



Dominique Gauzin-Müller

English Translation

"Towards a frugal and creative approach to architecture and city planning"

So, yes, today I'm here to talk to you about a frugal and creative approach to architecture and territorial development, because my friends and I prefer to talk about thoughtful development rather than territorial development. You undoubtedly know the story of Earth Overshoot Day in 2021. It was on July 29th. It meant that humanity had taken just 209 days to use up the resources that the Earth takes a year to regenerate.

Construction in France and this is relatively similar in other industrialized countries represents about 46% of energy consumption, 40% of CO2 emissions, 50% of the consumption of natural resources and 40% of waste production. And in certain cities, it can be a lot more. When I discovered this phrase by Albert Einstein, some 20 years ago, it really struck me.

What did he tell us? That it's not possible to solve problems using the way of thinking that created them.

What this really means is that we need to do a reset and adopt entirely new methods. And both of these reasons together need to think in a different way, needing to step back and the fact that the planet is in very sorry shape. As you know, this was the topic for today and will be the topic for tomorrow.

We have launched with my friends Philippe Madec who is a practicing architect and urban planner, as well as a theorist. He writes a lot. And Alain Bernard, who is an engineer. We launched in January 2018, about four years ago, the manifesto for happy and creative frugality in architecture, what is now called thoughtful urban and rural development. If you'd like to read our manifesto, you'll find it on the internet site. We are reworking it, and it's available in several languages. Each time you open this type of slide, it's an excerpt from the manifesto. So, for a frugal building, the ecological transition and combating climate change converge on the prudent use of depletable resources and the preservation of biological, as well as cultural, diversity, for a more livable planet. Because that's really what we want. Carrying on with architectural, urban and technical solutions from the past, along with current ways of living, working, eating and traveling, is incompatible with the task facing our generations and the coming ones, because we're leaving them a heavy burden. They must contain, and then eradicate, global disruptions.

Why did we choose the term "frugality" instead of "sobriety," which is sometimes used? Because frugality comes from frux or frugis, meaning "fruit" in Latin. For us, this means properly using the fruits of the earth. So, precisely then, it means not using more than what the Earth is able to regenerate. There is also a connotation of simplicity, humility and modesty. Jacques Félix-Faure talked about that this morning, when he spoke of his very beautiful Haut-Bois project. For us, frugality is both happy, because it's based on generosity toward others, and also creative, because it

requires us to follow other paths. If we consume less resources in Europe or in North America, in industrialized countries in general, the countries of the global South and the future generations, some of the young people are here with us and this pleases me greatly they will have more.

So, in fact, what we are defending is social justice, and we think that less is enough. As I mentioned, we launched our manifesto a little over four years ago, since then, we've obtained 13,500 signatures. I confess that we didn't expect this. When we wrote it with six hands, with Alain and Philippe, we really didn't expect that it would go so fast and that local groups would be created. One of the first groups was in Lorraine and was led by some of my former students. There's also a group in Brittany, led by Philippe's former students. Some of these groups are extremely active. There are also groups in Taiwan and Vietnam, in Morocco, Belgium and Austria. And we get together. We met twice in 2019, once in Loos-en-Gohelle and once in Lens. We were looking for a mining area, a rather poor area in transition, which is the case in Loos-en-Gohelle. Then we picked a rather rural spot in the *Marches de Bretagne*, area close to Rennes, and then Covid arrived. Next, we had to make, or rather, we chose to have a cycle of online conferences. And we are currently organizing meetings in Bordeaux in late June 2022. I invite you to participate. So, if you want to learn more, you can have a look. These conferences are still online. They've been viewed, I think, over 50,000 times.

That's quite a lot!

It also shows the interest in this movement. This has just changed. After our general assembly, I still don't have the photos of everyone. But during the past year, the group coordinating frugality included others besides we three. In German, it's called the "Senior Semesters," and we chose to invite young people to join the steering committee. And, above all, we want to have gender parity.

What I am personally very, very happy with is that Raphaël, the youngest, and Alain, the oldest, are separated by exactly 50 years. A half-century of difference. Raphaël is 26 and Alain is 76, even though he doesn't look his age. And I guarantee you that it's not Raphaël who talks the least. Therefore, for us it's really important to have totally open discussions.

Back to frugality. Here are the four frugality principles. This is what I discuss in the doctoral thesis I started one year and a half ago at the Toulouse School of Architecture. For us, frugality is, first of all, a reduction, a decrease in what is material; that is, in the use of ground, the use of energy, the use of materials. At the same time, along with this material reduction, we want growth in human relations. This is why we call our frugality happy and creative. I find that Jacques Felix-Faure described it extremely well this morning in his presentation on the Haut-Bois project. So, I'll start by saying that frugality, in sum, is something that's important to us. The frugal building uses with care land and local resources. It respects the air, the ground, water and biodiversity, and it's also generous with the territory and pays attention its inhabitants. And in the two meetings we organized, where there were quite a few participatory workshops, a bit like the one we had this afternoon, which was very, very interesting, the issue arose both times, in both the Hauts de France and Brittany region.

Should we continue to build?

That might seem surprising coming from architects. That said, after proclaiming in the early noughties that it was scandalous that in architecture schools nobody was teaching what was called sustainable or eco-responsible architecture. It's been several years that I have been saying that it's a scandal that in architecture schools we continue to teach the way to build new buildings, whereas I'm convinced that for our young architects, 80% of their professional mission will be transformation, renovation or rehabilitation.

Welcome to you!

As a matter of fact, I was speaking of students and young architects. So, how do we remake the city on top of the city?

Here's an example I found some twenty years ago. An example that impressed me greatly. It's the transformation of the London docks. And I think London acquired lots of attractiveness thanks to this transformation, which in a certain way gave the Thames back, to both the inhabitants of London and to tourists, because the docks were transformed at the ground level into businesses and restaurants. Above this level, there is housing and offices. So we have a metamorphosis, with other functions. And another way to remake the city on the city is to restructure urban brownfields. Here are different types of urban brownfields. There can be land previously used for industry, ports like we have here, and also railways. In Paris, there are several.

