



Voices on Infrastructure

# Charting new approaches to capital project delivery

February 2022

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# Introduction



**Zak Cutler**  
Partner, Toronto  
McKinsey & Company



**Mark Kuvshnikov**  
Partner, Houston  
McKinsey & Company



**Prakash Parbhoo**  
Partner, Johannesburg  
McKinsey & Company

Welcome to the first issue of *Voices on Infrastructure* in the new year. It's now been several months since the 2021 United Nations Climate Change Conference (COP26) concluded, and the path forward for the global infrastructure industry has continued to emerge and evolve. One thing is clear: COP26 reinforced the reality and severity of climate change and gave us a glimpse of the capital investments required in the years to come.

With this in mind, our February 2022 edition charts new approaches to capital project delivery, particularly those in pursuit of net-zero emissions. The global project delivery system has a critical role to play in limiting global warming to 1.5°C, yet significant challenges remain for asset owners, investors, and contractors alike. We attempt to tackle the questions around the need for and focus of sustainability benchmarks, upgrading the electric grid, and improving project delivery, among other topics.

Mark Reynolds, group chairman and chief executive of Mace Group, weighs in on how owners and contractors can help change how projects are delivered to meet climate targets. We talked with Emmanuel Jaclot, executive vice president and head of infrastructure for Caisse de dépôt et placement du Québec (CDPQ), about how investors can help develop innovative solutions to accelerate the energy transition. Finally, our roundtable discussion with Tony Hansen, Focko Imhorst, Anna Moore, and Sebastian Reiter, which was hosted by McKinsey at COP26, focuses on decarbonizing the built environment.

This year promises to be filled with exciting and significant topics, and we're thrilled to kick things off with such a substantive issue of diverse voices.

# News from the Global Infrastructure Initiative



**Tony Hansen**

Managing Director of the  
Global Infrastructure Initiative,  
McKinsey & Company

Welcome to the February 2022 edition of *Voices on Infrastructure*, which explores what it will take to successfully scale up the delivery of capital projects to meet net-zero targets.

Hitting those targets will require the largest capital reallocation in human history—it will mean annual clean-energy investments of \$9.2 trillion, which is \$3.5 trillion more than today.<sup>1</sup> Successfully delivering this massive increase in capital projects will necessitate new approaches to how we plan, develop, and construct projects, including better use of analytics and modern tools. Used strategically, analytics can provide the transparency and metrics to measure asset performance across the life cycle, thereby accelerating how quickly we can deploy capital to deliver clean energy and zero-carbon projects.

Despite disruptions to our plans as a result of the COVID-19 pandemic, we are putting together a robust schedule of roundtables and site visits for 2022. Topics include decarbonizing construction, scaling electric-vehicle infrastructure, preparing electric grids for the energy transition, creating a 2050 water strategy, and more. We also have a Riyadh Transit Network site visit planned. You can read insights from these and previous events and see our forthcoming roundtables [here](#).

We are in the process of extending invitations for our [eighth GII Summit](#), which will take place in Tokyo from October 19 to 21, 2022. We have already confirmed the attendance of more than 80 senior leaders and are looking forward to content-rich discussions on **creating the pathway to sustainable infrastructure**. For more details on our summit, roundtables, site visits, and *Voices* publications, please visit our [GII website](#).

We hope you enjoy this issue, and we welcome your thoughts on how GII can continue to be a catalyst for driving change toward sustainable infrastructure. If you have comments or would like to subscribe a colleague to *Voices*, please contact us at [info@giiconnect.com](mailto:info@giiconnect.com).

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<sup>1</sup>"The net-zero transition: What it would cost, what it could bring," McKinsey Global Institute, January 2022.



# Changing project delivery to meet net-zero targets

As construction increasingly adopts climate targets, owners and contractors can help change how projects are delivered. Doing so will likely require expert analytical and technical skills.



**Mark Reynolds**

Group chairman and chief executive officer  
Mace Group



**Tony Hansen**

Managing director  
Global Infrastructure Initiative  
McKinsey & Company

**Meeting net-zero targets** in the years to come will require unprecedented capital reallocation. Some estimates say that achieving net zero would mean tripling overall decarbonization investment from 2021 to 2025 compared with current investment levels.<sup>1</sup> Successfully delivering this massive increase in capital projects will require new approaches to planning, developing, and constructing projects, including better use of analytics and modern tools. Further investing in people can also help organizations develop carbon strategies that prioritize innovative solutions and new opportunities, as well as improve recruitment and retention.

To learn more about the approaches required to overcome the challenges ahead, McKinsey's Tony Hansen spoke with Mark Reynolds, group chairman and chief executive of Mace Group.

**McKinsey:** What strategic changes will the industry need to make to meet this anticipated increase in net-zero targets?

**Mark Reynolds:** There are three things that are fundamental to the industry achieving net zero. First, we must measure both embodied and life-cycle carbon at the outset of projects and minimize the impact throughout the design and delivery phases. Second, we should construct for the future, anticipating different economic and social needs in the decades to come so that we aren't redeveloping every ten years. And third, we need to put a collective effort into the creation of green infrastructure that encompasses biodiverse solutions and combats the effects of climate change that are now sadly inevitable.

We also need to rapidly prioritize reuse and retrofits over new-construction projects. However, there is one thing that trumps all of the above—and that's collaboration. There is simply no way the industry will achieve what it

needs to if it doesn't pull together. That means pooling knowledge and sharing best practices. It means peers in the contracting and property sector working together to drive change across the industry to collectively address Scope 1, 2, and 3 emissions.<sup>2</sup> Climate change isn't an opportunity to compete; it's a crisis that needs a collective approach.

**McKinsey:** What new approaches will be required for how we plan, design, and construct projects to successfully scale up project delivery?

**Mark Reynolds:** Early intervention is key. When we talk about carbon reduction at the construction stage, it's already too late. It should be discussed at the planning and design stages. And the designs we produce today must deliver targets by 2030 at the earliest.

The emerging problem to date is that, as an industry, we've naturally tackled the low-hanging fruit—the things that are easier to fix or eradicate—and the challenges we're left with are more complex. The only way we can overcome these challenges is by fundamentally overhauling how we design and construct projects. We can't expect to make small tweaks if we want to make a big impact.

Modern methods of construction are the way forward, but they need to be fully adopted across the industry if we are going to tackle Scope 3 emissions. We need more off-site manufacturing and a far greater commitment to locally sourced materials and products. The question we should ask ourselves is, "What would we do differently if we were starting out today?" Would each past project have operated under a completely reengineered specification?

