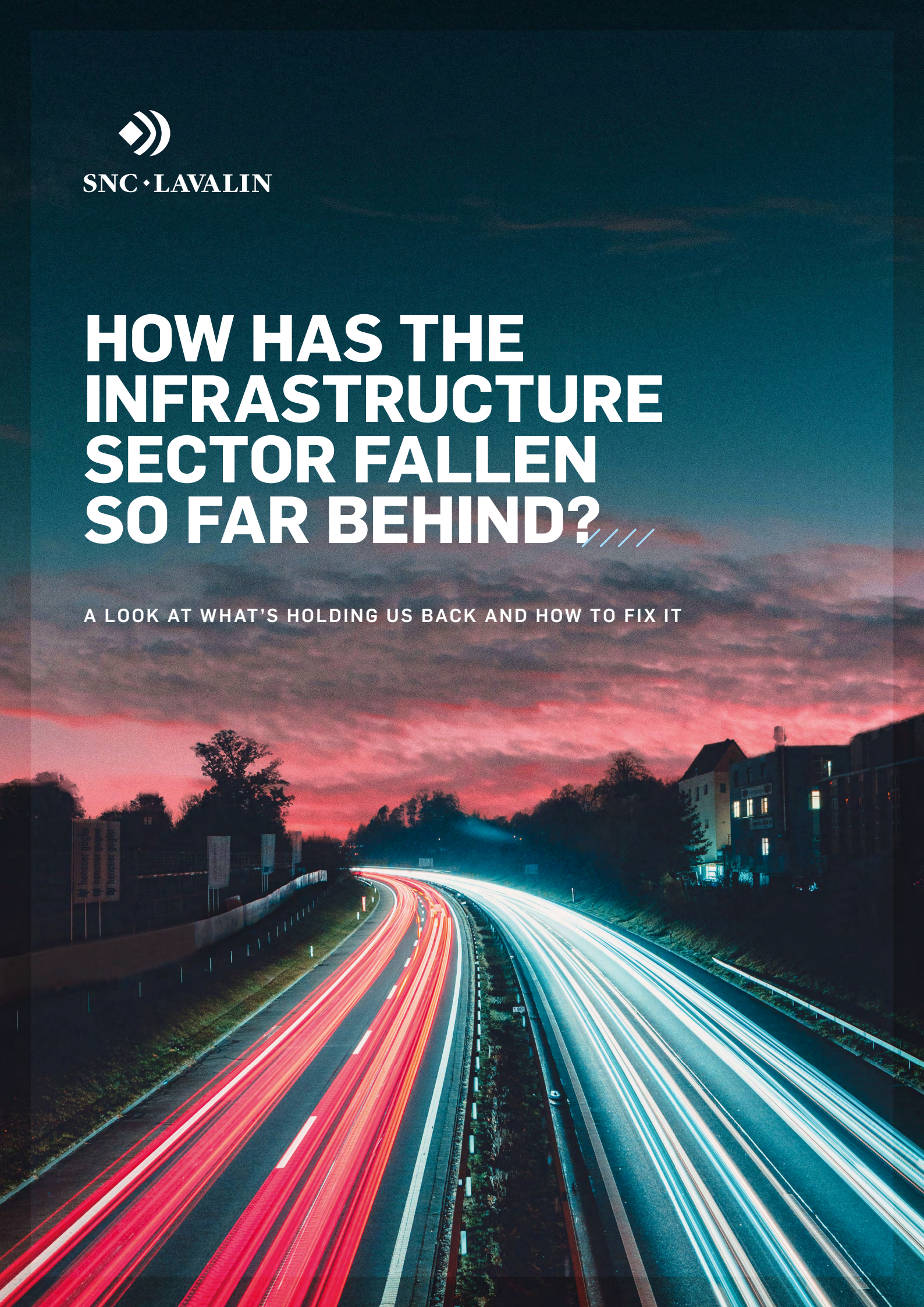