The eco-district here is called "Cambridge" and is found in Oslo, right in the centre of Oslo. On the right, you can see the Oslo town hall. And there, once again, the old port and the old docks. You can see that there are both old buildings, brick buildings that have been transformed, and new buildings. You can see here how this has been arranged, a bit like fingers and nonetheless keeping green areas. It's dense, but it's still pretty green. And the very big building you see here, is a museum by Renzo Piano. Here is what you see when you walk through this Aker Brygge neighbourhood. You see that everything invites you to have a seat, to take a break. There are tables in front of a clothing store. Benches, too. It's a district that the officials wanted to be entirely pedestrian, pedestrian and for bicycles. It's a building, but it's more than that.

As you see here, you can go from one street to another through the building. So it has a porosity that is especially pleasant. And for children, since it would be tiring for them to walk so much, they can be transported. Children from the nursery in a stroller. And there are some cyclists, too. Here, you have a small green area between two of the fingers. We're in a European capital, where you can jump directly into the water, into the fjord and swim. When we were there, in August 2016, well, there was a kayak competition. Being able to have all these activities in the heart of a European capital is really something. The quality of living I spoke to you about earlier is truly there. We also have the transformation of industrial brownfields.

Here is the *Belle de Mai* in Marseille. I don't know if you are familiar with it, but I find it to be a rather magical place. It was a former tobacco factory. It was transformed by Patrick Bouchain and others. Jean Nouvel also contributed at the very beginning. It was started almost 25 years ago. So here we have museums, an exhibition room, artists' studios, a restaurant and concert halls. Above all, there's this magnificent terrace that is open to all. This terrace, at least when I was there, had no shops, had no restaurant, had no bar. People brought their picnic lunch. Kids played there; there were grandmothers. And from there, you have a magnificent view of Marseille. I feel that it's truly a very important place.

And there's no way I could skip the transformation of the former *Bonne* barracks, which I especially appreciated. In this initial section, all the photos I'm showing you are photos I took myself. Last summer I was in Grenoble, and I very much appreciated this centre, this heart of the eco-district that is very green, very calm. I spent nearly two hours here taking shots. It was really interesting to see how people pass through here: some cross the area to shop, and then there are mothers with children and others who stop to rest. I think that quality of living is particularly present here.

Representing the transformation of military barracks, there is, of course, the pioneering eco-district, the Vauban neighbourhood in Fribourg. I find this work extremely interesting, and we don't

necessarily know how to do it well in France. On the frontage, which is this part between the roadway, that is essentially for bikes. If there are cars, it's only to drop people off or deliver groceries. But this entire area between the roadway and the façade is used. Here, this couldn't be more basic, these are social housing. There's a waste bin and you can park your bike. But there's still a bit of green. Here, it's a bit more elaborate, a bit wider, too, with bikes that hide the waste bins. I think that this frontage is a very important element in making the city, at least the residential city, much more attractive because there is a setting back that ensures that the ground-level housing units are a bit more pleasant to live in than if they were directly on the street.

Elsewhere, in southern Germany, in the Südstadt of Tübingen, is an eco-district that's rather green and rather social. You can see that for our German friends, colour is also a factor. Here, we have once again a mixture of restructured old buildings and contemporary buildings. I won't comment on the architecture in the second part. I will show you buildings that are perhaps more interesting from an architectural standpoint, but what I like in these eco-districts in Tübingen is the presence of greenery that's a bit wilder. Like this stream. All around, you have housing units that are relatively traditional. And there you have a stream. Before, a stream would have been channelled and hidden; here, it's in the open. And they've also made a small creek. Kids are jumping from one side of the creek to the other. I think that this untamed aspect adds a lot to the city.

Now, another example of the transformation of military brownfields, the Darwin ecosystem in Bordeaux. Here, it has been transformed into a multipurpose area at the ground level. Grouped together, we have an organic food store, a restaurant and a café. On the first floor, there are offices and meeting areas. Seminars can be held in the back. There is also urban gardening. On the right, you can see the type of furniture used inside the offices, which are mainly start-ups for culture and sustainable development. And, in fact, we find the principles that were also mentioned by Serge Latouche; that is, reduce, repair, recycle, renovate, reuse, re-employ, revalorize, relocate and redistribute. And I believe that today, truly all of this type of thing must be done to ensure transformation. We are still redoing the city.

For the city, there is one thing that seems to me to be extremely important. When we work on architectural heritage, it means not only conserving stones, but also conserving values. This is the reason, for instance, why I find that the extreme example is Venice, because Venice is almost empty of Venetians. And housing has become so expensive that almost all of the housing units have been purchased. The owners of these units are very wealthy, very wealthy individuals, from almost every country in the world.

So, in fact, Venice has been emptied of its values to create a sort of Grand Disneyland. My friend Christine le Compte, who last year became President of the National Order of French Architects after having served for a long time as President of the Ile de France Regional Order, just published a book precisely on repairing the city, on transforming the city. She has this beautiful statement: "Repairing the city means contributing to its magic." I find this to be very true. And here, we see an extreme case, which is Hong Kong, where the city has truly mushroomed, with lots of buildings, very tall skyscrapers. But they've still preserved a few places.

What is a bit strange is that the two places they preserved were former prisons. So there you have it. But this former prison has been transformed into a cultural and social site that I find very interesting. And here, we can see this little corner with ancient architecture, with brick and stone, that contributes to the magic of the place.

What we all want to have in our cities are soothing public areas. And how do we make soothing public areas?

Well, the first thing is to get rid of cars in the city. One day, I visited by chance a skyscraper with my husband. I was able to see that the entire area around the city centre was free of cars. That means that the cafés and the restaurants could put their tables on the street, on the sidewalk, and this suddenly changed the atmosphere completely. There are lots of Swiss cities that have this type of city centre, very, very animated. Of course, I mustn't forget Copenhagen, the cyclist's paradise, with all the work done by Jan Gehl there. We also find this in Marseille: bikes, bikes in the city.

In addition to bikes, there's also the work that's been done in cities where the centre is entirely pedestrian. For those who have difficulty walking, for the elderly, and even for children who are very small, there can also be this kind of moving sidewalk. Here, we're in the Basque country in Spain. But there's another example from Hong Kong. Travel, lots of travel, is done on moving walkways or escalators, outside or sometimes inside the buildings. And sometimes almost up to the +2 level. This means that in Hong Kong, there are two levels for travel. There is travel for cars on the ground level, with pavements, but they're not used much. Approximately on the first or second level well, there are also pedestrian streets where people can travel above traffic. And I showed you a picture of Copenhagen, which has been transformed by urban planning. There's a face that you have probably seen in the film by my friend Cyril Dion that he sent to Jan Gehl to see. But he also participated in the metamorphosis of New York, and, in particular, he metamorphosis of Times Square.