In 2022, I would like to see a significant change in the conversation—one that moves from carbon reduction to decarbonization and regenerative

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<sup>1</sup>"Private investors could drive over two-thirds of the trillions in investment needed to reach net zero," Race to Zero, November 3, 2021.

<sup>2</sup>Scope 1 refers to direct emissions from assets owned or controlled by an organization. Scope 2 refers to indirect emissions from energy consumed by an organization. And Scope 3 refers to emissions from assets not owned or controlled by an organization.

solutions and considers the whole-life carbon impact. We need to restore the biodiversity equilibrium. Many of the materials we use are already carbon intensive. So we need to look more closely at low-carbon cement and recycled steel and aluminum alternatives, as well as at how to adapt production methods and use so they work for our targets rather than against them.

It's essential to increase support for, and continue to invest in, research and development of new technology. However, the biggest opportunity for change sits with governments. Industry and governments need to work together to solve these urgent challenges. Planning laws need to change, and fiscal policies must reflect the direction we should head in. Reuse should no longer be penalized.

**McKinsey:** What do you foresee being the biggest challenges or obstacles to achieving our net-zero aspirations?

**Mark Reynolds:** A lack of will to change. Every leader and every team must be prepared to transform how they work—what they design, how they plan delivery, and what and where they build. Climate change should form the basis of every business decision, and we must take a collective stance against anything that cannot be rightly justified. Practically speaking, the industry needs to take a stand against construction solutions that aren't accompanied by whole-life carbon assessments.

We need to reinvent how we think about infrastructure. The world is changing at a remarkable pace, and what people need now is different from what they will need in the not-so-distant future. How can we design social infrastructure in a way that means it still operates in a world that is 1.5 or 2 degrees warmer? Particularly in hotter climates, we must

design for resilience rather than rely on current expectations of asset performance. The world is going to be hotter and wetter, and the climate is going to be less stable. Consequently, there will be a change in behaviors that projects will need to anticipate. We can't keep rebuilding infrastructure and knocking down buildings every few decades. Instead, we must develop solutions that utilize our existing assets and increase efficiency, either through technology or by helping change behaviors.

Using data is fundamental, though we must be clear about the targets and what is achievable. We can't reach our targets without knowing where we are. Data are implicit in making sure we're moving in the right direction as well as reinforcing the added value to maintain momentum. The industry needs a standard and consistent form of carbon measurement, and reporting should be mandatory. It isn't about calling out poor performance; it's about sharing and creating a sustained knowledge base so that everyone benefits.

**McKinsey:** What organizational capabilities and skills are required to realize these goals?

**Mark Reynolds:** Carbon reduction is highly complex, and solutions are evolving at a rate never seen before—the rate of industry change is evolving quicker than Moore's law.<sup>3</sup> Most organizations will need to enlist the help of experts, first to help them understand where they are, and then to set realistic targets and strategies.

Carbon touches every part of our business. Therefore, it must be central to every business strategy and sit at the top of every corporate agenda. Yet our recent annual industry carbon survey highlighted that just 35 percent of companies have a carbon strategy.<sup>4</sup>

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<sup>3</sup> Moore's law refers to Gordon Moore's 1965 observation that the number of transistors on a microchip doubles approximately every two years.

<sup>4</sup> *Picking up the pace: Property and infrastructure carbon survey 2021*, Mace Group, November 2021.

The biggest lesson we learned over the past few years was just how much untapped knowledge and motivation we had in-house—at every level. People are passionate about building a career with greater purpose, and once we realized the scale of the opportunity that we had, we set a clear platform and culture to encourage everyone to participate. This has resulted in innovative solutions and exciting

opportunities, and it's been a game changer for recruitment and retention.

The companies that succeed will have systems, processes, and a combination of talented people who have excellent analytical and technical skills. But success isn't about companies. It's about the industry as a whole, and that entails everyone working together.

**Mark Reynolds** is group chairman and CEO of Mace Group; **Tony Hansen**, based in McKinsey's Seattle office, is the managing director of the Global Infrastructure Initiative (GII).

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# Transforming capital projects to deliver net-zero emissions

Net-zero capital expenditures will greatly exceed the current capacity of the projects sector. Collaborative transformation can help players deliver the net-zero project portfolio.



**Zak Cutler**  
Partner, Toronto  
McKinsey & Company



**Tip Huizenga**  
Senior partner, Sydney  
McKinsey & Company



**Mark Kuvshnikov**  
Partner, Houston  
McKinsey & Company



**Richard Westney**  
Senior adviser, Houston  
McKinsey & Company

**Among the most notable** results of the 2021 United Nations Climate Change Conference in Glasgow (COP26) was a global consensus on the reality and severity of climate change as well as on the urgency and scope of the capital investments required. What happens next depends on how well the global projects ecosystem responds.

Each of the three systems that form the broader construction ecosystem can help deliver the promise of net-zero emissions and reach the goal of limiting warming to 1.5°C above preindustrial levels.<sup>1</sup> First, *the political system*—representing citizens, consumers, and community members—can ensure that government and local policies support net-zero investments. Next, *the financial system*—the global network of asset owners, investors, lenders, and insurers—can ensure that the necessary funding is available. Finally, *the project delivery system*—the global network of developers, operators, technology providers, engineers, constructors, service providers, and suppliers—can provide the \$9.2 trillion of capital expenditures needed each year from 2022 to 2050 to achieve the desired results.<sup>2</sup>

The political system is making progress. At COP26, leaders from more than 100 countries representing more than 85 percent of the world's forests made pledges to halt and reverse deforestation by 2030.<sup>3</sup> And in the United States, the 2021 Infrastructure Investment and Jobs Act (IIJA) provides new funding for clean-energy technology, electric-vehicle charging infrastructure, and transmission lines for renewable energy. The financial system is also moving quickly. In fact, the Glasgow Financial Alliance for Net Zero (GFANZ), a global coalition of leading financial institutions representing \$130 trillion in assets, has committed to reaching net zero by 2050.

The global project delivery system now has a critical role to play in completing this massive

portfolio of projects. This article provides an overview of the challenges facing players in this system and of the opportunities to reduce the cost, time to completion, and risks of each project. Moving forward, the sector will need to collaborate and transform to help deliver net-zero emissions.

## Global transformation challenges

The net-zero project portfolio calls for an extraordinary level of construction activity to be sustained for the next 30 years. Expectations are high, and the industry will need to deliver large and complex projects rapidly, cost effectively, and with a low carbon footprint. In addition, the capital projects sector faces unprecedented challenges in five areas: speed, predictability, technology, capacity, and safety and the environment.

