropriate?” The great potential of digitization lies in the capabilities of sharing knowledge, for example in the form of tutorials. “We don’t have to reinvent the wheel.” From an ecological point of view, it is better to disseminate knowledge than to transport material somewhere. “That’s how global knowledge meets local building materials,” explained Block.

The use of locally available materials and human resources can lead to considerable socio-economic advantages. When choosing an approach, it’s important to maximize the potential of work and materials while minimizing environmental impact. “Innovations are often associated with fears,” said Heringer. It is therefore important not to try to change everything at once and to take needs and fears seriously.

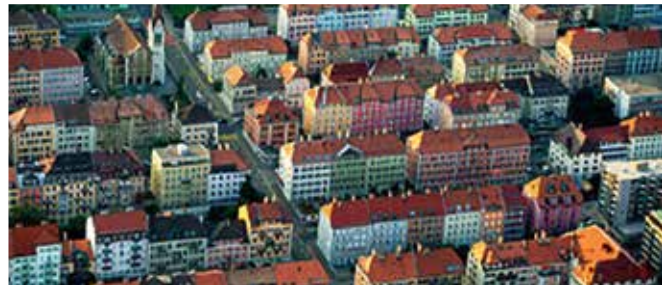
“Every strategy and every material has its limits – and that’s exactly where it becomes interesting: This is the point when you can approach others, work together, and strive for collaborative solutions. Heringer also appealed to political bodies: “Decisionmakers must become more aware and more involved. We have many of bottom-up approaches – but we also need top-down initiatives.”



Co-moderator Philippe Block is a Professor of Architecture & Structure at the Institute for Technology in Architecture at ETH Zurich, Switzerland.



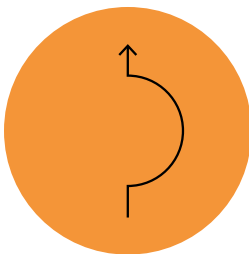
Co-moderator Anna Heringer is Honorary Professor of the UNESCO Chair in Earthen Architecture, Construction Cultures, and Sustainable Development in Austria.



# Marginal gains for a big effect

No matter where in the world: Housing demands enormous amounts of construction material (from top left): China, Brazil, France, Switzerland.

**“The reality that we are facing is the explosion in demand of construction materials.” This is not only negative; it has led to an improved standard of living for millions of people. But it cannot be denied that one cause of accelerating climate change is that the enormous demand for new buildings is being met with the consumption of available materials.**



“Wood is a very nice material – if you can get it,” said co-moderator Karen Scrivener. In Scandinavia, where the population is small and the forest areas are large, this works very well. But concrete still remains the most used building material worldwide. “We can’t get away from concrete, but we need to use it better.” The workshop focused on how to improve material efficiency. “We have to use all materials,” Scrivener noted, “but we need to consider where they come from and how they can be produced as energy-efficiently and emissions-free as possible.” Co-moderator Harry Guger presented the workshop findings in the form of six propositions. The first was “Reduce materials need and impact by intelligent

engineering.” Additional ideas for saving resources included digital monitoring, improved codes, and the development of low-cost adaptable structures.

The second proposition, “Use leaner and well-adapted local materials through the introduction of Artificial Intelligence and Machine Learning,” deals with the development of open-source databases and the use of big-data-driven analytics. The third guiding principle, “Bring the carbon home – make the built environment carbon absorbing,” focuses on natural building materials. Materials such as solid wood, agricultural by-products, and renewable insulation materials should be used whenever possible. Urban design should always respond to the local climate.

Recycling requires high-quality materials. Concrete made with copper slag, for example, cannot be reused. This is where the fourth proposal comes in: “Mining the city depends on mining data.” When waste materials are being reused, not all building materials will be of the same quality. Information on the condition of the used materials will therefore be needed. Hence, the fifth proposition: “Education and knowledge transfer are key factors for sustainable material use.” Gugger is convinced that “Material is a very big topic; it should be taught to all the kids.” The enormous potential of Computer Information Technology could be used to disseminate this knowledge.

“Being less bad is simply not good enough.” This provocative statement was heard several times during the Forum. The workshop participants discussed it – and deliberately decided against adopting it as their sixth proposition. The statement can be misleading in certain cases, because sometimes small steps are needed. Thus, the last proposition became: “Take all possible marginal gains – they will have a big effect.”



Co-moderator Harry Gugger is Professor for Architectural & Urban Design at the EPFL in Lausanne, Switzerland.



Co-moderator Karen Scrivener is Professor and Head of Laboratory of Construction Materials at the EPFL in Lausanne, Switzerland.



The two leaders of this mobile workshop, Dalila El Kerdany and Riham Arram, gave the participants deep insight into Egypt's current efforts to preserve its millennia-old cultural heritage.