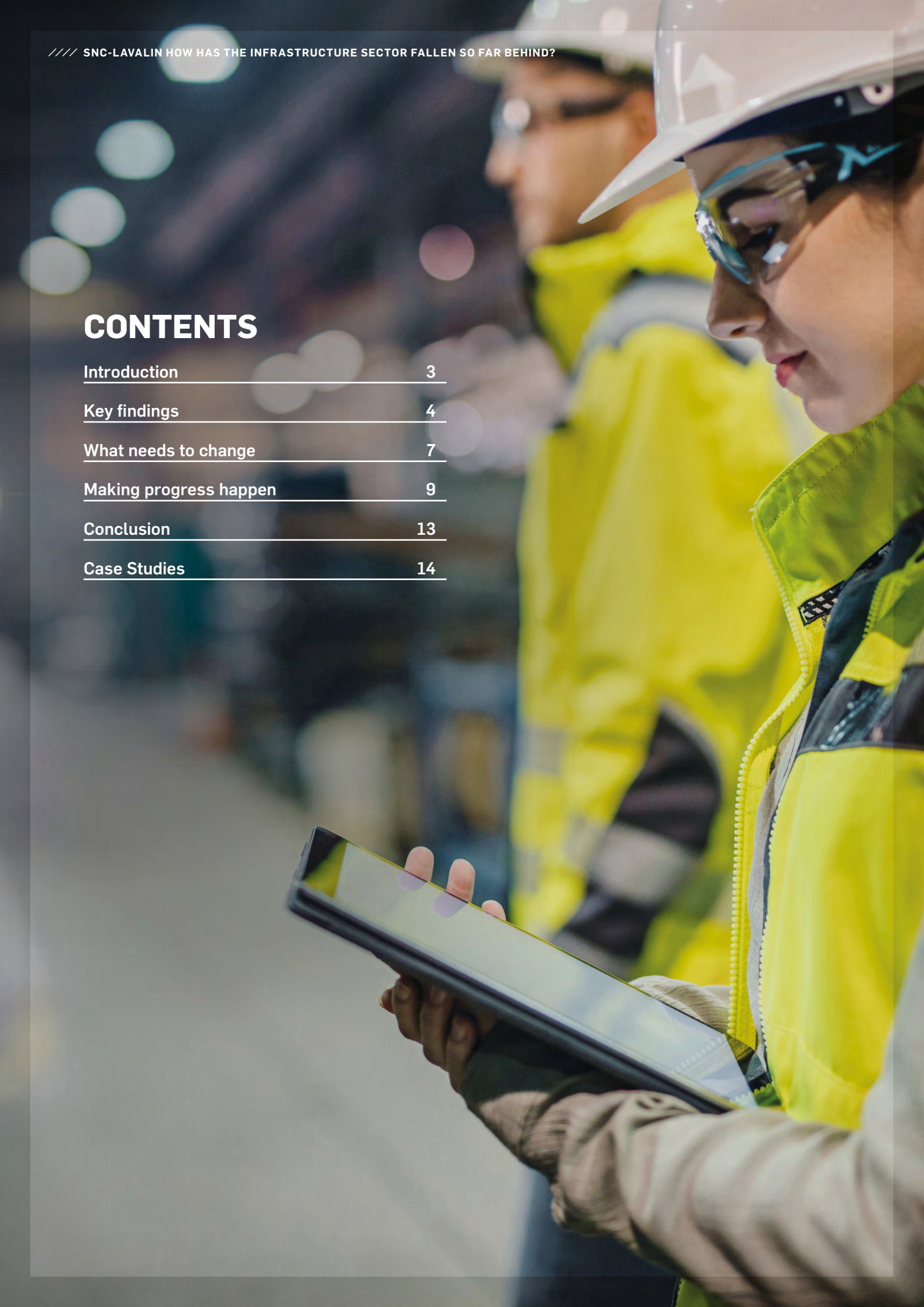
SNC·LAVALIN