- **Speed:** Given the typically long duration of infrastructure projects, 30 years is a short time in which to complete the net-zero portfolio. Fortunately, the urgency of decarbonization is prompting policy changes such as the One Federal Decision (OFD) provision in the IIJA, which aims to reduce the cumbersome and complex permitting process to two years (from the five to ten years typical today). The projects sector will need to transform its work and decision processes to enable net-zero projects to move faster through the investment-decision stages. It will also need to reimagine design and construction methods to reverse declining productivity trends.
- **Predictability:** Political and financial stakeholders will expect predictable cost and schedule outcomes from investments in decarbonization, but the project delivery system has a long history of unanticipated cost overruns and delays. Transformations in scope and risk management are needed to address root causes of unpredictable results

<sup>1</sup> For more on these targets, see "COP26 goals," United Nations, accessed December 22, 2021.

<sup>2</sup> "The net-zero transition: What it would cost, what it could bring," McKinsey Global Institute, January 2022.

<sup>3</sup> Maxine Joselow and Tik Root, "More than 100 world leaders pledge to halt deforestation by 2030," *Washington Post*, November 1, 2021.

as well as the new uncertainties created by rapid scale-up of new technologies, accelerated schedules, increased resource requirements and constraints, conflicting stakeholder priorities, and continuing stresses to the supply chain.

- **Technology:** New decarbonization technologies are advancing rapidly and will add complexity to engineering, construction, and operations planning and resourcing. The industry will need to transform its processes for maturing technology and quickly apply digital and analytics to accelerate the progression of clean-energy and infrastructure facilities.
- **Capacity:** Supporters of the net-zero project portfolio will likely expect every part of the project delivery system to include the people, skills, and production facilities needed to design and execute the increase in global project activity. To meet this expectation, owners or operators and engineering, construction, and specialty service providers will need to undertake organizational transformations.
- **Safety and the environment:** Despite the increased need for speed in project development and delivery, the industry's high standards for safety performance cannot be compromised. Furthermore, construction is directly or indirectly responsible for almost 40 percent of global CO<sub>2</sub> emissions from fuel combustion and 25 percent of greenhouse gas emissions overall.<sup>4</sup> Achieving net zero thus will require transformation in areas such as concrete supply to drive improvements in the industry's environmental impact. Transformations in practices, oversight, permitting, and compliance are also needed to ensure that high environmental standards are met even as capacity is expanded and projects are accelerated.

## The need for collaboration

The time to start these vital transformations is now. The global project delivery system has a mandate to address its long-standing challenge of cost overruns and delays while making use of its impressive technical and project management capabilities. Even under the best circumstances, timelines for energy and infrastructure projects can span a decade or more. If players fail to act quickly, the resulting backlog of projects could further heighten the difficulties of meeting the net-zero goal.

Rapid mobilization of global leaders is required to ensure a timely start. GFANZ provides a good example of an industry sector collaborating globally to enable rapid, substantive transformation. Launched in April 2021, GFANZ already has 450 members from 45 countries. This coalition of financial-system actors has implemented a collaboration model that will enable financing of the net-zero portfolio, methodologies for businesses to use, and a set of standards and metrics to enable the necessary governance.

Like the financial system, the global project delivery system is highly segmented, yet all actors share the same goals and challenges. As with GFANZ, the urgency of net zero could inspire a new level of collaboration.

## How the net-zero portfolio can improve project development and delivery

Despite the aforementioned challenges, the size and duration of the 30-year net-zero project portfolio presents unprecedented opportunities to reduce the cost, time, and risk of each project while continuously improving overall performance. Imagine the \$9.2 trillion in capital expenditures each year as a portfolio of projects, organized by region and type of project. Grouping the portfolio into these subsets of

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<sup>4</sup> "Call for action: Seizing the decarbonization opportunity in construction," McKinsey, July 14, 2021.

similar projects or locations highlights five strategic levers that can help enable the industry's transformation:

- ***Certainty:*** A predictably large level of investment sustained over decades can reduce uncertainties for owners, suppliers, and service providers. With increased confidence in cost and revenue projections, organizations can make investments in human resources and supplier production facilities more cost effectively and with lower risk.
- ***Standardization:*** Defining subsets of similar, repetitive projects can enable top-down standardization synergies that can reduce cost, time, and risk. Examples include standard designs that can be easily replicated, standardized methods for the adaptation of new technologies, and repeatable organization models for long-term agreements with critical suppliers and service providers. By reducing the uncertainty of investment decisions, standardization can also enable acceleration of the project definition process, while the repeatability of design and construction activities reduces execution time.
- ***Optimization:*** The long-term perspective enables investments to define new or better ways to optimize designs, construction methods, contracting models, work processes, metrics, and reporting formats. Supply chain agreements and models for allocating responsibilities and risks can also be optimized based on long-term

commitments, while multiyear continuous improvement programs can result in constantly improved efficiencies.

- ***Innovation:*** The size and duration of the net-zero capital expenditure portfolio reduce the risk of investments in innovation, including R&D, piloting and scaling up, and rollout. With its repeatable project designs, the portfolio provides an unprecedented framework in which new ideas can be rapidly tested, evaluated, and improved.
- ***Policy:*** As both a source of project and financial risk and a way to mitigate risk, successful decarbonization requires clarity and consistency at all levels and areas of government policy. Transforming the project delivery system can help clarify the impact of policy on net-zero project outcomes, help set priorities, and support needed changes.