The excursion started in the city center, where the group became acquainted with current urban renewal projects. The next stop was the impressive building of the Egyptian Museum in Cairo. It was built over a hundred years ago and, with over 150,000 artifacts, is considered the largest museum of ancient Egyptian art.



A particularly impressive experience was the visit to the Grand Egyptian Museum (GEM). Here, only two kilometers from the world-famous pyramids, Egypt is building one of the world's most exciting and largest museums: 50,000 items are to be exhibited over an area of nearly 90,000 square meters. The tomb treasure of Tutankhamun will be on display in its entirety for the first time. The GEM is scheduled to open in 2020.



The excursion ended on the Gizeh Plateau, which provides a magnificent view of sphinx and pyramids. Here, the experts placed special emphasis on techniques of archaeological restoration and the role of material science in securing and preserving ancient built works.





The mobile workshop led by Hani Sewilam dealt with water resources in Egypt and the associated challenges the nation faces. The excursion gave the participants insight into how water from the Nile was managed in ancient times and how it is used today.

The Nile is Egypt's lifeline – around 97% of Egypt's water resources come from the world's longest river. For thousands of years, the Nile was believed to be inexhaustible. This conviction is increasingly being questioned due to heavy population growth, climate change, and the changing geopolitical situation.

After an introductory presentation, the group traveled to El Qanater El Khayreya. The name means "Dams of Welfare." A dam was built here in 1840 to collect water and protect the delta from







flooding. The city is located in the Egyptian governorate of El Qalyubiya, about 22 kilometers from Cairo. The area is known for its great variety of gardens, parks, and agricultural zones.

The excursion then visited the Water Resources Research Institute, founded in 1975. A further stop was the Irrigation Museum, which provides an overview of the irrigation systems that had been used since pharaonic times –some of which are still in use today.





This mobile workshop was dedicated to traditional building materials and methods that remain relevant in Egypt today. The leaders, Khaled Abdelhalim and Mohammad Abou Samra, took the participants to lesser-known parts of the city, to districts, and to rural areas near the city which have been informally developed.



The excursion began with an overview presentation. Afterwards, the group visited an informal settlement in Cairo. About 60 percent of the population in Africa's largest city live in so-called informal houses. Interestingly, these are not built using traditional materials and methods but rather with modern ones, as in the formally developed parts of the city. The houses are often multi-story concrete and brick buildings.



The group stopped several times along the way and analyzed the urban typology from the street. The next destination was al-Azhar Park, Cairo's largest public gardens. Ancient city walls were found near the park, built by the Ayyubids in the 12th century. These

walls, with their crenellations, embrasures, stairways, and chambers, have been restored and integrated into the complex.

Before the excursion was fittingly concluded with a visit to the pyramids of Giza, the group visited the Wissa Wassef Center. The Egyptian architect Ramses Wissa Wassef was an enthusiastic devotee of Nubian architecture, which preserved domes and vaults of the earliest pharaonic dynasties, and he incorporated this influence into his own projects.





The mobile workshop led by Amr Abdel Kawi and Momen El-Husseiny took the participants directly into the desert. The objective of the excursion was to gain insight into the four generations of Egyptian desert cities. The first stop was the New Administrative Capital. This megaproject was launched in 2015 by Egyptian President Abdel Fattah al-Sisi, and construction began in April 2016. The



plan is for a new capital city with a population of 5 to 6 million to accommodate the government and financial sectors. This city is a fourth generation desert city. In the 1970s, when Cairo threatened to burst at the seams, the government devised a new concept: Egypt would conquer the desert. After several failed attempts, the 10<sup>th</sup> of Ramadan finally became the first completely planned satellite city. This was the group's next stop.



On the excursion it became clear that many of the desert cities are actually ghost towns. Even the city of Madinaty, which is about 20 minutes from Cairo, can't fully shake off its artificial character, although the urban plan is well thought out. In addition to detached houses and apartment blocks, there are also green areas, golf courses, hospitals, business centers, hotels, and schools, as well as sports, social, and entertainment facilities. But the city remains a concept, a product of the drawing board.

The last stop of the tour was 6<sup>th</sup> of October City. Like the 10<sup>th</sup> of Ramadan, this city was also planned as a satellite city in the late 1970s under President Anwar el-Sadat. It is home to numerous universities and an extensive industrial park.





# Use less, learn more

**In the concluding panel discussion, a board of top-notch experts reviewed the many findings from the workshops and keynote speeches – and discussed how the enormous challenges of re-materializing construction can be tackled. The panel comprised Marilyne Andersen, Harry Gugger, Anna Heringer, and Werner Sobek, and the discussion was led by Stuart Smith.**

The current problems that professionals around the world need to solve have been known for some time. One factor that makes it so difficult to find answers is that there are never any universally valid solutions. In addition, there is the time factor: We can't afford to continue doing business as usual for another 50 or 100 years.

