Delivering sustainable infrastructure: Insights from industry leaders

Sustainable infrastructure is critical in reducing carbon emissions. More efficient design approaches, new technologies, and better benchmarking can help.

Lara Poloni

President of AECOM

Nick Smallwood

CEO of IPA
Head of the UK government's
Project Delivery Function

Climate change is here. Evolving regulations and the increased frequency of natural disasters are changing how the construction industry designs, builds, and operates critical infrastructure, from transport and energy infrastructure to real estate. The industry's role in delivering sustainable infrastructure requires not one initiative but a portfolio of them, including decarbonizing the construction process and materials, designing and building projects that create net-zero emissions throughout their life cycle, and future-proofing infrastructure against both man-made and natural disasters, from cybersecurity threats to hurricanes. We spoke with Lara Poloni, president of AECOM, to get a sense of what's required during the engineering and construction phase, and Nick Smallwood, CEO of IPA and head of the UK government's Project Delivery Function, for an owner's perspective.

McKinsey: What are the three biggest obstacles to delivering sustainable infrastructure today?

Nick Smallwood: First, driving significant cultural and behavioral change to put carbon, the environment, and sustainable infrastructure and delivery at the forefront of our thinking. I think we are on a similar journey to that witnessed in the late 1980s and '90s and the message of "safety first."

This will not just be new skills and processes in terms of assessing how we measure our impact, but a cultural shift toward a sustainable "future first" approach. We won't have a successful project unless a focus on the future impact is at the heart of all our decisions.

The IPA's Transforming Infrastructure Performance (TIP) program supports this by transforming how government and industry intervene in the built environment to drive a step change in performance.

Second, too often we don't engage with the market on the basis of outcomes. This must be a focus, as set out in TIP and the government's Construction Playbook, and this is also linked to the continuing dependence on carbon-intensive materials in construction.[1] We need to establish the models that will incentivize industry to bring their innovation to bear to drive lower carbon solutions.

And third, using data to better understand the interconnected system and inform comprehensive decision making, supported by more consistent tracking and reporting, such as our construction metrics and benchmarking work.

Lara Poloni: Sustainability and resilience are often not considered early enough in the infrastructure life cycle. We need to make long-term considerations the default option when looking at the initial business case for infrastructure. And we need to better leverage data, not only to inform the type of asset that might be required but also to better identify the opportunities to maximize sustainability and resilience.

This requires a mindset shift to embrace "whole of life" infrastructure thinking, as well as a corresponding increase in client understanding that sustainable infrastructure does in fact provide a return on investment. Such an acceptance can ease the tension between capital expenditures and ongoing operations and maintenance budgets, providing a long-term view that stacks up.

In addition, long-term, effective policy with consistent bipartisan support is essential to promoting investment and supporting the market transition to net-zero emissions. Climate change and natural disasters are now at the top of many government policy agendas. New mandates and regulations are coming through that prioritize decarbonization. These

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[1] For more, see *The Construction Playbook*, December 2020, gov.uk.

will require focused solutions—cocreated by governments and the private sector—that reduce hurdles and offer incentives while demonstrating positive climate impact and social value.

Finally, if we can make infrastructure more socially acceptable—prioritizing more nature-based solutions over gray alternatives, as well as demonstrating the long-term benefits related to public amenities, green space, and air quality—then we stand to receive more community support, which can lead to more efficient and lower-cost delivery.

McKinsey: Which specific decarbonization measures should the construction industry prioritize now, and why?

Nick Smallwood: The construction industry must work with the government to support the move to platform approaches to construction, bring manufacturing principles into the sector, and act as an enabler for low-carbon materials and more carbon-efficient processes.

Whole-life carbon measurement and reporting must also be a priority. The focus to date has been on operational carbon, yet this doesn't take into account the big picture and won't take us to net-zero emissions. By focusing on whole-life carbon measurement and reporting, we can accurately determine our carbon impact and therefore make better decisions and drive efficiencies.

Finally, there needs to be a focus on scaling up industry's capability and capacity to retrofit existing social infrastructure and housing to improve energy efficiency as well as the resilience of our building stock.

Lara Poloni: The continued focus on reducing embodied and operational carbon should accelerate, whether that's through using fewer and lower-carbon materials or prioritizing Design for Manufacture and Assembly

(DFMA) approaches that increase off-site manufacturing and on-site, modular assembly.

I also believe we should challenge the notion of continuously building new infrastructure assets and explore options to get more use out of the infrastructure we already have. What is the best solution? Is a new building needed? Or is retrofitting an existing building the better, more sustainable option?