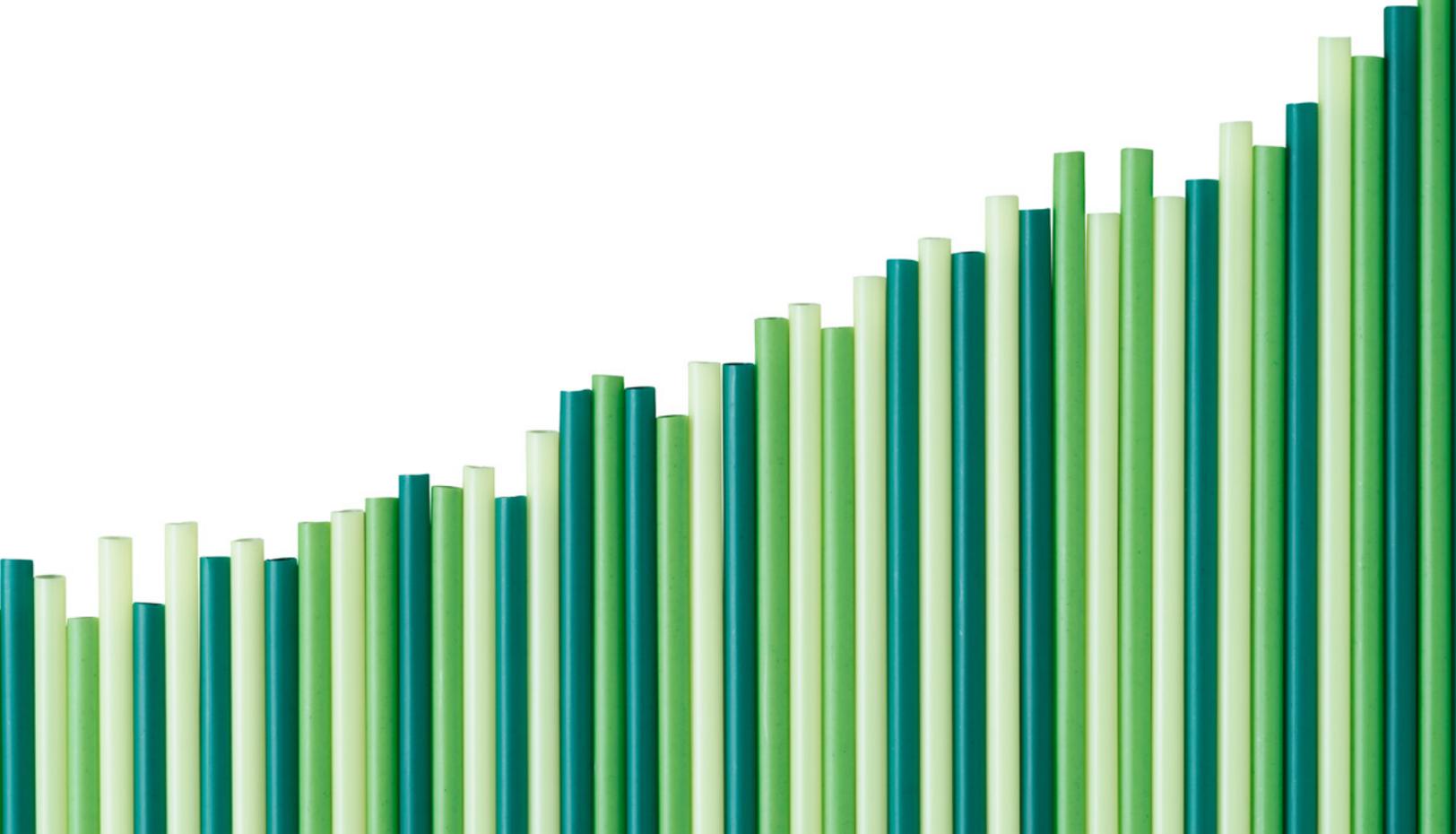
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COP26 made it clear: global leaders have a mandate to address climate change. Government and financial industry leaders are at the forefront of this charge. Now, by initiating a collaborative transformation process, participants in the project delivery system can do their part and become indispensable partners as the world builds the energy and civil infrastructure needed to achieve net zero.

*This is the first in a series of six bimonthly articles providing a deep dive into global transformation challenges.*

**Zak Cutler** is a partner in McKinsey's Toronto office; **Tip Huizenga** is a senior partner in the Sydney office; and **Mark Kuvshnikov** is a partner in the Houston office, where **Richard Westney** is a senior adviser.

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# Building better capital projects through sustainability benchmarks

As leaders across industries prioritize sustainability practices, a clear and defined set of metrics and benchmarks will be necessary to build sustainable capital projects.



**Rushan Doshi**  
Solution delivery specialist  
Waltham  
McKinsey & Company



**Mark Kuvshnikov**  
Partner, Houston  
McKinsey & Company



**Jemilat Ojetayo**  
Consultant, Houston  
McKinsey & Company

As the world transitions to a more sustainable economy with net-zero targets, there will be an increased focus on capital investments and project execution practices. To realize these goals in capital projects and infrastructure, industry leaders must establish a clear methodology to measure, evaluate, and improve upon key sustainability performance metrics.

## How do we measure the sustainability of capital projects?

In September 2021, McKinsey fielded a survey of 122 capital project leaders to learn how comparative analytics and prescriptive insights could inform how we measure the sustainability of capital projects. Our respondents span industries, including energy and resources, transport infrastructure, and real estate.

**86%**  
of respondents are in management roles

**44%**  
play an ownership role within industry

**28%**  
work in energy and resources industries

Note: Respondents were asked to choose all roles that apply.

The results lend credence to what many experience: the definition of a “sustainable project” lacks clarity, and the results are hard to measure.

But there is opportunity to improve:

**60%**

of respondents have a sustainability framework in place and consider it a key area of focus



One in three respondents takes a structured approach to prioritizing sustainability in project evaluations



Half of respondents measure, benchmark, or report project sustainability performance

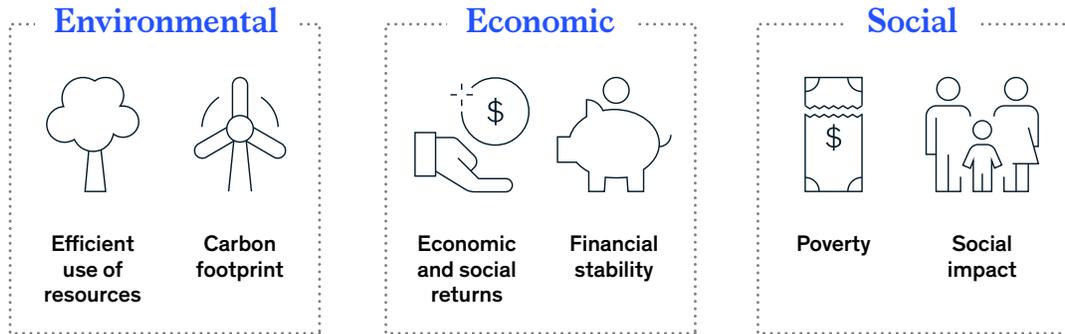


Two in five organizations do not have the in-house capital sustainability capability to take their projects forward

## Where to start

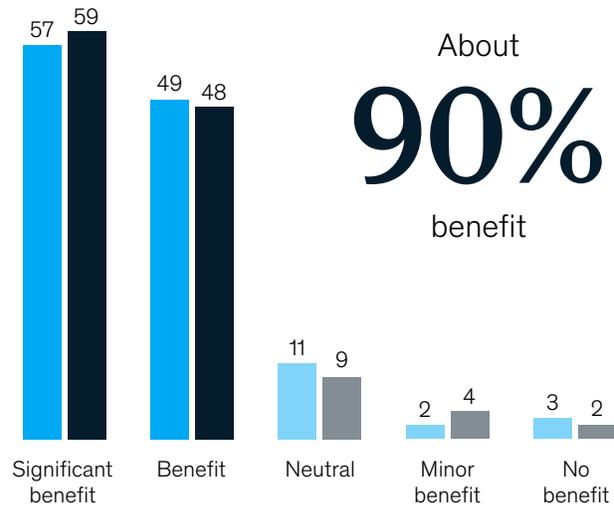
### Define what we want to measure.

