

Stirring the Pot ep112. Helena Gervasio – Tactics to achieve low carbon design

Helena: [00:00:00] Sustainability is really a mindset. We really have to shift our way of thinking as structural engineers and really to embrace sustainability as part of our design process and not really as an added value or a label that can be included in the project.

Troy: Kia ora, I'm Troy, here as Chief Executive and welcome to Stirring the Pot.

Thanks for connecting. If you're new, here's what you can expect. We're going to be talking the tough stuff, the things that keep us middle minds up at night. There are many challenges facing our industry, and equally, many opinions on how we should tackle them. Stirring the Pot provides a facilitated forum to discuss and challenge these viewpoints.

Rebecca: So let's get to the nuts and bolts of it. Today we're having a kōrero with Associate Professor Helena Gervasio, a Global Leader in Sustainable Construction from the University of Coimbra, and our very own GM of Structural Systems, Kaveh [00:01:00] Andisheh.

Kim: Amazing. Welcome so much to the podcast. It's great to have both yourself Kawa and you Helena in the studio today. I wondered if we could probably kickstart off by perhaps asking you Helena to introduce yourself a little bit and also maybe explain how you became involved in sustainability research.

Helena: Thank you very much.

Helena: I'm a professor at the University of Coimbra in Portugal, so very far away on the opposite side of the world, in fact. Um, I'm also a researcher. My background is a structural engineer, but over many years now, I've been focusing on the sustainability issues in the construction sector. So as structural engineer, of course, I'm focusing on structures.

Being included in the group of steel and composite construction in the research center, where I'm also an integrated member, Of course, I'm focusing on steel and [00:02:00] composite constructors, but sustainability is a very holistic topic. And of course, I also collaborate with many colleagues in other materials, other types of structure and so on.

So this is my main topic. Topic of research. So sustainability, sustainability, as I said, it's a holistic concept, so it's not only environmental problems. So when you talk about sustainability, we are talking environmental, we are talking about economic, about the social problems, just to refer the three main pillars of sustainability.

And of course, we have to focus of the things that happens today, but also in the long term, because sustainability is really putting a pressure on the future generations and the way they are going to live. And for that, of course we have to consider not only what happens now, but also what happens along the, the lifecycle of our buildings, which we know are a very long span.

So the lifecycle analysis in this case takes, uh, of course a very long span, but, uh, it's, it's two [00:03:00] way that we make the, as the or should make the assessment of sustainability of any construction work is to take into account the complete life cycle of the, the assets.

Kim: Yes, it's a pretty good segue considering one of the main reasons you're here in Aotearoa, New Zealand is to share some of your research understanding and some of the work you've been doing in the sustainability space in particular.

Life cycle analysis and assessment. So I wonder perhaps if you could explain that a little bit, what LCA is and perhaps why is it important to do this within your projects, within construction projects? So a life cycle

Helena: analysis is the name of a project. Says more or less is to consider every stage along.

Let's say about the building. So if you focus on the building from the very beginning of the extraction of the old material, the resources that are needed to make all the construction materials. The construction process [00:04:00] itself, all the stages during the service life of the building. So since the building comes into operation until the very end of life, and as I said before, it can be a very long span.

And then what happens in the end of life stage? So what we do with the materials that are coming from the demolition process and what are the final destination of these materials, whether to be reused, recycled, or any other kinds of recovering. So it's a very long. Uh, type of analysis. It's not a very complex analysis.

Of course, there are contexts related to the long lifespan. So a lot, of course, and uncertainties are or should be included. Take into account in the analysis. But as I said, a life cycle analysis take into account the problems of today and problems of the future. And this is what sustainability is about.

So we have to take into account what are the future impacts. And why. LCA is important is precisely because of that, because if we are [00:05:00] only focusing on the problems of today, then we know that there are other impacts that are occurring over the lifespan of the building, which have some importance. And if we don't take that into account, then we are doing our things not very good.