***“In central European buildings there is 20 to 30 percent more material than the code requires.”*** Werner Sobek



That's why Stuart Smith started by asking whether it is even possible to develop ideal solutions under the given time restraints: "Can we deal with the really major issues around steel and concrete in the construction industry, and can we do that quickly enough?"

From left: Stuart Smith, Anna Heringer, Werner Sobek, Marilyn Andersen, and Harry Gugger.

***"Maybe we should make it more difficult to take the easy route."*** Marilyn Andersen

Harry Gugger warned against actionism, despite the urgency. An example of the potential result of this was seen during the mobile workshops. On one hand, 14 new cities are being built in the Cairo metropolitan area, yet on the other, uncounted buildings in the city center are empty. "I know very well that refitting is always more difficult, but, with all due respect, if you would refit that city properly, you could do without half of those new cities out there," assured the architect.

The constantly growing population poses a huge challenge to materials management and building not only in Cairo but around the globe. Werner Sobek substantiated this with impressive figures: The global population is growing by 2.6 people every second. In order to accommodate these people adequately, 400 to 1,300 tons of all sorts of materials would have to be produced per second. Sobek: "It is scientifically proven that this will kill the planet." Architects, urbanists, engineers, and everyone else involved in the construction industry have a responsibility to save materials wherever possible. Overall, however, this responsibility is being poorly shouldered. "In central European buildings there is 20 to 30 percent more material than the code requires," said Sobek, "because there is no incentive for optimizing."

For Marilyne Andersen the Forum workshops showed once again that we should not seek one single solution; rather, multiple solutions are needed that can be applied in various contexts. In addition, we must be careful not to create new problems with apparent solutions, as is obviously the case with the new desert cities around Cairo. "It's easier to build new than to reuse what is existing. So maybe we should make it more difficult to take the easy route," she suggested, an idea that Anna Heringer instantly supported: "I really believe we need a carbon tax."

***"What is really missing is the will to do it and to act now."***

Anna Heringer

So is the next move up to government? Harry Gugger thinks it's too easy – actually even outdated – to constantly rely on government. Education, for example, can now be provided without school buildings. "With the digital information tools, we can reach the kids directly. We just have to do that in a meaningful way," Gugger said. Marilyne Andersen also thinks that the government is all too often put on the spot. Instead, it would make more sense to work harder to seek dialog and to communicate ideas for a sustainable future more intensively. Werner Sobek likewise finds it unfair to always blame politicians. Khaled Abbas, Deputy Minister of Housing in



Egypt, who had spoken at the beginning of the Forum, is rightly proud to be able to provide one million apartments a year. After all, this is not being achieved in Germany, where only 150,000 new dwellings are being built each year instead of the 400,000 needed – despite an abundance of qualified workers. “The Deputy Minister made it possible, but the architectural and urban mess that came out of it is not his responsibility; it’s the responsibility of the people who drew that up.”

***“As long as we do not change our lifestyle, they have no reason to do so either.”***

Werner Sobek

As another challenge, we must be aware that emerging countries see the prosperous regions of the world such as Europe and the USA as models for their own behavior. Werner Sobek pointed out that this is shown in the Western status symbols found in the homes of the well-off. We should not feel like shining examples, the German said, but in fact we are, “and as long as we do not change our lifestyle, they have no reason to do so either.” That’s why it’s so important how we convey values in the industrialized world, Harry Guggler said. We have to acknowledge that no single set of values or opportunities are universally applicable or transferable between cultures and geographies. Everyone must develop their own values that will lead to a sustainable future.

As the session was nearing an end, Anna Heringer once again emphasized that we need to remain mindful of the past: “We know there are no bad side effects from building with materials as humankind has done for thousands of years,” she said. Thus, old and new knowledge should be merged in order to arrive at solutions that are sustainable on the one hand and effective in the local context of the respective regions on the other.





# There's no easy way

**Rt Hon Simon Upton summed up the findings of the 6<sup>th</sup> LafargeHolcim Forum in a precise and forthright manner – and he touched on many sensitive areas.**

Simon Upton was impressed by the lively discussions, presentations, and workshops of the LafargeHolcim Forum. Such exchanges of information are urgently needed because, as he said: “There is a serious need for education and it applies to everyone in this room as well, starting with myself.” The world as it is today has become so complex that continual learning is now a precondition for bringing about any form of substantial change.

***“Trees, I’m afraid, are not the answer to carbon emissions.”***

Today, says Upton, we find ourselves on a treadmill of material-path dependency. Steel and concrete shape our world, but



they also leave an enormous environmental footprint. We can easily build 300-meter skyscrapers, but the environmental price is high. Even higher is the dependency on the energy we need to use our constructed world. So what should we do? Is the answer new biomaterials? Perhaps, but there is no real demand for them. So should we be focusing more on the design of our built environment?