According to survey respondents, the top sustainability challenges span environmental, economic, and social risks:



**Nine in ten** survey respondents said their organization—and their industry—would benefit from a defined set of sustainability metrics for capital projects.

■ Organization benefit  
■ Industry benefit



**A sustainability index, centered on the environmental, social, and economic impacts, could foster a more sustainable future for capital projects.**

Source: McKinsey survey of capital project leaders, results as of November 14, 2021, total survey respondents = 122.

McKinsey  
& Company



# Leveraging infrastructure investment to meet net-zero goals

Investors have critical roles to play in delivering sustainable infrastructure to address the rising risks of climate change. Developing innovative solutions can accelerate the energy transition.



**Emmanuel Jaclot**

Executive VP and head of  
infrastructure  
CDPO



**Tony Hansen**

Managing director  
Global Infrastructure Initiative  
McKinsey & Company

**In November 2021**, 120 world leaders representing 197 states converged in Glasgow for the COP26 UN Climate Change Conference.<sup>1</sup> There, they discussed the next decade of climate action and support needed to meet the 1.5° objectives of the Paris Agreement.<sup>2</sup> For hard-to-abate industries, such as construction, reaching net-zero carbon emissions won't be easy. Strategic changes are required to prioritize projects and deploy capital as needed; developing policies and incentives around new technologies and innovations can help.

To learn more about the roles investors play in these developments, McKinsey's Tony Hansen spoke with Emmanuel Jaclot, executive vice president and head of infrastructure for Caisse de dépôt et placement du Québec (CDPQ).

**McKinsey:** What are the biggest challenges or obstacles to achieving our net-zero aspirations?

**Emmanuel Jaclot:** Net zero needs to be more than an abstract objective. It needs to translate into real, concrete actions—and fast. Take energy as an example. According to a report published in May by the International Energy Agency (IEA),<sup>3</sup> we won't hit net zero by 2050 unless we triple annual clean-energy investment worldwide in the next few years.

As a long-term investor, one of the challenges [for our company] is delivering on our promises and deploying capital in the value chain as quickly and as early as possible. It's important to understand that renewable energy—solar and wind—by itself will not allow us to reach net zero. Investment in new technologies and innovations, such as batteries, green hydrogen, and carbon sequestration, will be essential. And policies and incentives to develop these sectors could greatly help accelerate their implementation.

Moreover, we need to work on the transition of the economy as a whole—not only by increasing the number of green assets but also by reducing the carbon footprint of high-emitting sectors. I believe we must consider current and potential impacts from the climate crisis on populations. If we want to achieve a transition to net zero, it needs to be a just transition.

**McKinsey:** What strategic changes will be required by investors and the infrastructure industry to scale up to meet net-zero targets?

**Emmanuel Jaclot:** The sense of urgency was evident at COP26: we have no choice but to cut emissions in half by 2030 for the world to reach net zero and limit the temperature increase to 1.5°C. Thus, investors must have the capacity to measure precisely where they are in the energy transition. This will enable them to set ambitious short-term and intermediary targets and to be held accountable for their evolution.

With those principles in mind, CDPQ launched its new climate change strategy in September 2021, four years after becoming one of the first institutional investors to set targets to reduce the carbon footprint of each of its portfolios. This year, we decided to raise our ambition even further. We aim to hold \$54 billion in green assets by 2025 and to achieve a 60 percent reduction in the carbon intensity of the total portfolio by 2030, as compared with our first measures in 2017.

Each investment decision we make considers the climate, and we use climate budgets to track the carbon emissions of our portfolios. We were also the first large institutional investor to tie employee compensation to climate targets. Our portfolio companies are fully aware that ESG [environmental, social, and governance] and the fight against climate change are two of our central priorities.

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<sup>1</sup> For more, see "COP26: Together for our planet," United Nations, accessed February 1, 2022.

<sup>2</sup> "The Paris Agreement," United Nations, accessed February 1, 2022.

<sup>3</sup> Net Zero by 2050, International Energy Agency (IEA), May 2021.

That said, investing in low-carbon assets alone won't be sufficient. As a major player in infrastructure investments, we cannot shy away from high-emitting sectors. This includes raw materials—such as steel, concrete, copper, lithium, and structural plastics—as well as transportation and agriculture. Our new climate strategy includes a \$10 billion transition envelope to proactively decarbonize these sectors.

**McKinsey:** How will investors prioritize projects within portfolios and deploy capital at the required pace?

**Emmanuel Jaclot:** With capital needs growing exponentially and competition and ticket sizes increasing, investors need to consider new approaches. One of the strategies we've found to be effective is forming long-term partnerships with recognized, like-minded players. For example, last year we joined Ørsted and Cathay PE in a major investment in the Greater Changhua 1 offshore wind farm in Taiwan.

We're also looking at new sectors, such as sustainable land management and green hydrogen, and considering new approaches. For example, we've created a \$500 million platform for innovation in stewardship investing (ISI), which has allowed us to create new partnerships and expand our expertise in emerging fields. It has also created business opportunities in key sustainable-economy sectors.

**McKinsey:** What role can technology play in increasing the sustainability of projects and how we measure performance?

**Emmanuel Jaclot:** First, let me say that we can't bank only on disruptive innovations to address the climate crisis. Beyond renewables, storage, and energy efficiency, new and diverse technologies will be needed to achieve net zero. Key sectors such as biofuels, batteries, carbon capture, and hydrogen have the potential to tremendously change carbon emissions.

Innovation in construction will also play an essential role in directing more capital toward the energy transition. For instance, modular, offsite design or 6-D building information modeling (BIM) solutions are both techniques that can substantially increase projects' sustainability. At the same time, they can bring down life cycle costs and reduce the risks of greenfield projects for investors like ourselves.

We want to support the development of innovative solutions to accelerate the energy transition. With this in mind, CDPQ has invested in companies such as Energize Ventures, a leading global alternative-investment manager that funds digital-first solutions.

**McKinsey:** What new financing approaches will be required to develop projects?

**Emmanuel Jaclot:** Governments alone won't be able to deliver sustainable infrastructure at the pace and scale needed to address the rising risks of climate change. Long-term institutional investors represent one of the largest capital pools available and can play a major role in financing infrastructure essential for a more sustainable, low-carbon economy.