The assessment is not very, not, it's not stress, but what I will say accurate, okay? Because we know that there are tradeoffs between. stages. For instance, a building can have a very nice performance in the very beginning when you start the construction of the building. But along the lifespan of the building, for instance, if you have used low quality materials that are going to deteriorate very quick over the lifespan, then you need a lot of replacements of such materials.

And it may end up that in the end you have a very bad performance. And compared with another building that from the very beginning have higher quality materials with lower maintenance requirements, [00:06:00] then comparing the two, focusing on the present, then can lead you to the wrong conclusion or the wrong decision.

So that's why it's very important to take into account the complete life cycle of the building.

Kim: Interesting. I do hear a lot, there's conversations around focusing on embodied carbon versus, yes. So maybe, could you just explain what are the issues if designers just focus on that embodied carbon conversation?

What is the dangers there of that?

Helena: Yeah, there are two things. One, it's when you talk about the initial embodied carbon, and then the embodied carbon that we can have over the lifespan. And the example that I was just referring to is one of the cases. We have the initial embodied carbon, so the construct, on the materials that we are using in the present for the construction of the building.

But if the materials are going to deteriorate, and we need to replace such materials, then, of course, we need to produce new materials. So we have a [00:07:00] Additional embodied carbon along the lifespan of the building. That's why I said and we could not

or should not focusing only on the initial embodied carbon because the remaining embodied carbon can also represent a lot in the old lifespan of the building.

And then we have the other thing that is the operational carbon. So the operational carbon is the emissions in the electricity, for instance, that is required in the building for the heating and cooling of the building over the lifespan. And this is usually occurring during the service life of the building.

So it is zero in the very beginning because you are just starting the construction of the building itself. So you don't need energy for heating and cooling, but along the lifespan, then of course you need energy. And energy as emissions carbon emissions associated, and then you have operational current.

So and usually somehow we can have a balance between the two [00:08:00] because we can have, let's say, in the very beginning of the design, we can have a building with a nice insulation in terms of the old park facade, but also on the glazing. And then, of course, we have higher embodied impact. But this building, because it was well designed, it will require less energy, so it can be better than another building that didn't care about these issues.

So in the initial, the embodied carbon may be not that high. But then they are going to require a lot of energy, and then in the end can lead to much worse performance.

Kim: Yeah, it's really interesting. I have heard a lot of people arguing that we need to deal with things right now, and we can't afford to wait to the end of a life.

So it is interesting that you're right. We do. We need to strike a good balance in between the two of them. I guess that sort of plays into some of the conversations you've been having as well [00:09:00] within your visit here to Aotearoa, talking about the concepts around talking of sustainability in a good way and not greenwashing the conversation.

I wondered if you maybe could unpack that for us a little bit, please.

Helena: I think greenwashing is really a threat. Sustainability because we are misleading the general public. We are misleading the consumers with false claims of sustainability. And of course, this somehow prevents the good actions that we really need to make the change.

So I really think that we should be very clear. When we talk about sustainability should be very transparent the way we communicate the results of the environment performance of a building or whatever we are doing. But it's very important to report the benefits, but also the laws because there are also laws associated.

But I agree with you. It's very important to clearly. [00:10:00] How do we communicate the results to be very transparent on the, um, uh, the assessments?

Kim: I think a part of that is that we somehow need to come up with a way when we're looking at different materials, as an example, that we're finding ways that we can compare them in a, in a way that's appropriate.

Um, I wondered if you had any thoughts on that and what you would suggest to designers in terms of trying to compare. Materials and their environmental impacts and in an appropriate way so we're not causing those conflicts of conversations and greenwashing that topic.

Helena: Of course, as a designer, so many materials that we have currently, there is, let's say, the initial idea may be to compare exactly one material to the other.

There are different ways of doing it. It's not really correct. To us to compare directly the materials, let's say, to compare one [00:11:00] kilogram of steel with one kilogram of concrete or any other material. So you if you want to compare, and of course, this is one thing that designers do, because if they want to have, let's say, a more sustainable design, of course, they have to compare different types of materials, different kinds of structures and so on.

So you should have or you should make such comparisons at the building level. Okay? So you have your building with a very defined function so you can design this building using different kinds of material, different kinds of structures. And by then you can make the comparison. Okay? So don't try to do it before starting to the the, uh, the course.