Do you remember?

You've most certainly seen films where Times Square is covered with cars. Well now, for about ten years, more than a third of the street is no longer there. It's only for some cars, mostly taxis, and the rest is for pedestrians. In fact, they did this in a very simple way. Almost in just one night. They put up barriers, very, very simple ones. And then they applied a blue thing to set off the ground in the area in front of the stores. And then, and then it was done.

So, just sit back and decide to do something. We can really transform things.

In Manhattan, which is truly one of the most cement-covered places on the planet, there is also an absolutely magical place called "High Line". The High Line is a former roadbed where there were rails. It was used to distribute merchandise to factories on the left and right. And it was transformed into something else, about ten years ago, into a pedestrian road. This was done in several stages, and it's an absolutely magical place. This is from the first time I was there, about ten years ago, and it was pretty ugly. Nonetheless, there were fields. This is from two years ago. The weather was beautiful. There are lots of places to sit; there are benches and stools. There are chairs. There are regular chairs and deck chairs. Now, at a distance of about one kilometre, one-and-a-half kilometres, there is a truly magical place, where people can get together. It's the only place with greenery in this southern part of Manhattan. So here is what this looks like, since it is crisscrossed here and there by the High Line. So, each time, it adds a bit of green in the midst of the skyscrapers. And then, nature in the city can also be a productive nature.

I think we should absolutely return to the nurturing city, the nurturing city. An outstanding exhibition was made at the *Pavillon de l'Arsenal* in Paris, some seven or eight years ago. It was called "Paris: Green Capital," I think, and it explained that, in fact, until not so long ago Paris was supplied with fruits and vegetables by the surrounding villages. Each one had a specialty, depending on the microclimate and type of soil. What does that mean? I think that it was Arpajon that supplied green beans; Montreuil grew peaches. Other villages grew apricots, and there were cherries in Montmorency and asparagus from somewhere else. But all that was totally abandoned, even though it was a true wealth. And do you have an idea of how many days that the city of Paris is currently

autonomous with respect to its food supply? It's exactly three days. Therefore, we must absolutely bring back this nurturing city.

This is where I got a surprise. I was walking in the 13th arrondissement of Paris and I found this. It's the first rooftop that I found, the first that I discovered, the first roof that had both a vegetable garden and a restaurant.

And this was in Durban. I was there for the UIA convention. And there, truly, it was directly from the producer to the lady who made the meals; so it was rather fascinating.

This morning, I had the pleasure of seeing this. Now, I don't know who brought this earth. But I can tell you that rammed earth used for construction is great for growing vegetables. But it's not easy to achieve.

First of all, you need to remove the big rocks. Then you need to remove the gravel. And you need a whip. It's a lot of work. There's another place I love, a place in Paris that was made by two young architects who are absolutely fabulous: Clara and Julia. It's the *Ferme du Rail*. And it's a project that was made within the framework of "Reinventing Paris". In fact, associations of the 19th arrondissement, where Clara and Julia are based, decided to make a place with two sections. What you see on the right are 20 housing units. Of the 20 units, there are fifteen for people who were homeless, who lived on the street, and there are five for students from the Du Breuil agricultural school, a City of Paris school. The other building on the left has a vegetable garden on the ground floor level. Then there are the workshops. In the basement, there's a mushroom farm. At the ground level are the kitchen and restaurant. On the first floor, is the restaurant

Can you see it?

On the far right and above, there's a greenhouse. So, it's a place in which people who were formerly on the street can not only sleep. They can also work, and eat, because it's their cafeteria. I think we need more places like this one, to make life a bit more pleasant. Of course, it's a popular place for all these local associations, and Clara and Julia have made others, other buildings, always in their 19th-century neighbourhood in the 19th arrondissement.

So, for me, the frugal city is green. It's also slow; that is, reserved for pedestrians and cyclists. And children can play there with full freedom.

This is a book about the recreational city that I contributed to with an essay. By the way, I came here about two years ago. Before, it was the side, probably about three years ago, to give a lecture on play areas, because for me this is extremely important. It's almost a public health issue. Because too many children are overweight, even obese; they're losing psychomotor capabilities, in particular motor capabilities, because they're no longer in contact with the ground. I feel we must do everything to combat this. So here, we're in the Vauban district. You can see that the only trucks authorized are for the kids. And here, it's the Südstadt of Tübingen, The Südstadt is made up of islands, and the heart of the island is always green, with a playground for the children, where people can picnic and spend the afternoon. It's a dense city at this place. So, I feel that we can very easily combine a dense city with green areas for children. I find that Lyon has been very successful on the riverbanks. And, of course, I must also mention the "dragon" in Grenoble, where you had an artist work to create this playground set that the children love.

And then there are also permanent playground areas. But we can also find, like here in Bern, ambulatory playgrounds. This is the idea they had in Bern. There are three or four people, who are educators and who have a little cart that they can move around and that is filled with toys. But, as

you can see, these toys are almost nothing; just pallets. And there's even a stove, a sort of brazier. They put the brazier in the middle of the square. And there are also nails. They also have things like these, that they hang in trees.

They stay in one place for a weekend or a few days and then move on to another area to create activities and to create links, to encourage encounters. Because people that meet each other there maybe realize once they get together that they didn't know each other although they lived in the same neighbourhood.

From then on, they will see each other again. Here, I have shown you a bit of my vision of the frugal city, which is both green and recreational. In fact, what are we going to accomplish by saying we still need to build?

We must avoid this. Finally, as you know, the people who live here wanted a home, a real home, but just look at their tiny terraces. Look at their garden that's only grass, without biodiversity, without vegetables, without anything. And each one has a swimming pool. But for me, this doesn't make sense.

And so, we need to work on this. But perhaps if these people wanted to live there, it was because where they were before, the noise problem had not been solved. There are perhaps many reasons. But I think that our duty as architects and as professionals in building is to be able to individualize what is collective and to make what is collective attractive. That's what they tried to do with the Haut-Bois. And it's also what they did in Bordeaux, where they were car parks and so on. So they purchased lots. And, in fact, you see that one building is rather high above the street.