The public and private sectors can also work together to derisk investments while pursuing net-zero objectives. Besides classic public-private partnerships, a good example is the Réseau express métropolitain (REM), Quebec's largest transit transportation project of the past 50 years, which is set to open in Montreal later this year. The REM was entirely developed by CDPQ Infra, one of our subsidiaries. We're acting as a principal contractor by taking on the planning, financing, execution, and operation phases. And our presence at each step of the project ensures the efficiency and quality of the work as well as its integration into communities.

**McKinsey:** How will investors manage the inevitable risk that comes with pursuing net-zero projects?

**Emmanuel Jaclot:** Climate change has the potential to disrupt companies, sectors, and communities. In the long term, it will have consequences for the value of every infrastructure asset, so we need to be able to evaluate how to build a sustainable and resilient future.

At CDPQ, the assessment and management of climate risks and opportunities are fully integrated into our processes. We ensure rigorous monitoring of climate risks—both physical risks and risks from the transition—which are the subjects of specific sections in the investment approval and accountability documents. We subject these risks to the same governance processes as other types of risks. Disclosures are also critical; we follow the Task Force on Climate-related Financial Disclosures' [TCFD's] recommendations, a global standard for investors.

Finally, our risk management considers the 1.5° objectives of the Paris Agreement as well as a series of scenarios from recognized sources, such as the IEA. We also work with our peers, remaining on the lookout for methodological developments for risk assessment and

developing comprehensive tools for investors and companies alike.

**McKinsey:** How do we make progress if the policy and the supporting regulations are lagging?

**Emmanuel Jaclot:** Investors can help move society forward by directing capital to sectors with enormous infrastructure needs, such as sustainable mobility. We know that we can increase our impact by collaborating with like-minded groups. That's why we're cofounders of two groups of leading global investors, the Investor Leadership Network and the Net-Zero Asset Owner Alliance, both of which work to tackle climate change issues and influence the development of policies and regulations toward a net-zero economy.

Here in Canada, CDPQ has also been involved in two expert advisory bodies for both the federal and Quebec governments. We work with actors from different sectors and organizations to ensure that all views are included in the decision-making process. Climate change will affect all of us—and everyone is responsible for taking action.

**Emmanuel Jaclot** is the executive vice president and head of infrastructure at the Caisse de dépôt et placement du Québec (CDPQ); **Tony Hansen**, based in McKinsey's Seattle office, is the managing director of the Global Infrastructure Initiative (GII).

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# Upgrade the grid: Speed is of the essence in the energy transition

The energy transition will require a dramatic increase in capital spending on the electric grid, delivered at an unprecedented pace. Improving project success is paramount to reaching net zero.



**Gracie Brown**  
Associate partner,  
San Francisco  
McKinsey & Company



**Bernice Chan**  
Consultant, Toronto  
McKinsey & Company



**Rory Clune**  
Partner, Boston  
McKinsey & Company



**Zak Cutler**  
Partner, Toronto  
McKinsey & Company

**An upgraded and expanded** electric grid will be the backbone of the energy transition—and a requirement of any realistic decarbonization pathway. The investment needed to usher in the energy transition is staggering: according to the International Energy Agency, annual investments in energy sector infrastructure and technologies will need to increase from today's level of more than \$1 trillion to \$4 trillion by 2030 to achieve net-zero emissions by 2050.<sup>1</sup> This capital will go toward both traditional energy delivery assets, such as transmission and distribution grid upgrades, and new asset classes, such as renewables and storage.

The good news as 2022 dawns is that the funding is coming together: examples include the US Infrastructure Investment and Jobs Act (IIJA) and the cumulative \$130 trillion commitment through the Glasgow Financial Alliance for Net Zero (GFANZ). And the technology we need exists. Utilities, developers, and engineering and construction firms must now turn their attention to building fast enough to keep pace.

### **Quantifying the speed of project acceleration**

The successful integration and deployment of clean-energy investment will depend heavily on the availability of traditional, large-scale grid infrastructure—including transmission and distribution networks, switching stations, and transformers—as well as on enabling infrastructure such as offshore wind ports.

Those behemoths are not easily constructed. In the United States, Princeton estimates that the electricity transmission system will need to expand by 60 percent by 2030.<sup>2</sup> Achieving this objective would require a mind-boggling acceleration of the typical ten-year capital project timeline. It is, arguably, a century of

work to do in less than a decade.

And the demand for investment far outpaces the industry's speed and capacity to build. According to Lawrence Berkeley National Lab, the backlog of large-scale electric generation (mostly renewable) and storage projects that have applied for connection to the grid has increased year over year, reaching 5,000 at the end of 2020 (exhibit). To develop and build the clean infrastructure needed to meet our climate targets, organizations will need to radically shorten development and construction timelines.

### **Overcoming a stubborn set of obstacles**

Three challenges tend to hound large-scale grid projects: long lead times for permitting and approvals, stretched global supply chains, and an impending shortage of skilled trades. Defining the scope of these three challenges is instructive in pointing toward solutions.

#### **Long lead times for permitting and approvals**

Regulators' standards for transparency and customer affordability continue to rise, as does pressure to meet sustainability mandates and voluntary commitments. Meeting these strategic priorities tends to be complex and time-consuming, and they're often juggled alongside large-scale projects with moving parts that are prone to delays. For example, siting issues—from limited access to right of way to a lack of community acceptance—are commonly referenced as a source of schedule overruns.

#### **Stretched global supply chains**

The world is well aware of how global supply chain disruptions can affect our supply of critical materials. Global demand for polysilicon and shortages of semiconductors and other raw materials critical to the energy transition