The process of design itself, because without any function associated to your unit of comparison, it's not really appropriate to do so. You usually should make comparisons at the building level. So when you have a function or different functions associated with your unit, so this is very important. But of course, uh, [00:12:00] Especially for designers that are not really familiar with the life cycle analysis and the assessment of sustainabilities, that can be sometimes the case.

Just to look, okay, we have this environmental pro decorations, which is the environmental performance of the building, uh, at the most simple unit, which is just the building. A declare units. Okay, the way it is produced and then to pick up these different decorations of the reports of the materials and compare just like that.

That is not really appropriate. So you should try to use them in your building. So designed building in different ways and then compare the performance based on the building itself.

Kim: Yes. I guess it's not so easy to do. It's one of those unknowns. Do you think that there's any sort of ways in which designers might be able to approach that?

Or is anyone working on ways to help make it clearer?

Helena: [00:13:00] Currently, we can have take advantage of digitalization. Currently, for instance, if we are using. beam building information modeling, it is already possible to include very easily the environmental information as well. So I think this kind of tools can be very helpful.

And for instance, for a building designer or structural building designers, which so far are not much familiar with this kind of assessments, this kind of tools will be a big help because very easily We can test different kinds of materials at the building level and then very easily can come out with a good solution.

So this kind of tools, I think, will be more and more helpful for building designers and other kinds of designers, not only building, to improve the lifetime performance of the building.

Kim: So I know that one of the big conversation questions that always pop up is what exactly is the difference between [00:14:00] a low carbon design and a sustainable building?

I wondered if maybe you could share your thoughts on that and help unpick that a bit.

Kaveh: I believe, uh, there is a huge, uh, difference between low carbon and sustainability. Um, sustainability as, uh, Helena mentioned at the beginning. Environmental impact is just one part of sustainability, but it's not the whole picture for sustainability.

We need to consider the others. And then when we talk about low carbon, we even make the environmental impact more narrowed down, just focusing on carbon. But environmental impact also is not just carbon. Uh, it is about construction and demolition waste. Uh, it is about the natural resources. It's not just carbon.

It's more broad area.

Kim: More holistic. Exactly. A viewpoint of the construction life. It's a very important

Helena: component, of [00:15:00] course, carbon, because we know that carbon emissions current is a huge problem, but I mean, it's really just a part of the problem. Yes.

Kim: Absolutely. So obviously doing a lot of mahi in the low carbon design space, Kawa, perhaps could you share a little bit about that research and how it relates to the work that Helena is doing and also.

You know what? That's leading to in terms of helping the construction sector in Aotearoa?

Kaveh: Sure. Uh, the low carbon design project started last year, March last year. It is funded by Hira and Brands. Uh, the one off the key research gaps. Uh, and that was also applicable. It's a global gap, but applicable to New Zealand as well.

is a lack of guidance for practitioners to implement the solutions. So some solutions [00:16:00] available, probably still we need to develop novel solutions in the future, but solutions available, however, no one could use them or no one, probably the majority of practitioners couldn't use them. So, and the, the The key advantage and, uh, main goal of that research was to address this, this gap to provide guidance for practitioners to be able to implement low carbon, uh, circular strategies and solutions and, and reduce carbon in building design.

So, uh, that project, the key deliverables of that project would be, uh, three documents. Um, One is a material agnostic framework design guidance framework, which would be a high level, uh, material agnostic. Mainly, uh, will help the sector to develop specific guidance. Uh, and [00:17:00] the other one is a specific guidance, which the focus is on, uh, low rise still concrete composite and still timber hybrid structures.

Um, that one can be directly used by designers. To implement solutions and reduce carbon, we provided detailed methodology how to quantify carbon and how to implement in their building design. And, uh, and finally, the last document would be a report on knowledge and research gap. Of course, the research program cannot address all gaps and provide all solutions.

But we mapped the knowledge gap and research gaps that future projects and research.

Kim: That's really cool. I know that you're actually quite a fair distance through the research itself, and you're already finding from the case study that you've been doing, some outputs or findings have [00:18:00] come from that.