Upton said the Forum brought forth many fascinating approaches: the possibility of reducing waste and generating

***“There is a serious need for education.”***

energy from it; new approaches in water management; Christoph Küffer’s notion of wild design, according to which the environment shouldn’t have to adapt to our requirements, rather, our design principles should be derived from the environment and ecosystems; and last but not least, Anne Lacaton’s approach of *make do*, which effects conservation instead of destruction. “But this location and this Forum have also exposed us to the fact that there are plenty of people who have, if not nothing, very, very little other than the degraded environment which we are now asking them to survive in – so asking them to make do with what is clearly inadequate will not suffice,” Upton said.

***“There will be transitional costs, and we need to be honest about that.”***

In addition to continuing learning and information exchange, action is also important. Upton: “We have to accept that the planet won’t give us much time if we don’t.” According to projections,

***“We have to accept that the planet won’t give us much time.”***

around 10 billion people will populate the earth by 2050. If we continue to deal with resources as usual, we will be consuming 90 billion tons of material per year by then – more than twice as much as today. And if we want to achieve our declared climate targets within 10 or 30 years, we have no choice but to reduce CO<sub>2</sub> emissions to zero. And even then, our chances of success would be only 50%. Simon Upton shattered the hope that more trees would be the simplest solution with a report he himself wrote: “Trees, I’m afraid, don’t cut it. They are not the answer to carbon emissions.” What’s more, there is always the pressure to provide services where there aren’t any and to provide better ones where there are.

***“It’s easier to see a structure than its consequences.”***

So it’s high time for action. But who should take action when everyone seems to agree that everything is incredibly difficult? There is agreement, the Forum showed, that it’s important for architects to listen to the needs of building users. “But what do you do when the client wants something grand?” he asked, and had to admit that “Lacaton’s injunction to think behind the brief may not always get us there.” For many, the motto is: seeing is believing. “It’s easier to see a structure than its consequences,” says Upton. “We can’t see the emissions or the gray water that have been externalized from our little slice of suburban paradise.” As far as the environment is concerned, humanity seems to be standing on a bridge and will recognize the consequences only when the bridge collapses.

***“And don’t go and choose easy cases, please!”***

Lord Norman Foster is probably right to say that architecture is still the easiest part of the puzzle to solve and that, above all, political will – which is lacking – is needed in order to bring about change. But that makes it too easy. “Politicians will go as far and as fast as people let them,” the former politician said. They are always only as good as their advisors, and that’s why many politicians fail to manage the complex social and economic systems that surround us – and to explain their actions as they should. “I think that politi-

cians need to be empowered to explain what it may be that needs to happen,” concluded Upton. “Just to say ‘We need a new paradigm’ – I’m sorry, that’s not good enough.”

***“Politicians will go as far and as fast as people let them.”***

With this thought, Upton returned to his opening call for education and information. This, however, must be done on a sincere basis, without lobbying intentions. We have to make sure that the proposed solutions are really the smartest solutions – and not just solutions that best fit into the current political context. After that, the task is to raise awareness, for example regarding the waste situation, because: “Ultimately, it’s about waste. Carbon dioxide is a huge fraction of that, but it’s not the only waste stream.” In addition, it must be explained that some tough decisions have to be made if we want to make lasting changes. Whether it’s the complete abandonment of fossil fuels or the fact that change triggers costs. Upton: “There will be transitional costs, and we need to be honest about that. Those who can afford to bear those costs will have to bear them. Those who can’t need to be protected.” In view of the highly complex situation, Simon Upton advised the Forum to get all decision-makers and knowledge-bearers on board, to exchange ideas, and play out real scenarios. “And don’t go and choose easy cases, please!”

Simon Upton



Rt Hon Simon Upton is Parliamentary Commissioner for the Environment based in Wellington, New Zealand. The office contributes to maintaining and improving the quality of the environment in New Zealand through advice given to Parliament, local councils, business, communities, public agencies, and the Maori people. He was Director of the Environment Directorate at the OECD (2010-17). He led the team that released OECD Environmental Outlook to 2050: The Consequences of Inaction analyzing the environmental consequences of “business-as-usual” growth at the global level. He was previously Chairman of the OECD Round Table on Sustainable Development (1999-2010), and at the age of 23 was elected to Parliament in New Zealand becoming one of the country’s youngest Cabinet Ministers and Minister for the Environment. He was a member the Board of the LafargeHolcim Foundation (2004-17).

# Exploring next generation potential



**Sustainable construction essentially has to do with our future. That's why the next generation of architects and engineers is given a dedicated platform at the LafargeHolcim Forum: the Student Poster Competition.**



Following an internal selection process at the associated universities of the LafargeHolcim Foundation in all the world regions, 25 winning teams were invited to the Forum in Cairo to exhibit their project posters and discuss them with the other Forum participants.