HOW HAS THE INFRASTRUCTURE SECTOR FALLEN SO FAR BEHIND?

A LOOK AT WHAT'S HOLDING US BACK AND HOW TO FIX IT





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HOW TO INNOVATE FOR BETTER INFRASTRUCTURE

Eighty-one percent of decision makers in the infrastructure sector say projects routinely run over budget and over schedule. Modern infrastructure projects are so complex, involving so many different stakeholders, moving parts, and supply chains, that delays and other complications can be hard to avoid.

Hard, but not impossible.

As this report will show, not only do the tools and methods to solve these problems exist, most of us in the sector already know what they are.

SNC-Lavalin surveyed senior infrastructure-sector professionals from Europe and North America, using both qualitative and quantitative research to uncover how well the sector felt it was coping with challenges such as the need to boost productivity and efforts to hit net zero.

Just 37% of respondents say their company have adopted new digital technologies, such as using machine learning to mine data from previous projects to predict the outcome of, and to optimise, future projects. For modern methods of construction (MMC), the figure is even lower – only 33%. And a mere 21% say their company has adopted the technology and working methods needed to meet net-zero targets.

The overwhelming majority of respondents think the sector – which suffers from low adoption rates across digital, MMC and net-zero technologies internationally – needs to do more to address these issues. More than three quarters (76%) believe hitting decarbonisation goals will have a positive impact on our infrastructure, and 92% say the same of digitisation, and the greater use of digital technology and data in the infrastructure sector.

The question now is how we, as an industry, go beyond recognising these things are desirable to making them happen. That is the question we want to answer in this report.

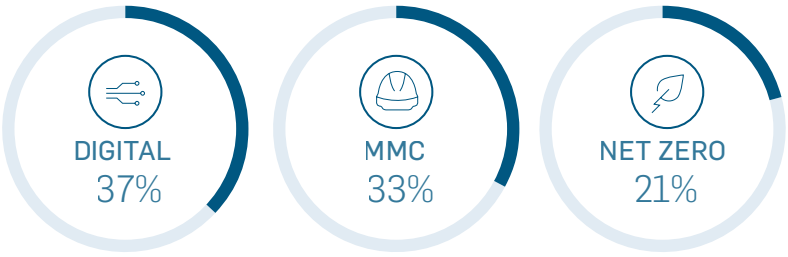
Our research has identified the barriers preventing, or slowing down, the adoption of new technologies and new ways of working. It also looks at how to overcome those barriers and the results you can expect when you do.

With the right approach, the right technologies, and the right partnerships, we can all start to make huge strides in productivity and improving the lived environment, today.

KEY FINDINGS

When asked if their firm had fully or mostly adopted the most relevant modern construction techniques and methodologies, most respondents say they have not.

Level of adoption comparison

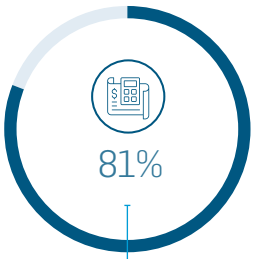


UK	37%	UK	33%	UK	27%
USA	44%	USA	32%	USA	19%
Canada	31%	Canada	35%	Canada	17%

● Adopters (Features in most/all work) ● Non-adopters (Features sometimes/rarely/not at all)

Adoption rates for MMC were roughly comparable across all three markets. The UK is significantly ahead of the US and Canada in adapting its working methods to meet net zero targets. Canada, meanwhile, lags the other two markets in its rate of digitalisation.

As mentioned, most infrastructure executives agree that large infrastructure projects run over time and budget too often, with respondents saying this can begin to happen right after the design phase, resulting in a noticeable impact on final costs.

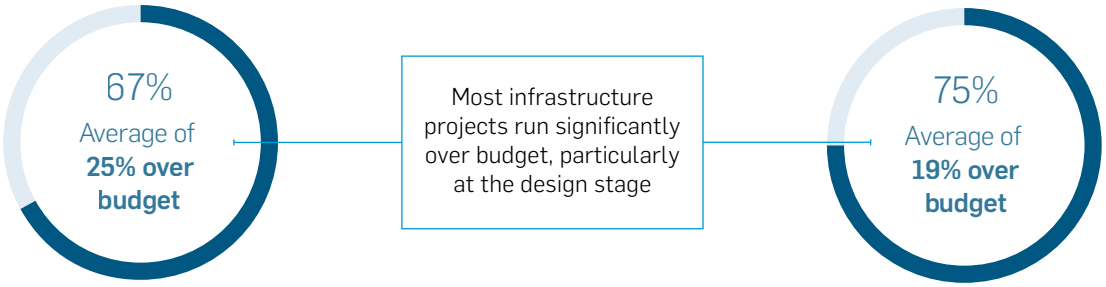


...agree **large infrastructure projects run over time and/or budget** too often

Vast majority agree that infrastructure projects run over time/budget too often

A start up is going to come in or a tech company without any of the baggage we've got in this sector. There is a huge risk some will come in with a completely different commercial offering.

Digital Expert Interview [LW]



...say total budget for the **design phase becomes more expensive than originally forecasted**

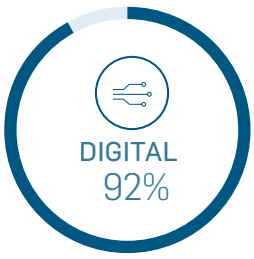
...say total budget for the **construction phase becomes more expensive than originally forecasted**

ADOPTION BRINGS SIGNIFICANT BENEFITS

The good news is that there is widespread buy-in for the need to change, which shows up in our findings in multiple ways.