Could you perhaps break down what you've found out so far in terms of the low carbon design solutions?

Kaveh: For, uh, regarding the, uh, the project and case studies, We, we actually selected a real building located in Christchurch, and we applied the strategies and solutions and quantified the impact of those solutions.

And in a high level, I can say that the solutions probably can be categorized into two groups. One group will reduce carbon, but they will change the structural performance because you have to, you have to replace carbon. materials, you have to change the structural systems or building system, and that will, uh, will change the whole building performance.

For example, materials and different systems. have different seismic performance, [00:19:00] different structural fire performance, different acoustic and durability performance. So that's group one. Yes, you can. You can use them. You can reduce carbon. However, The problem is the when you compare the carbon reduction or the benefit of utilizing those type of solution solutions with the reference building is not the apple to apple comparison because and the two buildings are very different.

We need more tools like optimization tools and multi criteria decision making to help practitioners, uh, to inform decision making. However, those tools. It's not available. It is in a in a research level. It's they are available, but in a practice level, they are not available. So it is one of the knowledge gap and research gap that needs to be, uh, addressed and in the [00:20:00] future, we need to develop those tools to support informed decision making with you when you have to change this, the system or materials.

The group, the second group is, uh, easy win. solutions that without changing the materials and structural systems or building system, you can significantly reduce carbon. For example, in a reference building for substructure, for example, the results showed that if you change the type of substructure to another one, you can reduce carbon by around 48, 49 percent.

But When you change the substructure, you may affect the selection of superstructure and also the performance of building. And also in some places you cannot do it because depending the geotechnical characteristics, maybe that alternative is not appropriate for that site. But [00:21:00] we also showed that without need to change the substructure system, you can reduce carbon by implementing levels.

solutions in New Zealand and that lead to 61 percent carbon reduction and pretty similar results for superstructure as well.

Kim: That's so exciting. It seems like the solutions you're coming up with that they are achievable things. I think a lot of people get overwhelmed by this conversation and think it's going to be quite a difficult thing to achieve a low carbon design.

And I guess it's probably dependent on changing the mindset. Of how we design buildings, right? I wondered if you had any thoughts on that and what that means in terms of practical applications, is it that we are just going to have to look at buildings as parts and independent of each other? Or how do you see that playing out?

So that actually designers could start thinking like this more [00:22:00] practically.

Kaveh: Uh, we are not far away to releasing the documents, uh, framework and specific guidance for, for, uh, this, uh, project. Um, and then, um, once the documents released designers and practitioners can see that it's really easy. It's super easy to implement that solutions.

Yes, of course, there are some something that people need to learn or probably with, for example, life cycle assessment is one of the tasks or one of the items that is required for low carbon design. But in terms of solutions and implementing solutions, And technical solutions. We have a list of easy win solutions in New Zealand.

They can easily utilize it and implement it. No problem. And during the disseminating of this project, low carbon project in the seminars, one of the [00:23:00] objectives was to show practitioners that low carbon circular design building is not scary. We have tools, we have solutions and they can implement it.

Hopefully by publishing the documents, everyone can easily implement in the practice and we can have lower carbon buildings. In New Zealand.

Helena: I would like to have that this kind of the outcome of this project, as I was saying, it's very much important, I think, because it will be a very good guidance for structural designers to see that with a very little effort, they really can lower the carbon, the embodied carbon in their design, because I believe, I think that currently we have structural design and we have sustainability design.

And they should be the same because it's the way we do our structures that, of course, affect the sustainability of the environment. We [00:24:00] should not have two different parts. They should be combined because it's upon our, my background as a structural engineer, it's our responsibility. We have a huge responsibility in the sustainability of the built environment because We decide what kind of materials we are going to use, how we are going to use, and these are a huge impact on the environment.