The Student Poster Competition inspires new ideas among the Forum participants. The creators of the posters explain their projects to interested viewers, answer questions, and persuasively promote their ideas.

All Forum attendees were asked to cast their vote for the best project presented by the students. Three projects were awarded and two were highly commended.



# Re-mate struction





# rializing

Cairo, April 4 - 6, 2019



# M-E-X – Mercado Embarcadero Xochimilco, Mexico

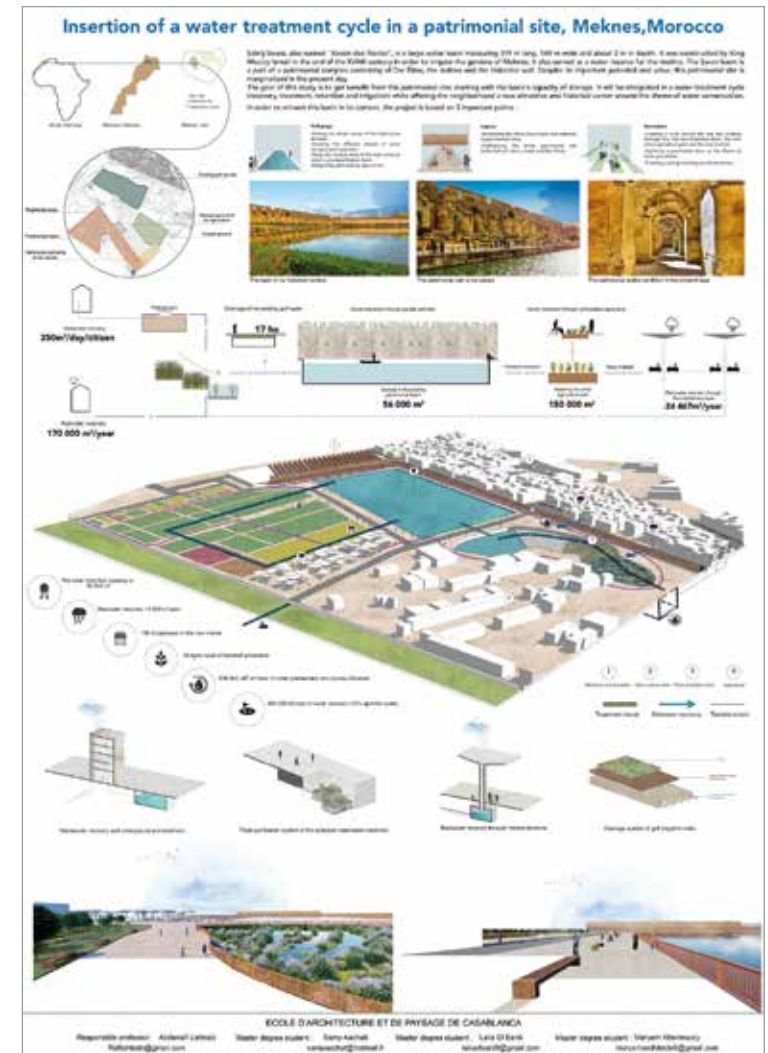


First prize went to **Juan Manuel Name Guzzy, Armando Palacios, Carlos Vázquez, and Roberto Villaseñor** of the Universidad Iberoamericana (IBERO) in Mexico City. Their project promotes the integration of social spheres of both residents and visitors of Santa María Nativitas Zacapa in the metropolitan area of Mexico City. It does so by expanding and mending public spaces that have badly deteriorated over the years due to informal appropriation and that have failed to significantly help to mend and unify the social fabric, resulting in fewer opportunities for social encounters and wellbeing.



# Insertion of a Water Treatment Cycle, Meknes, Morocco

**Samy Aachati, Laila El Bardi, and Meryem Kharmoudy** of the Ecole Supérieure d'Architecture (EAC) in Casablanca, Morocco, were voted by the Forum participants to receive second prize. Their project is to integrate the Basin of the Norias, a large water basin that is part of a patrimonial complex, into a water treatment cycle. At the same time, the project will offer the neighborhood a new attractive historical center focusing on the theme of water conservation. With these measures, the marginalized patrimonial site will be revived and its potential for the area explored and developed.



## Living Mexico City, Mexico



Third prize went to **Eduardo Cortazar**, student at the Universidad Iberoamericana (IBERO) in Mexico City. He postulates that it's time to rethink our cities. Using Mexico City as an example, he asks: How can brick and concrete shape the cities of tomorrow? With his poster he presented an exciting and holistic analysis of the current situation. Using an example site, he showed potential approaches and their effects.