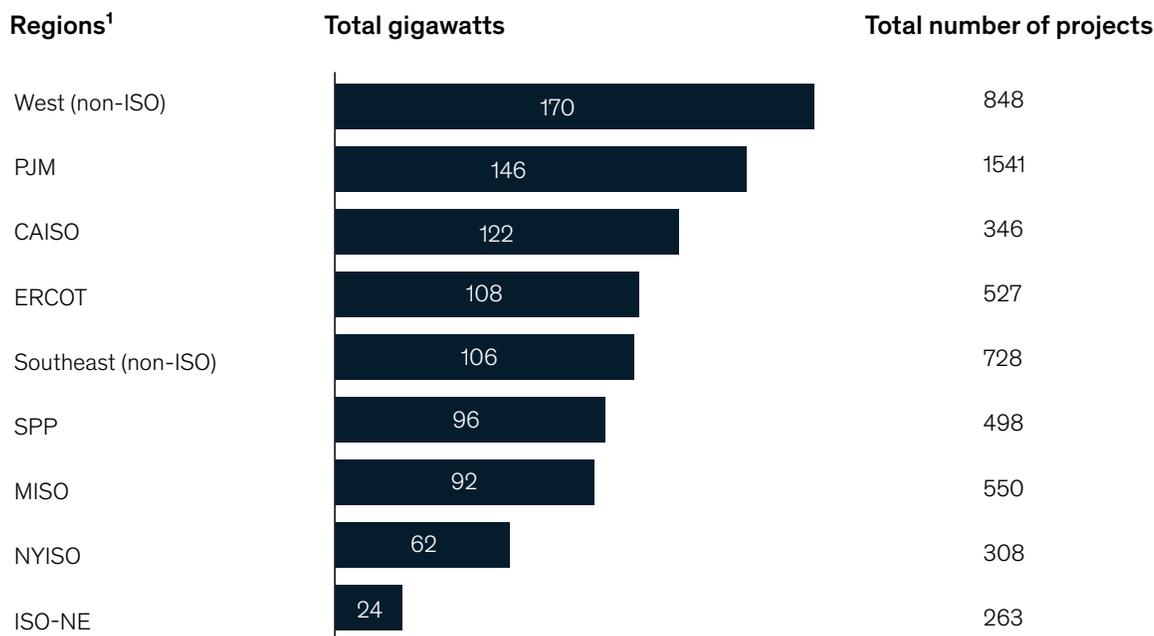
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<sup>1</sup> *Net zero by 2050: A roadmap for the global energy sector*, International Energy Agency (IEA), May 2021.

<sup>2</sup> Molly Seltzer, "Big but affordable effort needed for America to reach net-zero emissions by 2050, Princeton study shows," Princeton University, December 15, 2020.

Exhibit

## There are many projects, including renewables and storage, waiting to be connected to the power grid.



<sup>1</sup>West (non-independent system operator); Pennsylvania, New Jersey, and Maryland; California Independent System Operator; Electric Reliability Council of Texas; Southeast (non-independent system operator); Southwest Power Pool; Midcontinent Independent System Operator; New York Independent System Operator; Independent System Operator of New England.  
Source: Mark Bolinger et al, "Queued up: Characteristics of power plants seeking transmission interconnection as of the end of 2020," Berkeley Lab, May 2021.

have resulted in cascading delays on renewable energy projects and upgrades to the grid. According to the 2021 McKinsey Supply Chain Survey, one in five procurement leaders identified long lead times and delays as the greatest risks to their supply.

### Impending shortage of skilled linemen and trades

With every utility and developer seeking to increase their capital spending, demand for skilled labor will outpace growth in trades. McKinsey research estimates that the recent

surge in infrastructure funding will drive growth in construction jobs by up to 4.5 percent annually in some states.<sup>3</sup> When combined with an aging workforce in which 23 percent of employees are older than 55, a lack of skilled labor could further extend project timelines.

### Thought starters: Shortening the lead time

Accelerating the lead time for the deployment of clean energy will require utilities, developers, and engineering and construction firms to work

<sup>3</sup> Aaron Bielenberg, Garo Hovnanian, Shannon Peloquin, and Simon Webb, "Creating capacity to deliver: Using investment to spur transformation," McKinsey, December 2, 2021.

together to address these permitting, supply chain, and labor challenges. There is no one right answer, but meeting net-zero targets will require quick and confident decisions—and, in some cases, bold actions.

### **Streamline permitting and approvals**

The permitting phase has the highest risk of delay for myriad reasons, including stakeholder pushback, lack of coordinated effort, unclear regulation, and a backed-up permitting office. There are a lot of opportunities to streamline. New York City has enacted a number of policies to expedite development of net-zero projects, including establishing an oversight body to track project development, expedite permits, identify build-ready sites (such as abandoned commercial lots) for auction to developers, and offer incentives (such as utility bill discounts) to property owners and communities that host renewable-energy facilities. At the national level, the IJA granted the Federal Energy Regulatory Commission (FERC) the authority to override state siting decisions in areas with power transmission capacity constraints and projects.<sup>4</sup> While this is a good start, more will need to be done to further accelerate project approvals.

### **Fortify a resilient supply chain**

In a recent McKinsey survey, three out of four construction and engineering companies said they have started to implement supply chain analytics to improve anticipation of supply chain risks. Some companies have set up procurement nerve centers, with liaisons from functions across the organization working together to address challenges in supply availability.

### **Harness the full potential of digital and analytics**

Proven technology and digital assets, such as digital control towers, satellite imagery, and analytics, can reduce material and labor costs

and accelerate timelines. One US transmission and distribution system operator developed a tool that provides a summary view of asset conditions, offers asset replacement scenarios, and quantifies the potential impact of equipment failure under different scenarios. With the tool, the operator was able to reduce the time required to gather, unify, and clean data for their annual asset maintenance planning by 75 percent (that is, shorten the planning time frame from four months to one month).

Meanwhile, best-in-class talent attraction and retention policies will help leaders lessen the effect of the squeeze on labor capacity. One company in logistics—a sector with particularly acute talent needs<sup>5</sup>—used people analytics to improve new-employee retention by 20 percent and increase the number of new hires by 30 percent.

### **Take bold actions**

Deploying infrastructure investment efficiently and effectively will likely require bold, systemic changes to how we plan, finance, and execute energy infrastructure:

- **Cross-sector cooperation.** Leaders in the energy system can work together to design solutions fit to purpose for a broad set of varying characteristics and geographies. For example, the energy source mix that works best differs from climate to climate. Integrated planning across systems and sectors can aid in assessing trade-offs, reducing overall investment need and the total number and scale of projects required.
- **A push in the right direction.** Incentive models and market mechanisms are needed to encourage the behavior changes, new technologies, and alternative investments that will enable the energy transition at pace. For example, redesigned rates and grid-planning processes that motivate nonwire alternatives

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<sup>4</sup> Infrastructure Investment and Jobs Act of 2021, Pub. L. No. 117-58, Sec. 40105.

<sup>5</sup> Dilip Bhattacharjee, Felipe Bustamante, Andrew Curley, and Fernando Perez, "Navigating the labor mismatch in US logistics and supply chains," McKinsey, December 10, 2021.

<sup>6</sup> For more, see Blake Houghton, Jackson Salovaara, and Humayun Tai, "Solving the rate puzzle: The future of electricity rate design," McKinsey, March 8, 2019; Evan Polymeneas, Humayun Tai, Amy Wagner, "Less carbon means more flexibility," McKinsey, November 9, 2018.

can reduce the need for large-scale grid investments where feasible.<sup>6</sup>

- **Lower stakes.** As technologies, policies, and markets evolve, the risk of making investments in this uncertain environment is high. Policy can support rapid deployment of capital by reducing the risks associated with needed early investments in energy transition infrastructure. Government targets and commitments, explicit policy support (such as tax incentives or carbon pricing), for demand and offtake, and industrial standards and certification mechanisms are among the policy levers that some governments have pursued and that could reduce uncertainty for private investors.