The other is a bit lower, in the continuation of the lot. And finally, at the very end, three townhouses, another rehabilitation of a real estate complex. Here, it was in the centre of Joinville, in the Haute-Marne, in the Greater East. There, they restructured worn out cultural heritage--

I spared you the "before" photo but it was truly very sad.

And suddenly, instead of just giving it to a promoter, who would have made a new island, they reworked it using various elements. And this is really an issue that to me is a major one: try to make do with what is already there.

There are in the "Ile de France" area nearly three million square meters of empty offices, and we need roughly as many square meters of housing units. The transformation of offices into housing is a real issue. This is a project I find to be rather interesting. As you see here, they have doubled the façade to make these small balconies. I think we have a lot of work to do for this metamorphosis. So, I've talked a lot about frugality here because, first of all, we are focusing on the city, the sustainable city. Therefore, I wanted to show projects and urban planning examples. But, of course, there is also frugal energy at the building level. We know how to build buildings that are healthy and pleasant to live in, without mechanical ventilation or air conditioning, even without heating. Thanks to natural ventilation and passive cooling, free sources of heating and thermal inertia. Bio-climatic design enables reducing energy consumption to the strict minimum, while ensuring greater comfort. We know how to do this.

Why don't we generalize it?

We find this is true for small homes in a village, like here. These houses are in strips. After the renovation, that was made by one of my former students, energy consumption was divided by ten. It's not passive, but it's almost at the passive level, thanks to measures that are simple and robust.

And the owner I met is absolutely thrilled; also because within a very narrow strip, only four-and-a-half meters wide, natural lighting has been implemented. Of course, we can work toward passive buildings; even make buildings with positive energy, like this one, which was one of the first public buildings. It's in the Vorarlberg region, in Austria, and dates from 2005. This building was built using white pine, like the trees you see on the hills around the community. Insulation is both in sheep's wool and cellulose. And the roof, with its solar panels that produce more energy than what the building consumes. Of course, there is a strategy for cold, but there's also a strategy for heat, like you see here on this building, which was designed by my two friends, Philippe and Alain, whom I presented to you. This is a Zen building, with zero energy. It was built about ten years ago. The towers you see are for natural ventilation. It's located between Montpellier and Nîmes and there is no air conditioning. It was built with local materials. Even in tropical zones, Alain, who was the engineer on this building, knows how to make natural ventilation with chimney effects. You can see it on the left here. And there are the fans. We can save energy, it's true, on buildings, but also, of course, in the city. There is a very important regulatory function provided by green areas and plants.

This is a thermal map of the city of Stuttgart. Now Stuttgart is a city in a basin, with approximately 300 meters of vertical drop between the bottom of the basin and the plateau.

And can you see that?

It's at night; it is between 13 and about 21-22 degrees, a temperature difference of eight degrees approximately. There is also the difference in altitude, so we can remove the two or three degrees that result from the loss of one degree per 100 meters of altitude. But there are still about six degrees left. And it's the same difference that was recorded during the big heat wave between the centre of Paris and suburban towns that were located roughly 30 kilometres from Paris. There were about six degrees of difference. Here, you can see how much this heat-islands effect is strong. To attenuate this heat-island effect, we can use what is known as public vegetation, as well as the private vegetation found near the Trocadéro. So you see both dense vegetation on the Paris quays and vegetation that is just as dense that private individuals can use.

Another example from Rome. We have public vegetation on the riverbanks, and in the centre of this very, very mineral city; we suddenly turn the corner and encounter this. You need only for someone to be green-thumbed and already, just looking at that, you feel a bit refreshed.

And then there are functions that are both recreational and combat heat islands. We can see this in certain American cities, like here in New York, in Central Park, where there is only just one place, although it's an immense park, they have only one place with vegetation, and it brings together a lot of people who can no longer stand the city heat. So, energy for heating and cooling is only the tip of the iceberg. And the submerged part is energy for building. In fact, this is where we see frugality in context.

But, well, we all know how to do without materials that waste resources. There is a series of materials. I can show examples of each. But what is important is how these materials are used. We must consolidate the development of supply chains and local know-how at the territorial level. And here, in Grenoble, it's wood in particular, but also earth, because you have a very long tradition of raw earth architecture, in particular using rammed earth. And you also have the type of earth that's good for doing this. Sand and gravel resources are dwindling, and, in addition, producing cement and reinforced concrete consumes an enormous amount of energy. It must be heated to over 1000 degrees. And this production is responsible for around 7-8% of CO2 emissions, and participates in a major way to climate change.

I'm not saying that concrete is a bad material, I'm saying that concrete is not the magic material that some think it is. It's precious, and that's why we should keep it for work like foundations, where it is truly indispensable. For everything else, well, there are a number of alternatives that are tried and tested. Previously, I spoke to you about reusing buildings. But in addition to reusing existing buildings, when we're obliged to deconstruct them; above all, we must no longer demolish. We must deconstruct. We can recover bricks, radiators, floor tiles, and reuse them. This building, the Great Hall at Colombelles, was transformed by the architect of the *Encore Heureux* architectural firm. Who are these architects? Are they the best known and most specialized in re-employment in France? Well, they not only gave new life to a building, but in this building, they re-employed certain elements. As you can see, everything depends on the design in which you incorporate these re-employed elements. And I find that in the utilization of doors, radiators, and window frames, everything has been designed, even the urinals. Well, suddenly, there is a new impetus for upcycling. It's a way of glorifying re-employed elements. And we can also re-employ in participatory worksites, like this one. In fact, one of the architects no, it was the engineer here, worked on the transformation of a building, a town hall. I think it was about thirty kilometres from Paris. It was necessary to take the floor out. So they said, we'll transform the floor. We'll clean the wood and use it for the framework of a shared workshop in an emergency housing centre located in the 16th arrondissement of Paris. So, there you have it. They transformed this wood, and the people who live in this emergency housing centre participated in building it.

Do you see that?