# Community Farm Produced Processing and Storage, Amravati District, India



The first highly commended project was by **Shubham Bayskar**, Amravati, India, dealing with the food situation on the subcontinent. Farmers suffer huge financial distress every year due to chronic crop failure, low income, and debt. The student proposes a processing and storage facility that will increase the shelf life of crops and farm products, giving farmers more time to sell. The construction is kept simple and, thanks to the possibility of collective ownership, the project would also be affordable to realize in poor areas.

## Community Farm Produced Processing and Storage.

Name:- Shubham Haridas Bayskar,  
Amravati District, Maharashtra State, India.

### Introduction

Farmers in India's huge rural economy suffer severe financial distress each year due to chronic crop failure, poor income and financial loss. These are frequent reports of starvation and malnutrition particularly by small farmers. The hardships arise mainly due to the following causes:-

- Lack of sufficient storage/processing and storage space
- Shortage of farm/road and produce due to environmental hazard and natural disaster
- Fluctuation and change in crop produce due to inadequate post-harvest measures
- Shortage of demand and supply, price falling prices and excessive sales in peak or off-season
- Insufficient and costly use of farm machinery due to small farm sizes
- Cost may due to farming from nearby lands at high interest rates

This is a project to build a **processing and storage facility** that is designed ready to increase crop and farm produce. The simple framework structure that addresses the criteria of sustainable, collaborative, highly professional owned and managed as a storage and distribution hub to serve a small community of farmers.

### Sustainable features of Project

- Coordinate operation and maintenance of facility by the community to be benefited.
- Minimize impact on environment, water and resources.
- Reduce low cost materials that are accessible to the local population of urban and rural.
- Use of recycled **tree waste** from existing sources, reuse and reuse proper high strength material.
- Use of local farmers and labor resources for **affordable** low cost and high green space to utilization of Indian Resource, partners to solve issues where they address for crop storage.
- A concrete for radiologically shielded from nuclear leakage, processed using polymers through thermal and electrostatic energy system to seal the structure to increase, **thermal, hearing and cooling system** for reducing the noise propagation.
- Keeping to healthy, balanced and safe and safe for handling.

### Advantages of Facility

- It offers plenty of storage and processing space in the production country with small houses.
- Management of supply with market conditions of demand and prices enabling farmers to schedule sales at better prices and get better returns.
- Avoid losses from damage and pilferage of crop every year due to adverse weather, rain, pests, etc.
- Storage storage system with a one key with farmer and another with other and post-construction.
- This facility will encourage the **smallholder** holding due to regular income generating and storage outputs.
- Employment opportunities will arise for handling, loading, unloading, processing, sorting, transporting.
- Common machinery hub to increase productivity.
- The information Centre enables farmers to be better informed about daily market rates of produce.
- Assess existing government infra, trading partners, the WASH, Kisan Kiosk, etc. through information centre to avoid double main.

### Ground reality - specifies project significance

- 1% to 10% of food produced for human consumption is lost or wasted. **World Bank**
- 1% to 20000 acres north of food produced wasted every year in India. **Agriculture Ministry India**
- 500 million Indians go to food hungry every night. India ranked 103rd among 179 countries in 2017. **Global Hunger Index**
- Food production is not a commodity, since in India nearly 200-220 million tonnes of food per year while farm output has more than 275 million tonnes in 2017. **World Economic Forum**
- Central government of **India** spends about 100 billion that, over 10,000 farmers commits each every year.

Fig. Share of crop wastage/loss for crops

### Materials Used in the Design

- Use of **recycled waste** from other sources and from the community to be benefited.
- Using local materials such as bamboo, which is of low cost and high strength.
- Use of **recycled tree waste** from existing sources to solve issues where they address for crop storage.
- Use of **local** farmers and labor resources for affordable low cost and high green space to utilization of Indian Resource, partners to solve issues where they address for crop storage.
- Geothermal Heating and Cooling** system of heat will be present.

### Facilities Offered

- Weighing Platforms** - Trucks loaded with farm produce entering into facility would be weighed here.
- Office** - To manage maintenance and owner details.
- Processing Space** - a roofed space offered to farmer to process the farm produce with protection from sunlight.
- Storage Room** - a secured space for farmer to store his farm produce until he is ready to sell.
- Information Centre** - A communication room with internet and online connectivity to agricultural or grain market to inform farmers about daily market rates of their produce, crop advice, weather conditions and other details.
- Machinery Hub** - This hub offers farm machines on hire at nominal rent or lease payment.
- WASH Road and Passages** - WASH (Water Bound Macadam) of entrance and Passages in roofed facility would provide basic free access to trucks and vehicles.
- Security Guard Surveillance** - Individual farmers will not need to protect their farm produce as there would be a common surveillance.