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The energy transition hinges not only on significant investment in clean-energy technologies and

assets—but also on significantly upgrading the grid itself. The new priority for engineering and construction firms will be maintaining the necessary building pace. With cooperation and bold action, we can hope to achieve the ambitious goal of net-zero emissions by 2050.

#### **Join the conversation**

McKinsey will host a GII roundtable, “Preparing the grid for energy transition and climate change,” in spring 2022. Leading utilities, transmission operators, engineering and construction companies, investors, and regulators in North America and Europe will each gather to discuss how to address this emerging capital-deployment gap and to accelerate capital productivity to meet net-zero and climate adaptation targets.

**Gracie Brown** is an associate partner in McKinsey’s San Francisco office; **Bernice Chan** is a consultant in the Toronto office, where **Zak Cutler** is a partner; and **Rory Clune** is a partner in the Boston office.

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# Decarbonizing the built environment: Takeaways from COP26

How can the cement and construction industry achieve net zero by 2050? Here are the key takeaways from a roundtable discussion McKinsey hosted at the COP26 Climate Change Conference.



**Tony Hansen**  
Managing director  
Global Infrastructure  
Initiative



**Focko Imhorst**  
Partner, London  
McKinsey & Company



**Anna Moore**  
Partner, London  
McKinsey & Company



**Sebastian Reiter**  
Partner, Munich  
McKinsey & Company

**The built environment**—that is, the cement and construction value chain—accounts for approximately 25 percent of global CO<sub>2</sub> emissions. Reaching net zero by 2050<sup>1</sup> will require the buildings and construction industry to decarbonize three times faster over the next 30 years versus the previous 30. Companies from across the ecosystem have committed to decarbonization, but no one player can achieve this goal alone. At the COP26 Climate Change Conference, in Glasgow, Scotland, McKinsey hosted an interactive session that brought together global property owners, contractors, materials suppliers, investors, equipment manufacturers, and disruptors to define the path forward, with a focus on the following questions:

- What actions can the industry take now?
- How can stakeholders across the value chain collaborate to succeed?

Four key themes emerged from this roundtable.

1. ***The challenge is huge, but concentrated.*** Materials processing and building operations together account for some 97 percent of building and infrastructure emissions.<sup>2</sup> New buildings incorporating alternative materials, decarbonized cement and steel, and reduced embodied carbon are needed to meet net-zero targets. Existing stock will require renewable-energy sources, efficient building operations, and measuring performance, supported by more convenient end-to-end retrofit solutions.
2. ***Businesses that move quickly and work together will solve the challenge—and create value.*** COP26 made clear that achieving net-zero emissions has become not only an organizing principle for business but a point of competitive

differentiation (see McKinsey's summary of five key priorities coming out of Glasgow<sup>3</sup>). The construction industry has been stymied by a first-mover problem between policy, funding, and projects. CEOs can break the stalemate by joining (or forming) coalitions and moving at pace on investment and innovation.

### 3. *How do we get there?*

- a. ***Shift from volume to value.*** Decarbonization is a license to grow, but grow responsibly. The industry historically has relied on GDP and population growth to create value—this will no longer suffice in a retrofit, redesigned world. Players must differentiate through decarbonization and by meeting new green demand. For example, developers that construct green buildings will have access to cheaper funding and green-only planning districts. Conversely, those that do not decarbonize will face an existential threat.
- b. ***Scale by sharing.*** Fragmentation distorts the risk equation for new green investment. The industry can boost innovation by developing common standards, shared R&D resources, and a forum to navigate and align decarbonization levers and new technologies.
- c. ***Get serious about green investment and new technologies.*** As the commitment of \$130 trillion of private capital to the Glasgow Financial Alliance for Net Zero (GFANZ) made clear, there is no shortage of patient, green financing. Investors, however, face a shortage of large-scale green projects. Corporates can channel capital by making bigger bets on sustainability—decarbonizing existing assets at scale and partnering with the wide range of green start-ups serving the built environment.

<sup>1</sup> The target required to limit warming to 1.5°C above preindustrial levels.

<sup>2</sup> That is, 3.88 gigatons per carbon-dioxide equivalent (GtCO<sub>2</sub>e) and 9.40 GtCO<sub>2</sub>e, respectively, out of a global total of 13.70 GtCO<sub>2</sub>e. For more, see *Global Energy & CO<sub>2</sub> Status Report 2018: The latest trends in energy and emissions in 2018*, International Energy Agency, March 2019.

<sup>3</sup> Harry Bowcott, Daniel Pachthod, and Dickon Pinner, "COP26 made net zero a core principle for business. Here's how leaders can act," McKinsey, November 12, 2021.

- d. *Start with the customer.* Unlocking demand will require high-quality, convenient solutions, with a clear payback. In the retrofit market, for example, consumers are often deterred by complexity, unattractive offerings, and unclear financial benefits. Companies can break through by investing in new products and integrated solutions, taking a design-thinking approach to customer problems.
  - e. *Create a culture of innovation.* The buildings and construction industry is notoriously slow to change. COP26 participants addressed the need to create a culture of innovation. Practical steps<sup>4</sup> include setting targets for net new growth, promoting “test and learn” with minimum viable products, deploying venture capital–style metered funding, increasing R&D budgets, using certifications to drive a sustainability premium, and fostering precompetitive collaboration.
  - f. *Develop the skills now to deliver at scale.* COP26 demonstrated that the industry has reached an inflection point. Policy and capital are moving and will make skills the bottleneck down the line: for example, the retrofitting workforce of tomorrow is not in place today. Industry leaders across the public and private sectors need to start developing the skills and capacity to deliver on the anticipated demand.
4. *The public sector can support by aligning ‘decarbonomics’ incentives.* A mixture of carbon pricing, higher building performance standards, and building code changes can help move consumers and industry toward a more just and orderly net-zero transition. Clear signals are also needed on investment horizons, especially for transitional solutions (for example, biomass).

**Tony Hansen** is the director of McKinsey’s Global Infrastructure Initiative, based in the Seattle office; **Focko Imhorst** is a partner in the London office, where **Anna Moore** is also a partner; and **Sebastian Reiter** is a partner in the Munich office.

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<sup>4</sup>Daniel Cohen, Brian Quinn, and Erik Roth, “The innovation commitment,” *McKinsey Quarterly*, October 24, 2019.



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