It's very difficult to meet building standards on structures made in recuperated wood. So here, in fact, using pallets and ropes, they reconstituted the requirements for the standard and then had people get on it and they added weights. So they did this in an empirical way, and it worked. Currently, I don't know if there is also a re-employment platform in Grenoble, but lots of them are being created just about everywhere. The principle is that it's a platform where there are people who deconstruct buildings and say,

"We have x linear meters of skirting board, x window frames, we have x tons of bricks."

And others say,

"We need that."

Often this requires creativity from the architects because they must sometimes look around to see what's available for their project among what is offered. So, in addition to re-employed materials, there are also mineral-based materials, that is, stone and raw earth. And then there are materials that are called bio-sourced. This includes both bamboo, particularly in southern countries, and, in France, wood, straw, hemp and thatch. Concerning wood, I must, of course, mention the Solaris building. And also the Haut-Bois. This is a photo I took this morning from the rooftop, after having been a jury member for the competition. I am very pleased to see it come into existence now. So, to valorise these alternative bio-sourced and mineral-based materials, my friends and I created CRAterre for Terra and then amàco and the *Grands Ateliers*.

So first, the Terra Award and then the Fibra Award and now the Terra-Fibra Award. It is the first worldwide prize in contemporary architectures in raw earth and plant fibres. So this was the Fibra exhibition at the *Pavillon de l'Arse* in Paris. This exhibition also came to the platform about two years ago. So there you have it.

Do you see these materials?

These are buildings in plant fibres. You find them around the world. But, as you can see, there are quite a few in France, and I'm going to explain why. But first, before I show you examples from France, I want to show you two or three examples in bamboo.

So, between wood, which needs at least 25 years, in the case of eucalyptus, which I don't necessarily recommend that you plant, through some forty years for a conifer, to around sixty years for a beech. And 80 years for an oak. As you know, bamboo is not a tree; it's a grass that can be used for building after about 5-6 years. We can do things with a broad scope using bamboo. You see, this is a youth hostel at the Bamboo Biennial of Baoxi in China by my friend Anna Heringer.

So here it's a building--there are three buildings with a base in stone, large flat rocks, a heart in rammed earth. And this magnificent structure in woven bamboo slats. It's been used to make a gymnasium, like in Thailand, this is the Panyaden School, which is made from earth and bamboo and which already includes some dozen buildings: primary schools, pre-schools, and music rooms. And also a gymnasium. There you have it. Twelve meters of span and really everything is in bamboo, including the pins that hold the structure.

Do you see on the right?

Even the roofing is in bamboo. The bamboo has been cut and flattened to make a sort of tile, and they use this like stone slabs of the Thiers region. And we can also make roadway bridges. What you see here is not a walkway; it's a roadway bridge that can hold up to two tons and has a 30-meter span. Very impressive. There are more than a thousand species of bamboo. There are hundreds that resist freezing temperatures. That said-- there are also bamboo groves in France. However, I don't think bamboo has a great future in France as a resource, as a local resource. However, straw is really a very very important resource for us. France is a pioneer in using straw in construction, with about 5,500 to 6,000 buildings created, including, I think about 150 or even 200 public facilities insulated with straw. You have the *Bon Lait* gymnasium in Lyon, but there are also many public facilities. I'll show you some of these in and around Paris. Why do we say that France is a pioneer? It's because in 2012, the French network for construction in straw got well organized. And then they published professional regulations that allowed insuring buildings--public facilities, and the same year, fire resistance tests were conducted to ensure that straw insulation could be covered by insurance. And finally, RFCP organizes lots of training programs that are called "Pro-Paille". These training programs run over one or two days and others for a week for architecture students and for architects, as well as for carpenters. Because, generally speaking, carpenters are the ones who work with the straw.

So how do we build with straw?

There are three techniques. For the first, bales of straw are simply placed one on top of another, a bit like Legos, Another involves wooden frame uprights in which bales of straw are inserted. And finally, a type of wood can be made from wood by-products, wooden panels in wood by-products. And these are also filled with straw, with bales of straw. These are bales like those you see in a field. You just need to be careful that the moisture content is below twelve degrees, because otherwise it will get mouldy. But apart from that, and this is also a plus, this is not a very expensive material because no major work needs to be done on the raw material. What's important is that the thickness is homogeneous: 37 cm. Using 37-cm straw bales, you can easily obtain the "Passivhaus" label.

Here is one of the first large public buildings built in Issy- Les-Moulineaux, near Paris. It's in wood, with, as you see, in the coffers at the top-- they call this the "6000-straw bale school". The school covers 6,000 square meters. There are also other public facilities as big as this, in wood, insulated with straw. These are the fire resistance tests that were conducted for this project at Issy-les-

Moulineaux, and which were partially paid for by the architect and the engineer because he really wanted this to be a success. At a certain point, someone has to provide financing to carry out the project, and you see the result. And just why doesn't straw burn?

It's because for wood to burn, it needs oxygen. And the straw has been so thoroughly pressed that it has no oxygen. So, there is no risk that it will burn, except maybe on about one centimetre of surface. Here's another of the pioneer buildings in wood insulated with straw, with the same wood engineer and the same technique: it's the "Boiserie", a centre for associations in Mazan, here we are in the south of France. As for straw, it was used in two ways: as part of a strategy to combat overheating, and as part of a strategy to combat cold. The mayor of Mazan, when I prepared the exhibition of the Fibra Award, told me that using bio-sourced materials really helps lower the carbon footprint, both in design and in operation. The cost was the same as for a project with traditional materials. For building, traditional is the standard way. Traditional materials are cement blocks, cement and steel. In addition, operation is economical because the building is very well insulated.

Here's another school building that was also built roughly the same year, around 2013. This is at Montreuil, so we are still very close to Paris. It also covers 6,000 square meters, and the same technique has been used.