### Project Location

- To take this research about a case study is proposed in the district of Amravati (population 2.8 million and area 12,238 sq km) in the Maharashtra region of Maharashtra which has almost 70% of farmers in the state. **2017 - Annual District**
- The major crops in this district include Soybean, cotton, wheat, Tur, Groundnut, Jowar, Green Chilies. The special requirements of these crops will require processing and storage it to be stored.

Amravati District in Maharashtra

Share of Crop Wastage

### References

**Reports Refered:-**  
 World Bank Report 2018 "India's Growth Story"  
 Global Hunger Index Report 2017 "The Realities of Hunger"  
 World Economic Forum Report 2017 "The global competitiveness index 2017: The global competitiveness index 2017"

**Website Refered:-**  
<http://www.worldbank.org/>  
<http://www.hungerindex.org/>  
<http://www.weforum.org/>

### The solution through project

The project addresses the need of crop storage, processing and storage of farm produce such that it is a roofed structure for weather proof storage of food grains, vegetables, fruits, seeds and any other farm produce.

It design and layout enables separate rooms for each activity in processing and storage of farm produce such that it is a roofed structure for weather proof storage of food grains, vegetables, fruits, seeds and any other farm produce.

### Contact information

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 Civil & Environmental Engineering,  
 WIT, Mumbai University, India.

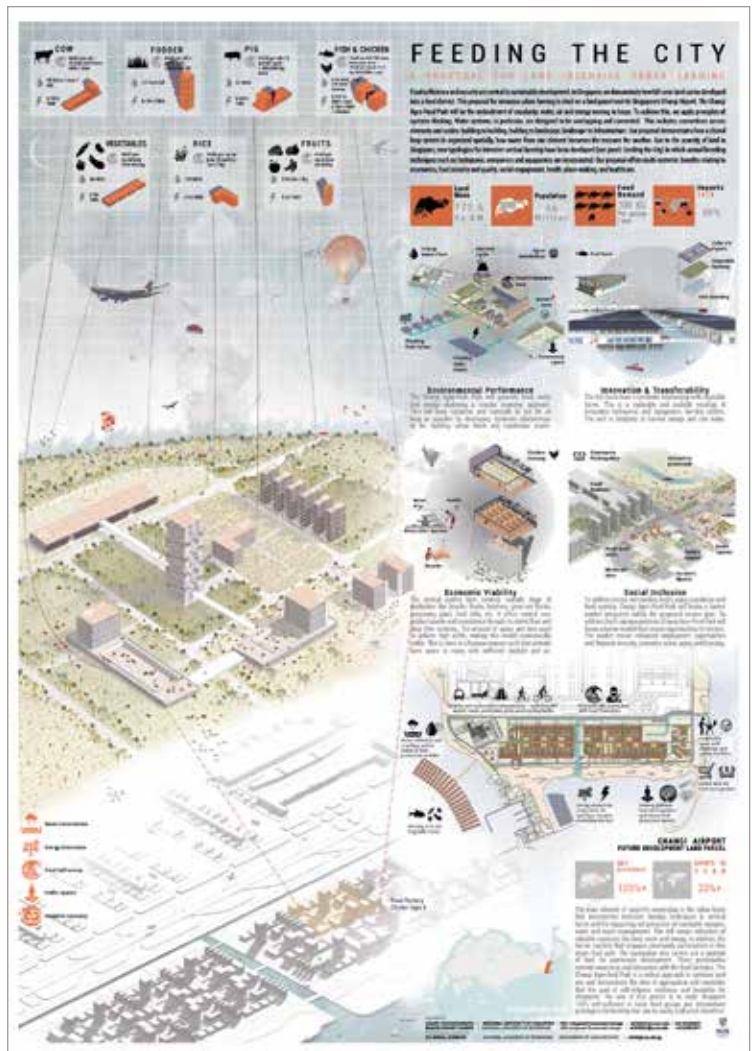
Address: At: Rajgurunagar Post, Muzar,  
 Tal: Basse, Dist: Amravati,  
 State: Maharashtra, India

Phone No: +91 9717374506

## Feeding the City, Singapore



**Jhanvi Sanghvi** and **Bhavya Hemant Gandhi** of the National University of Singapore received the second highly commended accolade for their innovative urban farming project. Using a land parcel next to Singapore's Changi Airport, they demonstrate how leftover land can be developed into a food district. The project is designed to be the embodiment of circularity, with water, air, and energy recycling in loops. To achieve this, they apply principles of systems thinking. Water systems, in particular, are designed to be overlapping and connected.







# Re-materializing networks

**Sustainable construction requires interdisciplinary approaches. An important purpose of every LafargeHolcim Forum is thus the networking of experts. The informal exchange during breaks, workshops, and social gatherings is both stimulating and fruitful – and leads to many new ideas.**









# Creating awareness, promoting excellence

Founded in 2003, the LafargeHolcim Foundation for Sustainable Construction raises awareness of the important role that architecture, engineering, urban planning, and the building industry have in achieving a more sustainable future. The Foundation expresses the commitment of its sponsor LafargeHolcim to drive sustainability in building and construction. The LafargeHolcim Foundation seeks to globally interlink knowledge and to encourage sustainable responses to the built environment. It promotes outstanding approaches to sustainable construction via print and online publications, maintains a comprehensive Internet presence, and engages on social media.