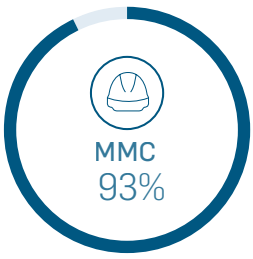
Respondents are clear that adopting digital technologies, MMC and practices designed to cut emissions all help improve project outcomes.

For digital and MMC, there is not a big difference between the three markets regarding how much respondents recognise the value of change. However, when it comes to the adoption of technologies designed to help meet net-zero targets, the US significantly lags the UK and Canada.



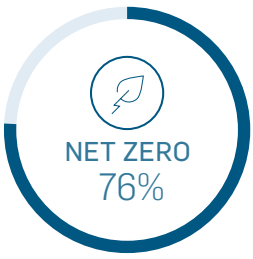
...say **modern digital approaches can have a positive impact** on infrastructure projects in the future

UK	88%
USA	94%
Canada	94%



... say **modern methods of construction can have a positive impact** on infrastructure projects in the future

UK	90%
USA	97%
Canada	93%



... say **Net Zero/decarbonisation goals will have a positive impact** on infrastructure projects in the future

UK	81%
USA	68%
Canada	78%

IDENTIFYING AND REMOVING BARRIERS

To increase adoption rates, companies and key stakeholders must identify the main obstacles preventing change and remove them.

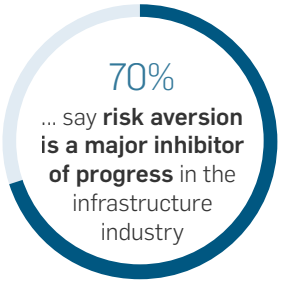
Respondents highlighted risk aversion, lack of collaboration and weak frameworks as key barriers to progress.

To overcome these and other barriers to progress, we recommend a few key approaches:

- All stakeholders must improve how they communicate and collaborate, adopting new frameworks and technologies to facilitate transparency and efficiency.
- Accelerate the adoption of new digital technologies, such as AI and augmented reality, to ensure maximum efficiency in time, materials, energy, labour and costs.
- Build an approach to talent that enables the sector to recruit the next generation of digital natives, while also giving existing workers the digital skills they need to thrive.
- Find and develop new materials, and approaches to working with materials, which will help the sector achieve its sustainability and productivity goals.
- Evolve legal, contractual, and other frameworks that encourage collaboration between stakeholders, innovation and risk taking in pursuit of greater productivity and sustainability.

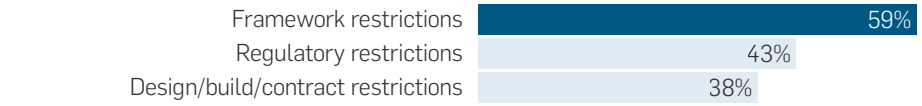
By taking these actions, companies can evolve their operations to adopt new digitised, streamlined, and efficient ways of working: 92% of respondents say doing this, and adopting modern digital approaches, will have a positive impact on infrastructure projects.

When companies work to overcome the barriers that prevent modernisation, everyone wins. It helps the environment, their customers, the public – and their bottom line.



% agree that lack of collaboration is limiting progress (total + breakdown by sub-theme)

% agree that framework issues are limiting progress (total + breakdown by sub-theme)



WHAT NEEDS TO CHANGE

Infrastructure and real-estate firms are going bankrupt faster than firms in other sectors[1,2]. And the sector's productivity growth is still 1% a year, compared to 2-3% for developed economies[3].

As budgets tighten and clients become more demanding, the sector must find ways to address these problems, becoming more cost efficient and sustainable.

Areas of focus

For this report, SNC-Lavalin focused on three areas in which adoption rates are low, but the potential positive impact of adoption appears to be extremely high. These are:

- **Digital technologies**, such digital twins and machine learning, which can radically improve efficiency in construction and asset management
- **Modern methods of construction (MMC)**, such as the use of 3D printing, precast parts, as well as innovative on-site techniques and new materials
- **Progress towards net zero**, including improved design, construction, materials, and energy sources to radically reduce carbon emissions

This report looks at how widespread the adoptions of these are, where they have not been widely adopted, why not, and what it will take to change that.