When you see this, you tell yourself that you're in the middle of a park. But that's only one side. Look at the other side. It's actually a dense urban environment. So, in a dense urban environment, we can build in wood with straw insulation. We can do this for public facilities, as well as for social housing. It's always the same story. I am showing you only the pioneers to tell you that this has existed for some ten years now. It was designed by one of the two architects who made the Haut-Bois. His name is Antoine Pagnou, and this is a seven-storeys building. In any case, Antoine Pagnou is currently working with Vincent Piret, who is the architect-- the thermal engineer of this building and of the Haut-Bois too. This building is found at Saint-Dié-des-Vosges and has eleven floors. The Technical Director of *Toit Vosgien*, the social landlord that built it, said that since 2010, twelve years ago, all our housing meets the requirements of the Passivhaus and is insulated with straw. It's waste that's almost free of charge from the fields. It takes on added value as it is being worked on by valorising local manual labour. The step forward was the decision to consider straw a common technique. And that, that's something decisive. That is, with this technique what costs money is when it's only done a little with this technique, a little with that technique, and companies don't yet have the habit, don't yet have the skills. This is what was also said by the Director of Actis this morning. He said that it was rather costly because the companies had taken a bit of margin, because they weren't familiar with it. But here, the *Toit Vosgien*, which builds and renovates a lot-- all these projects over twelve years-- they use the same technical principle; that is, a veil in KLH and straw insulation in the cubicles. Consequently, right away the price is lower, with each project. So there you can see the construction. And if you're interested, I can pass it on to you. Because for the book on Fibra Award and Fibra Award, I worked with a graphic designer, Pauline Sémon, on cartoon drawings that described the work on some of these buildings. And it was actually verified by the architect, the company, the engineer. It's a comic series, of course, but with very, very concrete data; A factory has even been made in the suburbs of Toulouse, a wooden factory with straw insulation.

Can you see it?

When you enter the hall, you see bales of straw. And that's the most surprising technique that I've ever encountered. The bales of hay are suspended. It was a participatory work site. The social landlord agreed to make this experiment with two architects. So they worked a lot on the plugs that they put in the stone wall, on which there are these types of ropes—well, not ropes really—in

plastic and with this, they suspend the bales of straw. It's a building with ten levels. But they didn't want to do it over the ten floors. They said they would only do a part with this technique. Only on the two lower levels. It would be easier to change in case there was a problem. And the eight other floors are made with a more traditional structure, a structure, a wood framework that would hold bales of straw. The fact that a social landlord had the courage to do that, I find that truly interesting and important.

I've shown you examples in straw; now we'll look at hemp. Perhaps you aren't aware, but France is not only a pioneer in insulation with straw; it's also a pioneer in isolating with hemp or in using hemp. And besides, approximately half of the surfaces where hemp is grown in Europe are found in France. So, hemp is used for building in two ways. It is used in the form of wool, a bit like rockwool or linen wool. It's used in panels or rolls for insulation; for example, for uprights in a wooden frame. But it can also be mixed, like here, usually with lime. But other studies have been made by mixing it with clay, and for building. It is called "Hempcrete" so "crete" for concrete, and "hemp" for the plant material. So, it's an excellent material, in particular for the energy rehabilitation of an old building.

Why is it interesting?

Because if you insulate an old stone wall with polystyrene, for instance, pathologies will develop, because the wall can no longer breathe. But if, as we see here, you add about ten centimetres of lime hemp on the stone wall, there on the inside, the wall will still be able to breathe. As concerns the Air coefficient, it is not extraordinarily good, but as far as feeling goes, it's very good because it enables avoiding the cold wall effect. Perhaps you have noticed that sometimes when you get close to a wall, especially to a concrete wall, there is a feeling of cold. Well, with lime hemp the temperature remains the same in the entire room and you feel better.

Here's another low-carbon rehabilitation in Paris, on a Haussmannian building. This works very well on Haussmannian buildings. Claire Simon of the RIVP told me that "hempcrete is a breathable insulating material", as I said previously, "one that adapts to the building's needs. Its architectural aspect meets the requirements of the architects of *Bâtiments de France* for old buildings. We are going to reinforce the proportion of bio-sourced materials in coming operations." So, the RIVP is one of the main social landlords for the City of Paris, and it uses these materials with increasing frequency. Here, as you can see, since it's not very thick, it can be applied with a trowel. And here, another building, where it has also been applied with a trowel. This building is very special because they put—here as well the *Bâtiments de France* architect was very much involved because they had modenatures. So they removed the modenatures. They added eight centimetres of lime hemp mix on the exterior of the façade. After applying it, they put back the modenatures.

Why do it on the exterior?

It's because if you do it from the interior, you can no longer do it when the site is occupied, people would have had to move. Above all, you also lose a certain amount of surface. Now, in Paris, a square meter costs a lot. It's worth a lot. So they did it on the exterior. The same architects work not only on the renovation, but on new buildings as well. And they just finished a building in Boulogne-Billancourt, once again in the Paris suburbs, very close to the city. A nine-level building, in lime hemp. Hemp is not for support. There was a wood structure, and on this wood structure, they added it. There were uprights in wood and a panel derived from wood. I don't remember if it was plywood or SP, which they used to project the lime hemp, because that's another way to use lime hemp. There, it's almost heated; 27 cm of lime hemp. And after having tried this type of machine in the large workshop, in a training program I did recently, I can tell you it's really heavy, and I admire the people

who do this all day long, because it's very physical. So, along with straw, along with hemp, we also use thatch in France.

We have thatch both in Camargue and in the Grande Brière area, north of La Rochelle. Normally, you're also familiar with it in England. Lots of roofs are made in thatch. Especially around Cambridge and Oxford. There are lots of thatched roofs. But here, the building is a bit special because they used thatching not only for the roof, but for the vertical cladding as well. Date and here you see once again this project, with our comic strip. I can send it to you so that you can share it. So, we can make this on-site, at the worksite. But here, in these departmental offices, in Nantes, the thatcher made a machine to prefabricate the panels that were later placed on the façade.

And this is a knowing nod to our friend from Senegal. This is one of the Fibra Award winners. I find this building to be absolutely magnificent. I don't know if you are familiar with it. It was made by an American foundation and the architect Toshiko Mori. It is a cultural centre and residence for artists in Casamance. I find that truly, truly magnificent. It's a building that gets away from bricks made in raw earth. There are a few cement posts, because there's a substantial amount of load. And also metal edge beams, once again because there's a substantial amount of load. But the underlay roof is made in bamboo and the roofing itself is made of a type of grass called *imperata cylindrica*, which is an invasive species in Senegal, like typha, another invasive plant. And I feel that it's extremely positive to find uses for typha or the *imperata cylindrica* in construction. There are also examples of typha, of using these reeds, for roofing. There is a project with CRAterre and amàco and also for panels made from a mix of clay and typha.