## **LafargeHolcim Awards**

The world's most significant competition for sustainable design. Projects and visions from architecture, engineering, urban planning, materials science, construction technology, and related fields are eligible for entry.

## **LafargeHolcim Next Generation Awards Lab**

The Foundation's workshop laboratories on sustainable construction offer Awards winners in the Next Generation category a platform to exchange ideas on a global level.

## **LafargeHolcim Forum**

The tri-annual series of conferences on sustainable construction, conducted in collaboration with the Foundation's associated universities, advance the international and interdisciplinary dialog.

## **An initiative of LafargeHolcim**

The Foundation is an initiative of LafargeHolcim, the global leader in building materials and solutions. LafargeHolcim is active in the business segments cement, aggregates, ready-mix concrete, and solutions & products. With leading positions in all regions and a balanced portfolio between developing and mature markets, LafargeHolcim experts solve the challenges that customers face around the world.



# Re-materiali

Cairo, A





Left: Three generations of **Heads of the Academic Committee** of the LafargeHolcim Foundation on stage at the Forum in Cairo: Hans-Rudolf Schalcher (2003 to 2013), Marc Angéilil (2014 to 2019), and Marilyne Andersen (from 2020), professors at the ETH Zurich and the EPFL (Swiss Federal Institutes of Technology).



All **members of the Board** of the LafargeHolcim Foundation attended the Forum on "Re-materializing construction." From left: Jan Jenisch, Roland Köhler, Brinda Somaya, Harry Gugger, Enrique Norten, Alejandro Aravena, Maryline Andersen, Maria Atkinson, Marc Angéilil, Jens Diebold, and Stuart Smith.



Behind the scene and last to leave Cairo: The **extended team** of the LafargeHolcim Foundation. From left: Alain Bucher, Marc Zutter, Mona Delluc, Carmen Schmid-Zeindler, Kevin Jones (seated), Diego Brito, Kathrin Haake-Rüegger, Edward Schwarz, Marius Leutenegger.

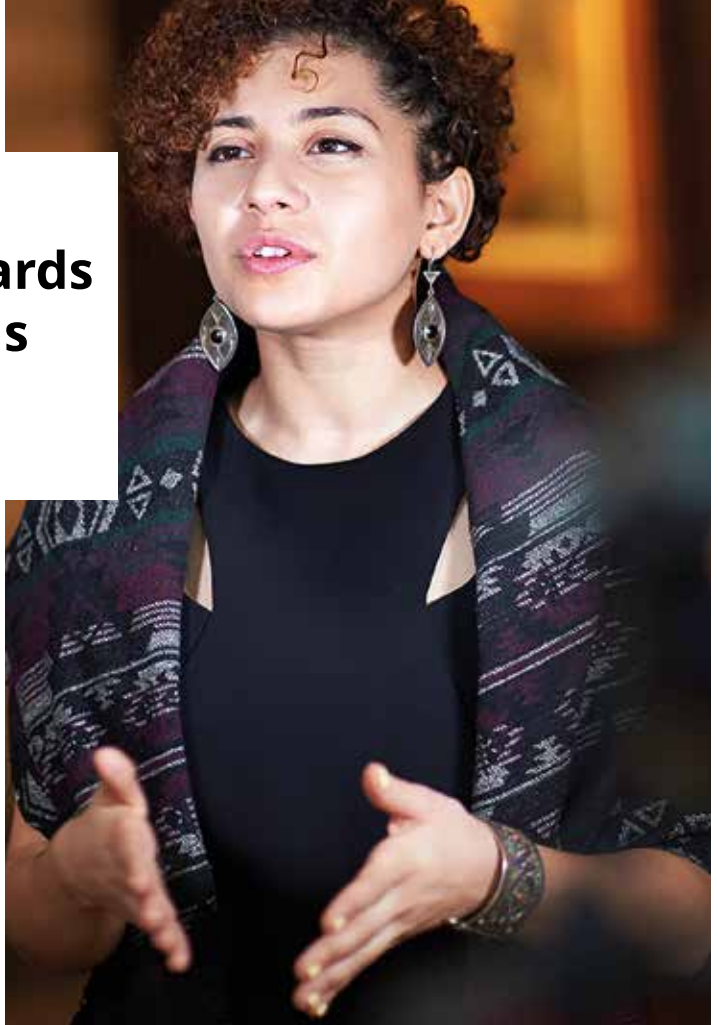
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