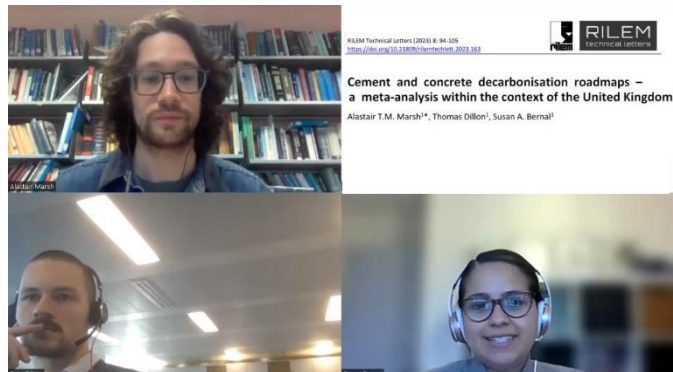


Interview with the authors of the *RILEM Tech Lett* paper “Cement and concrete decarbonisation roadmaps – a meta-analysis within the context of the United Kingdom”

Dr Alastair T.M. Marsh, Scientist at the École Polytechnique Fédérale de Lausanne, Switzerland, Thomas Dillon, Structural Engineer at Ramboll, UK, and Prof. Susan Bernal Lopez, Professor of Structural Materials at University of Leeds, UK, and Visiting Professor at ETH Zürich, Switzerland, are the authors of the paper [Cement and concrete decarbonisation roadmaps – a meta-analysis within the context of the United Kingdom](#), published by *RILEM Technical Letters* in Nov 2023. This interview offers a behind-the-scenes view of the paper. 17 January 2024



Dr Daniela Ciano - RILEM Implementation Manager (RIM): Good morning everyone! I have the pleasure today to talk to Susan, connecting from Zurich, Alastair connecting from Lausanne, and Tom, connecting from Manchester. What's the origin of this paper? (*Editor's note: Any article in RILEM Tech Lett is invited to submission either based on the sent abstract or directly upon invitation from an Editor*).

Prof. Susan Bernal Lopez (Susan): I'm an [associate editor of RILEM Technical Letters](#), so part of my functions is to invite exciting, thought-provoking papers to the journal. During the pandemic, I was awarded a new grant: [Transforming Foundation Industries – A Network plus towards value by innovation](#). This is an initiative as part of the [UK Government Clean Growth Strategy](#) where we are trying to create different organisations to bring together foundation Industries, which have many commonalities in terms of challenges for decarbonization. I'm the co-Director of *Network plus* in the UK. Within the scope of *Network plus* it was important for us to understand how best we could support these foundation industries; and to do so we were tasked with doing a review or an overview of the existing road maps. And because of my technical background in cements, I was tasked with developing this scoping of “where are we?” within the UK sector in terms of cement decarbonisation strategies. At the time, Alastair was working with me as part of my team at the University of Leeds, and it was interesting to find out that there were so many different Road Maps available, making so many different suggestions about decarbonization strategies, that could be applied to the UK. So... at the time this exercise started, we didn't have a UK low carbon cement and concrete strategy: the decarbonization Road Map was published a couple of years afterwards, so it was somehow a parallel work that other organisations were doing. But we wanted to do some work independently. Alastair came up with a brilliant idea: offering this interesting topic as a Masters dissertation project. We were very fortunate that Tom came along, and he was very motivated, very passionate about it. And I think that the rest is history. Perhaps Alastair and Tom would like to add more about what motivated us to work in this area.

Dr Alastair T.M. Marsh (Alastair): We started this in 2021. At that time, perhaps in our favour, lab-based projects weren't available because of the Covid restrictions. So we thought “What's the most interesting things that we can do with students while they sit at home?”. Fortunately, Tom was interested enough to accept.

RIM: I think the ages of the three of you do not add to 100 years. It's a paper with very, very young authors! Let's talk about other numbers now: TMRL, that is, Technology and Market Readiness Level (*Editor's note: definition in section 2.2.5, and values in Table 4 of the paper*). Tom, were you in charge of getting these numbers?

Thomas Dillon (Tom): Initially I was, yes! I completed this as a masters dissertation, so I displayed these numbers into a format suitable for a thesis dissertation. The carbon reduction was quite quantitative. We assessed the European documents, specifically for carbon reduction because they had much better quantitative data; the global papers were too broad and the scope was just massive and you know it would have been quite difficult to condense to something useful. There was inconsistency in how embodied carbon reductions were quantified in the UK roadmaps we reviewed, making meaningful comparisons difficult. We shortlisted the European Road Maps because they gave that sort of middle-ground, reasonable, and quite applicable data for the areas that we worked on. That was for the CO₂ reduction data! For the Technology and Market Readiness Level, the figures were a bit more qualitative; based on what was being reported in those European Road Maps that we looked at, we had a few rounds of seeing where they lined up and obviously we've given a broader range where it was less certain where they're up to. That was the process we went through. Alastair, how much did you reviewed those numbers for the for the paper itself?