Let's move now from bio-sourced materials to mineral-based materials. Now, we'll start with massive stone. The leading specialist in massive stone is Gilles Perraudin, who was based in Lyon for a long time and now commutes between Lyon and Senegal. He builds in earth and stone, and with massive stone social housing can also be made, like here. In Paris there are several examples, or there is this beautiful conservatory of music and dance near Marseille. Here, you can see it's really like a lego and in this-- in this type of climate, there's no-- Rather, it's a problem of finding a strategy to combat heat in summer. And the inertia provided by the stone fully meets this need. And then, there's this project for a covered market in Saint-Dizier, which is made with local limestone. It's a very beautiful building being built. And, finally, among the various materials, there is raw earth.

What are the advantages of raw earth?

Well, it's available in large amounts in most regions, and the raw material is cheap and is often taken directly from the worksite. It can be worked using little energy. There's no pollution, either in water, or air or in the ground. And it can be reused without limit in case of deconstruction, if the earth has not been stabilized. This is why it's so important to not use cement with the earth. And CRAterre in particular, and amàco work on this. Among its other qualities, haptic qualities, surface qualities, warm, pleasant to touch, hygrothermal properties, which is really very, very important: there is both inertia and a phase shift that means it takes up heat during the day and restores it at night if needed.

And then, there are the acoustical qualities. And it's easy to use, even for beginners. But only when things are supervised by an expert. And there is extensive expertise in France, in particular in Grenoble, with CRAterre. There is also a chair, the UNESCO chair in earthen architecture. And-- So also we have done our Terra Award, you can see there were also projects worldwide, on every continent. So, here are some examples from the Terra Award and Terra-Fibra Award. In fact the first nomads who settled in Mesopotamia about ten millennia ago began to build with earth and fibres. The three techniques that emerged during that period are still in use today. And by the way, almost a third of the world's population lives in earthen buildings. Here you see the wattle. Bricks in raw earth

were one of these first three techniques. Another technique invented ten millennia ago is wattle and daub. Here, you can see an example of wattle and daub from Brazil. And the third one is cob. In English, it's cob, cob. It's used a lot in the south of England. And here's a building in Bangladesh. But the cob technique is also used here, probably influenced by the south of England, in Brittany and Normandy.

So there's lots of thatching and cob walls. Following these first three techniques, which were developed ten millennia ago, there's one that was developed only about three millennia ago, just because it required a bit more infrastructure. This was rammed earth, a technique that is used a lot in your country.

And by the way, NAMA Architecture, a firm with two architects from CRAterre who also teach at the Grenoble School of Architecture. So they built this European centre, they took soil samples and then built here. You undoubtedly are familiar with the *Collines* school group, in the-- in the Community of Communes of Haute Herbasse with rammed earth. The other walls have a wood framework with straw insulation. In Alsace, we build rather traditionally in wattle and daub. But among the Terra Award finalists, there was also this archaeological museum with a double wall in rammed earth. A wall was made on-site, rammed on-site, and the other with small elements which were prefabricated, and between the two are 20 cm of cork, to meet RT2012 requirements. Rammed earth can be made on-site. Rammed earth, for those of you who aren't familiar with it, is a technique that uses form panels like concrete does. By the way, Vicat copied the rammed earth form panels to make concrete. So, in these forms, which can be in wood or metal, you pour layers that are about 15-20 cm thick. You compress them with a ram that can be manual or pneumatic. And then you add another layer. The only problem is that you can only build in rammed earth when temperatures are above freezing. And so, in our latitudes from March-April up to October-November. So for this very large building which was the *Maison des Plantes* of Ricola, Martin Rauch, who is the leading contractor for rammed earth and is Austrian, developed the first assembly line for prefabricating rammed-earth on a large scale. It's his assembly line that you see at the top. It's 50 meters long. During the winter, they prefabricated the elements, and then, in the spring, from the month of March-April to the month of October, they built the 3,000 square meters of walls. And here's the result. It's a building that was designed by Herzog and de Meuron. Using the same technique, Martin Raugh made this ornithological centre in Switzerland. It's located south of Zurich. Still using this technique, he built a campus for Alnatura, a company that produces organic food and cosmetics.

Do you see the walls?

The trumeau walls are in prefabricated rammed earth. Here again, they had to meet German thermal regulations, which are rather demanding. For this reason, Martin transformed his assembly line because the architect and the client wanted to see rammed earth on both the interior and the exterior. So, he put his prefabrications between two layers, the load-bearing layer on the exterior, which is about 40 cm--35 cm thick, and the interior layer. They put in 20 cm of foam glass to provide the necessary insulation. There is another technique, which was not invented until around 1950. It's the compressed earth block technique. We also build in France with that, and including load-bearing walls like this one. Now this is Philippe Madec, whom I told you about previously. He built this very beautiful cultural centre. Currently, he is building a cellar near Bordeaux, also with a very large span of more than fifteen meters.

As we can see, raw earth is beginning to have an impact. It's the same with construction. This is a very, very special worksite, since it's under the Grand Theatre of Geneva. The Grand Theatre of Geneva is like our Palais Garnier. It was copied from the Palais Garnier and was meant to be larger.

But it couldn't expand on the sides, so it expanded underneath. And the earth that was excavated to create two additional underground levels was transformed into compressed earth blocks that were used on-site to make both the bar and the restaurant.

And the very latest technique that was invented about ten years ago, is called cast earth or clay concrete. That is, with this we also have panels and we pour the mix from above. There's much more earth and much less cement. For the moment, we need only about three percent of cement, which allows using excavated earth to make the walls. So this is something that's really very, very interesting. As of today, we can say that raw earth architecture is no longer on the margin. At the time of the Terra Award, I've seen really more than 120 articles. There are some I can't read but I saw that they focused on the Terra Award. There is also a worksite, and even though the worksite has not yet started, there is an entire neighbourhood in earth next to Paris.

Why now?

First of all, because there has been a rediscovery of raw earth architecture, among others, thanks to CRAterre. There has been scientific work on the material in pellets. Thanks to CRAterre and amàco, the resource is widely available. As I said previously, the legal obligation to recycle waste is rather recent. This has really incited cities to use waste, in particular waste and excavated land. Public interest in local, ecological materials and the international enthusiasm for earth-built architecture, among others, thanks to the magnificent project I showed you, as well as to many others that can be found in the exhibition or in books.