Clients need to come on this journey with us and help identify and cocreate the appropriate lowest-carbon, most resilient infrastructure solution. In this way, those solutions can solve the identified issues and support community health and well-being.

McKinsey: What roles can new technologies and materials play in increasing resiliency, accelerating delivery, and enabling more sustainable infrastructure?

Nick Smallwood: There are many positive roles technology can play. For example, there are a number of first-rate technologies available now, and we will need all those to be brought to bear, from AI to new materials, to help solve the challenges.

On the cautionary side, these areas do come with their own challenges. While new advanced materials will undoubtedly bring about some amazing capabilities, in the shorter term we will need to find ways to innovate within the existing system.

Lara Poloni: Both play important, interconnected roles. Technology provides the opportunity to better collect, organize, and analyze carbon and climate data. This in turn enables us to design low-carbon and resilient-asset options that may use sustainable materials or fewer materials in general. These options not only provide more accurate cost-benefit projections for the asset owner but

can also aid community engagement efforts, helping demonstrate social value, secure buy-in, and ultimately accelerate delivery.

On the materials front, we know materials such as concrete and steel are enormously carbon intensive, but there are nature-based or hybrid alternatives to standard gray-materials solutions—some of which may even absorb carbon emissions. There's already been a lot of investment in decarbonizing steel and in the development of lower-carbon concrete, and although there may be risks attached to these new materials, the sharing of that risk between the contractor, designer, and asset owner is key to accelerating their adoption. Investing in trials of new materials, sharing the trial results, and updating design standards will also go a long way to facilitate the introduction of low-carbon materials.

McKinsey: How can we establish a benchmark and measure sustainability impact across the project life cycle?

Lara Poloni: There are already many benchmarks—for example, rating and certification frameworks LEED and CEEQUAL.[2] The Envision rating system is also widely used to embed sustainability into infrastructure projects. That said, we need to understand why these systems, and others, aren't used more often.

There is also considerable fragmentation across the current benchmarks and standards. The International Coalition for Sustainable Infrastructure seeks to provide a more coordinated, consistent approach by cataloging the various guidance, tools, and standards currently used in the design and delivery of sustainable infrastructure. Meanwhile, Infrastructure Australia's new Assessment Framework includes societal impact—with sustainability and resilience as supporting themes—as part of its assessment criteria for new projects.

That's where there's an enormous opportunity to improve how we share and analyze the massive amount of data generated through those various standards and benchmarks across asset types, and to drive sustainability and resilience advances. We'll have better benchmarks when we have better carbon and sustainability data, and that data can come via the development of a library of asset types, such as bridges, roads, and tall buildings, that align with corresponding benchmarks and can act as a point of incremental improvement.

Nick Smallwood: The IPA is currently working on setting out construction metrics. Establishing a carbon baseline is critical—we will not be able to move forward without it. However, this is only part of the picture. Colleagues across government are working with us to establish the appropriate measurement methods for this on a whole-life basis, and we need industry to support us in this by providing the data and by coming forward with strong ideas.

Recently, the IPA updated its benchmarking guidance document to include a new annex that provides guidance on how to bring whole-life carbon into the heart of the benchmarking process. This will help to ensure carbon is captured and considered alongside cost, time, and benefits as part of the project investment and decision process.

McKinsey: What new skills and capabilities are required to realize the sustainable-infrastructure goal?

Lara Poloni: Ongoing skills development across the engineering profession is critical. Ultimately, we need to shift our thinking. We need to approach every project through the lens of sustainability, resilience, and long-term community benefit. And that will happen only through developing a high level of carbon literacy and competency around how materials—and design and construction

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[2] LEED refers to Leadership in Energy and Environmental Design, and CEEQUAL, a sustainability assessment rating scheme.

approaches—impact the carbon load of an asset's design and operation.

If we are designing a sustainable, resilient bridge, then we need to consider how it can be constructed from fewer, less carbon-intensive materials at the business-case stage. In this regard, as we develop and leverage our own technical and visual design skills to improve decision making, we also have the opportunity to show communities how these decisions will protect them from future climate impacts.

Nick Smallwood: People deliver projects, so it is crucial to success that we attract new skills to the sector and build up a technologically smart workforce for the 21st century. Most important, this means building multidisciplinary teams that are made up of both innovators who can come up with creative solutions as well as those with strong contract-management skills to drive the change we need. It is crucial we recruit people who can think across silos and bring together conflicting demands to drive better overall outcomes.

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