Alastair: Regarding the process of treating the data in this whole study, as a general principle, we tried to really minimise the extent to which we had to bring in our own judgement and our own opinion. The idea was basically: “OK, here's what's out there. All together. This is what it is”. So, for those TMRL values, we got them from the [International Energy Agency](#) (IEA) whenever possible. So, I want to emphasise that we are reporting others' numbers and presenting them in a way that's comparable.

Susan: I would like to add that perhaps one of the big differences with the quantification process that we presented here, with what others perhaps have done in in other studies, is not just accounting for technology readiness, but it's technology readiness for market. This is something that perhaps people are not very familiar with because they talk always about TRL (Technology Readiness Level), not TRML. And then perhaps that's one of the reasons why there can be some discrepancies between what we are presenting here and what others are publishing. The other important matter is one of the points that that we highlighted in the paper, which I think is also very important: a lot of the decarbonization Road Maps that are led by industry, for example, focused mostly on cement. Not cement and concrete!

RIM: How has the paper been received so far?

Susan: Readers have shown a genuine interest; especially different stakeholders are interested in having a clearer picture of where we stand, which is the objective of the paper. We want it to be as transparent and as fair as we possibly could, as unbiased as we possibly could, to report what we found is available in the literature, of course within the context of the United Kingdom. We tried to be very careful in the way we processed the data, but I would say that, in general, my feeling is that the paper has been well received. Of course, it needs to be thought-provoking, that's the idea! Make people think! I think it has achieved its purpose. Alastair articulated very eloquently in the paper that

our objective was to inform better policymakers and investors about where we are in terms of technology. It was not our intention to drive research agendas based on these different decarbonization strategies.

RIM: Alastair, would you like to add anything on this subject?

Alastair: Yes! Just going back to what we were saying earlier about the range of values: I hope we made this as clear as we could that we are not saying anything about whether we agree or disagree how certain values are calculated or the assumptions behind them. Partly it's just for feasibility concerns because it's a lot of work converting all those sets of numbers into a common set of units and boundaries which are comparable and fair. But also, because people who make the big decisions would read these Road Maps before reading academic journal articles. Tom, now that you are working in industry, would you agree with this?

Tom: Yes, definitely! I think that with the time and cost pressures inherent to industry, you don't have the luxury of being able to absorb long, detailed academic papers. Resources that are concise and are well presented are preferred, so the Road Maps and reports that we looked at fit that bill perfectly. I think you'd really have to have an interest in cement and concrete sustainability to even pick them up in the first place. It's maybe not an intended consequence, but I think it's quite useful that we picked the resources that we did for that exact reason, just to make it a bit more accessible and it also made our analysis that we did feasible.

RIM: I have one last question. Is there any hope that these Road Maps are somehow working well, leading the way to reach the objective in 2050, for instance? Are we going towards the right direction? Would you say that the outcome of this paper is positive or negative?

Tom: When I finished the paper and before I started working in industry, I didn't have the most positive outlook for 2050. But now I see movement! Even since I started two years ago, sustainability is much higher on the agenda when we're talking to clients. There is some momentum, but whether the rate of change is quick enough, I'm not sure just yet.

Alastair: I'm going to focus more on the process aspects. What I'm positive about is that hopefully by reading our analysis and other Road Maps, we, as a community, as a sector, can improve the way we do Road mapping ourselves. One of the interesting things about writing this paper was digging into the history of Road mapping, a process that started in the 1970s and has been iterated in different sectors. It has a rich heritage and people have done various research on it. We are making projections about the future and we literally cannot predict what is going to happen in the future! But we make our best guesses about that. I hope that collectively we can integrate more of the best practices (e.g. explicitly stating assumptions about market adoption) into future iterations of Road Maps, which at least in the UK are coming out about at least two a year from various organisations. Just improving some of the methods and processes in making Road Maps would be a success. Finally, an area for improvement is the issue of time scale: we have these strategies but they're not all going to be implemented immediately. Time scale is a jigsaw puzzle: which strategies have potentially the most impact versus how soon they can be applied? Time scale element is really crucial to make the most coherent plan that we can.

Susan: For me this exercise enabled me personally and the *Network plus* to identify more clearly what were the different decarbonization strategies that were favourable at the cement production scale and then concrete. It was important for us to identify those strategies because then we can inform better other stakeholders, open the conversation about why this strategy has been identified as more beneficial than the other. One of the main takeaways, in my personal opinion, from the

exercise is that realistically we cannot divorce decarbonization strategies of the cement sector from the decarbonization strategies of the concrete sector. We can't have concrete without cement. This is a very important point, which is different compared with other foundation industries like glass or steel. Another important, valuable takeaway is that, at least within the context of this study, decarbonization strategies go hand to hand with energy decarbonization strategies as well. Positive: there's so many low hanging fruits, so many things that can be done now to decarbonize the construction sector. Not looking just at cement, but also at the concrete scale.