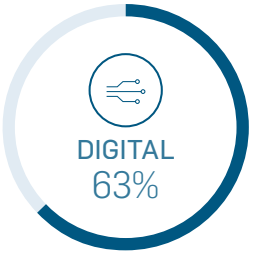
THE SECTOR IS AVOIDING NECESSARY CHANGE

Adoption rates for modern construction methodologies and technologies are, according to respondents, universally low.

To get a real idea of where adoption rates were low, why and what could be done about this, SNC-Lavalin has created a unique set of indices. Each index measures adoption rates in, and a range of attitudes about, one of the three categories – digital technologies, MMC and net zero. Using these indices, it's possible to see at glance what needs to change and the barriers we need to overcome to make change happen.

These indices help us understand what is holding the industry back from tackling problems such as low productivity or high emissions.

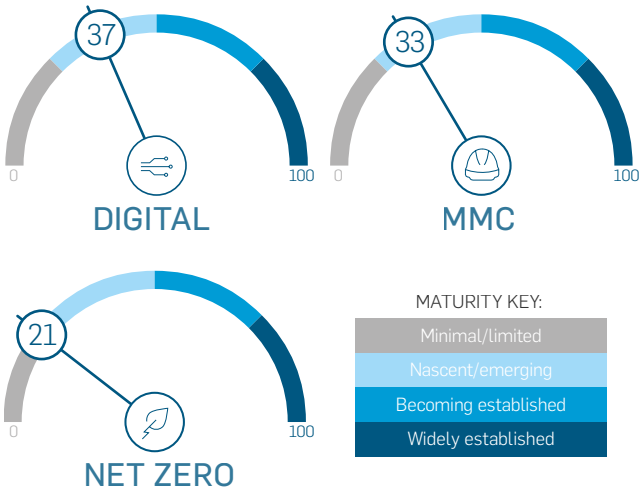
Yet they also make clear the positive impact of digital, MMC and net zero progress, offers significant first mover advantages for those companies prepared to invest in innovation right now.

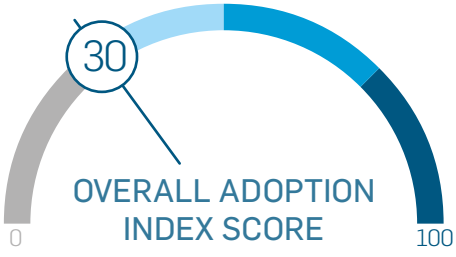


...believe the infrastructure industry is **behind other sectors in the adoption of modern digital ways of working**

UK	63%
USA	62%
Canada	62%

Low adoption rates, especially for Net Zero





- Digital, MMC and Net zero are all yet to establish themselves within the infrastructure industry, leading to a low overall adoption score.
- While Digital and MMC are in the nascent/ emerging phase, Net Zero is even less embedded within the industry thus far.There is widespread recognition that change is necessary

1 https://www.dnb.co.uk/perspectives/finance-credit-risk/global-bankruptcy-report-2021.html
2 https://www.globest.com/2021/08/30/real-estate-firms-bucking-trend-of-fewer-bankruptcies-in-2021/?slreturn=20220626071852
3 https://www.mckinsey.com/business-functions/operations/our-insights/improving-construction-productivity

THERE IS WIDESPREAD RECOGNITION THAT CHANGE IS NECESSARY

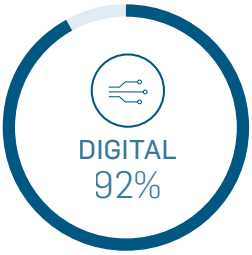
The overwhelming majority of respondents in all three countries believe innovation that helps meet net-zero and productivity targets would benefit them, their clients and society as a whole.

This high awareness makes the task of encouraging adoption more complicated, as it is not just a case of using education to overcome ignorance.

We must find the barriers that are preventing already enlightened stakeholders from making the leap to adopting new technologies and ways of working.

> **"Nearly eight in ten (78%) agree that faster progress towards Net Zero goals is becoming a necessity."**

There is wide recognition of the benefit that modern digital approaches, MMC and net zero goals can have



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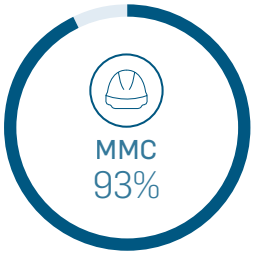
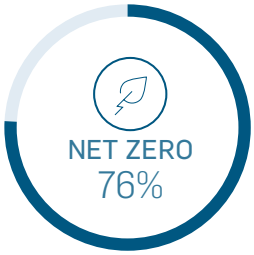