So I don't think that we should be apart. Of course, there are technical things like a life cycle analysis that, of course, maybe a structural engineer is not familiar. Um, I don't think they should yet, but I think they should, uh, but there are also tools and, of course, there are guidelines that can be, of course, helpful, uh, but I think we should combine because we should embrace, of course, sustainability as a structural designer, because it is our responsibility, in fact, and we are the ones who can really make the change,

Kim: and I, and I think you do have a really good point there that, uh, this is a responsibility for everyone who's working to influence or build our, uh, [00:25:00] Built environment as such, and I know from a global perspective, you have shared that local governments are starting to put in standards and policies and practices.

Are you seeing anything else from a global perspective that's starting to influence the need to design low carbon?

Helena: There are some over the last years, there are, of course, some policies in order to reduce the carbon emissions in the building sector and any other economic activity. I have to say that so far they have not been that much efficient because, in fact, we are still off track.

In terms of the objectives of the Paris Agreement, so we really have to do a lot more, but there are some, you know, because this is what I know a little bit more in detail, there are already some regulations enforced with the goal, of course, to reduce carbon emissions. And they provide good opportunities for steel [00:26:00] strikers, for instance, uh, in terms of promoting the reuse and the recyclability of the strikers by the end of life, so it's good opportunities of course.

And, uh, but as I said, I think, uh, a little bit more has to be done because we are still off the track for the goal of, uh, releasing the, the,

Kim: Yeah, lots more work to be done. For sure. I wonder from your viewpoint, what you thought steel's role in the future would be in terms of climate change and influencing the built environment.

If you had any thoughts on that.

Helena: Okay. Uh, in terms of steel, of course, steel has a huge potential for recycling and for reuse. So in that case, for sure, steel is, I'd say. A good material and say to take into account the sustainability performance of buildings, there is one problem about steel, which is currently the way steel is produced.

So the steel industry [00:27:00] is very energy intensive, and these, of course, are sealed to emissions, but it depends very much on the steel route. But there are, of course, current developments in order to produce low carbon steel. Very good solutions. But in this moment, they are still not economical viable. So we need some time in order to have these new ways of producing low carbon steel close to zero emissions.

But we need time to become economical viable. But, uh, as I said, uh, the steel as it is, and as Carol was saying, there are already some design strategies, not only for steel, but also for the other materials that we can further reduce the emissions currently already with very little effort.

Kim: I wondered if either of you had anything else, perhaps, that you wanted to share?

Helena: I just want, I'd like to reinforce the idea that [00:28:00] sustainability is really a mindset. We really have to shift our way of thinking as structural engineers and really to embrace sustainability. As part of our design process and not really as a heavy value or the label that can be included in the project because, as I said, we have a huge responsibility.

Our choices, our ways of selecting materials and the structures of the type of structures. It will affect performance of the building and of course affect the sustainability of the sector.

Kaveh: I would like to add that first. Outcome and documents that we will publish for low carbon design. Our audience would be the whole building designers, including architects and service engineers, etcetera because we talk about operational carbon or we talk about the flexibility in the building design, which is related to [00:29:00] architects as well.

To provide more lower carbon solution. I think I also would like to add that secular low carbon design and sustainability design is part of the journey. The other part, as Helena mentioned, we also need innovation. And innovative idea to produce resources, more sustainability, more environmental friendly.

And also, we need to make sure that we align our efforts to improve and build environment sustainability. I think there are, uh, different things that need to be done simultaneously. And our focus and goal should be provide Um, more sustainable solutions and improve build environment sustainably.

Rebecca: So there you go. Thanks for joining our conversation with Helena and Kaveh today. If you'd like to [00:30:00] connect more with them, you'll find their details in the show notes. Whether you're an architect, engineer, or just passionate about sustainable

construction, we hope you've picked up some practical takeaways to implement in your projects.

Remember, the path to low carbon design is a journey and every step we take makes a difference. Food for thought till we see you next time. So hit subscribe and if you like what you heard today, please like, review, and share with any MetaMinds you know. Let's spread the word.

If you found today's kōrero valuable, don't let the conversation end here. Stay connected with us for more insights on sustainable design and low carbon strategies. Sign up for our newsletter, follow us on social media, and keep an eye out on our upcoming events and resources from our structural team.

Together we can continue making a difference in the built environment.