And finally, there is also a political will to confront the ecological and social crisis. Grenoble has shown us the way. Therefore, above all it's because of a growing number of project owners and officials, architects, engineers, research workers, craftsmen and contractors who are committed to changing things. This morning-- I think that it wasn't about earth but about wood--the Director of Actis, and also Jacques, showed us to what extent, when we are committed, we can change things. So they created in Paris, with amàco, CRAterre and with *Grand Paris*, they created an enterprise-- rather an association that's called Cycle Terre, and it uses earth from excavations of large-scale projects, such as the *Grand Paris* project. In fact, it constitutes a circular economy. There is a factory, which has been in operation since December 2020 in Sevran to work with earth that has been excavated for *Grand Paris*, to make earth mortar, for construction work, to make small prefabricated blocks, to make earth coatings. Each year, they aim to process about 8,000 tons out of the 20-35 million tons that are produced each year. So, this factory in Sevran isn't meant to grow larger; rather, it should be repeated locally so that not so much earth is transported over long distances. And the first neighbourhood in raw earth is being built, it is Aquitanis, the social landlord and developer in Bordeaux Metropole, who is already working on a first experimental building that is part of a development area that will feature 600 social housing units built in earth, essentially with blocks of prefabricated rammed earth, which are roughly like this. And 1.5 meters long, approximately. You see Etienne, who contractor who completely transformed his company to carry out this project.

What you see here is one of the silos in the development area that includes 110 housing units by the architect Maurice Boucher. Le Corbusier said that architecture is a wise game, rigorous and magnificent, of volumes assembled under light. Of course, he's right, but for me it goes even further. Bamboo, thatching, wood, earth, stone, and the other materials have haptic qualities, and therefore aesthetic qualities. Tactile qualities, too, that encourage us to caress them and thereby reconnect with nature and our deep needs. So, if you would like to learn more, there are the books of the three exhibitions that we did with amàco and CRAterre.

Finally, I told you that we would reduce the use of ground, energy and materials. And we also want to change the process. We believe in the creative richness of human relations. And we also think that it's not the building that's smart, or the city, which is another field. It's the people, the inhabitants, who are smart, and we must take them into consideration, help them to be even smarter. This is in a Parisian suburb, in the city that is most committed to frugality: Rosny-sous-Bois. They build a new school about every two years, because the population is growing rapidly. They build a school building about every two years. Here, you see a preschool that they made in a former market hall. It's made of wood, with straw insulation. You can see the natural ventilation, the chimney. They built with Alain Bornarel, with whom I wrote the manifesto, as the engineer.

There's a very funny anecdote about this. There is only one stove in the centre of the school. But they asked some lady knitters, perhaps also some gentlemen? I don't know. But in any case, a group of knitters from the city. They were asked to knit cardigans in raw wool for all the children and teachers. So, when it's cold everyone puts on a cardigan. This is a simple way to solve a problem. This is another building made by one of my former students, Julien, who was the Project Manager for the HABA agency and it's made in beech wood. It was the first communal building built in beech. You can see here. And it was insulated with straw. In 2012, it was one of the first buildings in straw and beech in the community. Between the forest, the sawyer, the carpenter and the return trip, there are about 50 kilometres. So this is a short circuit, and the same agency continued to work with wood and straw insulation. This is their latest building, which was just finished and which has not yet even been delivered. The E 3C2, like the Haut-Bois building. And have a look at the actors; they are all from the Vosges region. So here, there are really structural architects, a supply of wood, sawing and drying, production of the glued laminates, the company, a 100% Vosges wooden structure.

Here's another building that is quite exemplary and multipurpose. Here's another of my former students from Nancy who is extremely talented, in addition to being deeply generous and smart. This festival, the carpenter told me, this project with a low carbon footprint, reinforced the local economy. The black pine cut down in the forests of Ancy, in this small town, was transformed into cladding strips in a nearby sawmill and the waste was processed in a neighbouring village. And this man, the carpenter, is from that village. And I believe that today we are returning to what was done traditionally; that is, use local products. Once again, here's the same architect with the same engineer. And here, in Nancy, in a village, a gymnasium that is entirely made from solid wood supplied by a local sawmill, with six-meter-long planks. As you see, the section is truly standard, a standard dimension. And as a group, these are all beautiful projects.

We are making a collection that is called "Frugal architecture: Inspiring examples." So, this was our inspiring example in the Great East region. I currently work with VAD, the resource centre based in Lyon. It's a resource centre for sustainable development. A book on "Frugal rehabilitation: 20 inspiring examples in the AURA region. And then, I'm also doing the same thing with a team in Occitanie. A team in the Hauts de France region is also working on this. So, we are trying, with examples, to encourage people to change their habits. I think that to convince them we need to show them beautiful things. We can't show them buildings that are ecological but ugly. That won't do. They must be ecological, attractive and inspiring. The group from Lorraine, the *Frugalité Lorraine* group, was the first to make a cartography. As you can see here, it's a cartography of the sawmills, a cartography of the quarries, designed precisely to help people who want to start working on frugal architecture with mineral-based and bio-sourced materials.

Give them an impetus. They show, for example, the sawmill. And personally, I have long been persuaded that we need to revalorize manual work and that the hand speaks directly to the brain, and the brain answers the hand. In my opinion, hands think. And I believe that to make our

architecture frugal, happy and creative, we need to simultaneously valorise local resources. This is pine tree, white pine from the Vorarlberg region that accounts for the richness of the architecture of this region. We also need to valorise regional know-how. Here's the costume of a German carpenter. The Austrians have one that is similar.

And so, to conclude: happy and creative frugality is both a philosophy and a process that is necessarily open, that is based on sharing knowledge. This is what I'm trying to do today, based on mutual trust, based on collective intelligence. It was also a question this morning, when we visited several projects, of looking for beauty and shared pleasure, without forgetting creative empathy. And I have experienced this for a long time with my friends of frugality, with my current and former students and all those who work on topics like these. It's truly something that I experience daily.

For us, what is essential is the human aspect and not what is technical. Of course, we need to fully master construction in wood and construction in earth to move forward, but what is essential is human.

Thank you.