... say **modern methods of construction can have a positive impact** on infrastructure projects in the future

UK	90%
USA	97%
Canada	93%



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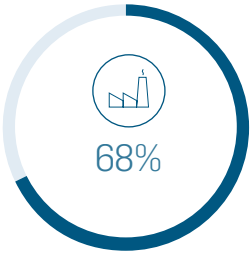
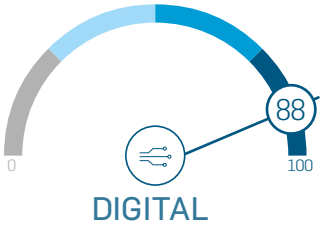
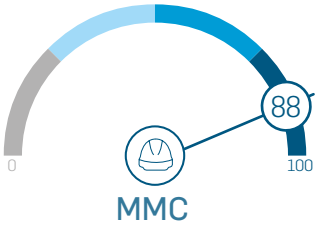


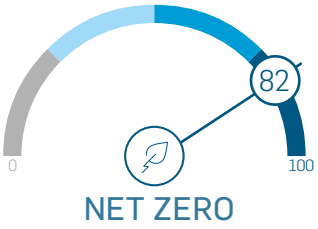
... believe there is clear potential for **new industry entrants to initiate major change** in how projects are designed and delivered

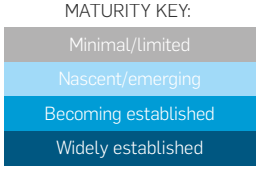
UK	63%
USA	66%
Canada	75%

Buy-in indices: strong levels of buy-in across Digital, MMC and Net Zero









- High Digital, MMC and Net Zero buy-in demonstrates widespread industry acknowledgement of the benefits.
- Overall buy-in looking across Digital, MMC and Net Zero combined is therefore high.

MAKING PROGRESS HAPPEN

HOW TO MAKE PROGRESS HAPPEN

During the study, researchers identified six key themes; areas in which any improvement was likely to yield significant benefits for the infrastructure sector.

1. Communication and collaboration

The first of these was communication and collaboration. 71% percent of respondents say better collaboration would bring a wide range of improvements to the sector. The key finding was that teams, and organisations must stop working in siloes.

Instead, they should collaborate across different functions and for the full lifetime of the project. This could be as simple as improving communications. But at its most sophisticated, it will means using common systems and platforms, so that for each project there is a single source of truth, minimising the loss of time and budget to unforeseen conflicts and maximising productivity.

Recommendation:

Build new and collaborative systems, technologies, and frameworks, to make partnerships for greater efficiency the norm across the sector.

Steps companies can take to make this a reality, include:

- Treating each project as a community of stakeholders, in which all parties have the right and the obligation to shape shared working practices, as well as digital and physical assets.
- Creating solutions, such as using digital twins, which allow all functions but particularly design and construction, to operate and communicate in a hared visual workspace.
- Building institutions that enable regular feedback, on processes, workflows, and all other aspects of operations – and reward high-quality feedback, even if it is inconvenient.

> **"You need to be able to share. You need to be able to speak a common language. And you need to understand what you're doing in design and how that translates into construction, operations, and end-of-life. Everyone must think long-term about all of that. And that probably requires greater collaboration than you'd traditionally find."**
>
> – Net-zero expert

2. Digital best practice

The next theme to emerge from the research was digital best practice and innovation – 64% of respondents identify this as an area in which there are significant opportunities to make a positive impact on infrastructure outcomes. This includes greater adoption of digital approaches (38%), improved systems (37%) and more digital continuity across project phases (30%).

Recommendation:

Foster the adoption of digital, net zero and MMC technologies and methods. This needs to happen across sectors, companies, and the whole lifecycle of projects.

Steps companies can take to make this a reality include:

- Developing a single, authoritative source of truth for all important data to reduce errors and accelerate your workflows.
- Investing in new data-driven workflows to better connect design and construction, to reduce the need for rework, cut project costs and improve stakeholder collaboration.
- Using AI and machine learning to mine historic data for patterns in infrastructure performance, spotting problems before they occur, cutting costs, and improving productivity.
- Creating common standards for data storage and processing, digital modelling and other core functions to allow all stakeholders to participate in and derive value from the common platforms and digital workflows.

> **"There's enough people being brought up in a world where data is the norm. Let's get them to help us embrace the opportunity of data and digital. It's an exciting space to help an industry that desperately needs to embrace these things."**
>
> – Digital solutions expert

3. Focus on people

After digitisation, the third theme to emerge was the need to focus on people. Companies must invest in their employees, developing the next-generation skills, knowledge, and leadership that's required. 68% of respondents say that fostering more open attitudes to innovation, and encouraging new and innovative ways of working, are key to improving infrastructure performance.

Recommendation:

Shift the culture within the sector so it fosters innovation, as well as welcoming and encouraging change and experimentation.

Steps companies can take to make this a reality, include:

- Investing in your existing experts to add digital and data skills to their portfolio, to multiply the value they bring to the business and enhance their own careers.
- Hiring the next generation of digital and data natives and training them in infrastructure – but also encouraging and empowering them to bring innovative ideas and approaches into the company.
- Develop a culture across that encourages change and accelerates the rate of technology– and data-driven evolution. Some of this is about adopting best practices and technologies that already exist. Some of it is about driving totally new innovations.
- Creating a culture that encourages innovators to challenge the way the company currently works, rather than going with the flow just because that's how things have always been done.

> **"Some people are embracing the change and other people are terrified by what it means for them. I look at it on the basis that there is something else I can do if a computer starts doing my job. I can focus where I can add more value for the client rather than repetitive tasks."**
>
> – Digital solutions expert

4. Innovation in materials

Another key theme to emerge was the need for greater efficiency and innovation in materials – 53% of those taking part name this as a key focus. By developing new materials and new ways of using them, the sector can replace high-carbon materials, or those with long-lead times and other less efficient inputs with more efficient, better designed, more cost-efficient materials that are better for the environment.

Recommendation:

Support new materials development and experimentation – including new ways of working with them.

Steps companies can take to make this a reality, include:

- Finding new materials, such as the latest non-cement concretes, which help you reduce costs, overcome shortages, and improve efficiency.
- Moving to new ways of working, such as off-site construction, which help to reduce project leads times, improve safety, and increase efficiency.
- Using more efficient materials, particularly energy efficient materials, to supply a demonstrably more sustainable and cost-effective end product.

> **"If you think about the lifecycle of a building, it spends more time in use, than in design and construction. So why wouldn't we spend more time on future proofing buildings, making them intelligent, making them easier to be upgraded? So that the next generation don't feel the need to rip them down, and instead easily adapt and move them forward."**
>
> – MMC expert

5. Develop common data standards

The volumes of data the infrastructure industry now produces are massive, and there is a huge amount of potential value locked up in this information. To unlock it and get the best possible returns and outcomes, everyone on a project needs to be able to access, share and process that data to turn it into information and insights.

This can only happen if data is stored and organised using common data formats. Conflicting or incompatible formats complicate sharing and dramatically raise the cost and time involved in building a single source of truth for all stakeholders on a project.

Recommendation:

Steps companies can take to make this a reality, include:

- Work across the industry to develop common data standards, such as ISO 23386 and ISO 23387 to standardise data for building information modelling and other digital processes
- Agree which standards to use at the start of any project, and stick to them across the full project life cycle
- Develop new collaboration models based on shared data and these common standards

> **"Major projects involve masses of information moving across different platforms and systems, and across contractual lines. At every stage, data structures and standards may differ from client to client, sector to sector, supplier to supplier – often because each had to develop their own standards in the absence of an overarching framework to align with.**
>
> **Seamless interoperability across all these layers would help reduce risk, improve compliance, and give us a solid foundation from which to innovate. But it is not going to happen organically – it is going to require a concerted industry-wide effort.**
>
> **We must adopt common data standards. We must adopt them across the board if we're going to benefit as an industry, and we need to do so quickly.**
>
> **Within Atkins we are setting minimum data requirements – based on ISO open data standards like the pair noted above – for all our design, engineering, and project management schemes. This will allow our teams across the globe to work seamlessly and with confidence, knowing that they are all singing from the same hymn sheet."**
>
> – Richard Robinson, CEO for UK & Europe, Atkins

6. Framework evolution

The sixth and final theme we have discovered is framework evolution: shifting the way the industry frames contracts, regulation, and other conceptual constraints, to encourage rather than hamper the formation of partnerships and collaborative working. More than half (52%) say this should be a priority for anyone who wants to improve the sector's productivity and efficiency.

Recommendation:

Create new regulatory and contractual frameworks that foster collaboration, innovation, and change, rather than impede it.

Steps companies can take to make this a reality, include:

- Adopting a more holistic approach to assessing project value that considers the total lifetime returns and impact of a project, rather than just short-term costs and returns.
- Using the data derived from this more transparent approach, to formulate more accurate models of risk transfer across an asset's lifetime.
- Building upon these innovations to create new contractual and collaborative models that allow shared value and align incentives for different stakeholders to work together.

These are the reforms the infrastructure sector should focus on first if it is to have the best chance of making the necessary changes as quickly as possible, and maximising returns for investors, clients, and the public.

By promoting these changes and collaborating with industry partners adopt them throughout the sector, and across borders, we believe the infrastructure industry can solve its long-standing productivity challenges, deliver greater value for customers, and meet our shared social obligations.

> **"Clients need to procure in a different way. Value doesn't always mean the cheapest input price."**
>
> – Expert in digital construction workflows

CONCLUSION

NEXT STEPS

Across the industry, there is an understanding that the low adoption rates of modern methods of construction and digital technologies is holding the sector back. It's making it harder to hit net-zero targets, to increase productivity in line with other sectors of the economy and to offer customers the value they demand.

Barriers preventing adoption must be identified and broken down to minimise sector vulnerability. These range from inertia and reluctance to change, through cost concerns to lack of the right skills and technologies.

The good news is that for companies prepared to make the investment in changing their technologies and working practices, there is the opportunity to make significant cost, efficiency, and sustainability gains. Not only is that a good thing in itself, but in a market that is slow to make the changes required of it by customers, legislators, and the public, first movers are likely to have a significant commercial advantage.

For more information on how new technologies and methods can help companies transform their working practices, visit the SNC-Lavalin website

www.snclavalin.com

ABOUT SNC-LAVALIN

Founded in 1911, SNC-Lavalin is a fully integrated professional services and project management company with offices around the world. SNC-Lavalin connects people, technology, and data to help shape and deliver world-leading concepts and projects, while offering comprehensive innovative solutions across the asset lifecycle.

Using our industry knowledge and leading resources, we create and deliver predictable outcomes for an unpredictable world. How do we do it? By thinking and working differently. With offices around the world, we connect people, technology, and data to shape the future of our industry and the world around us.

And because we cover everything from blueprint to delivery, across the entire lifespan of a project, you can count on us for a client experience that is smoother, smarter, and more efficient. At SNC-Lavalin, we are not just embracing change – we're driving it.

CASE STUDIES

CASE STUDY 1: UK NATIONAL UNDERGROUND ASSET REGISTER

To enable the UK government's 'build back better' agenda, it's necessary to accelerate the rate at which public- and private-sector bodies can build new infrastructure. But the UK is already a heavily developed built environment.

More than four million holes are dug in the UK each year, many in the wrong place, according to a government statement. The economic cost of accidental utility damage is around £2.4bn each year. And too often, the need to investigate and plan around existing infrastructure — particularly underground pipes and cables – significantly slows down the rate of work.

Solution

The UK government hired SNC-Lavalin to help it create the National Underground Asset Register (NUAR). SNC-Lavalin is working with UK mapping agency Ordnance Survey and global leader in geospatial data management 1Spatial to create a database of all underground pipes in the UK. Using market-leading underground surveying technology, data-gathering skills, and digital expertise, SNC-Lavalin and its partners are giving infrastructure providers the data intelligence they need to accelerate project timelines and avoid unplanned downtime.

Target outputs

When the NUAR is completed, it will help cut unplanned downtime and delays in construction projects. It will also help avoid damage to critical infrastructure, such as electricity cables or gas and water mains. In this way, it's expected to cut project delays and reduce costs. Once operational, the NUAR is expected to deliver around £350m a year in benefits by avoiding accidental asset strikes, improving the efficiency of works and better data sharing.

CASE STUDY 2: UK GOVERNMENT PROPERTY AGENCY

Thirty-eight percent of all emissions originate from the construction industry. The UK's Government Property Agency (GPA) is searching for ways to ensure that government construction projects have the lowest possible environmental impact. "Our strategy is to partner with industry leading companies to support successful delivery and drive the best commercial deals in the market," said Steven Boyd, CEO of the GPA.

Solution

The GPA has partnered with SNC-Lavalin to developing green technologies and new methods for the infrastructure sector. SNC-Lavalin will supply technical and design support including due diligence, compliance, and assurance, as well as cost management and annual planning cycles across the portfolio.

Target outputs

By 2030, the UK needs to cut the emissions associated with construction projects by 68%. By 2050, construction-related emissions must be 78% lower than they are today. This will help Britain reduce its impact on the environment and meet its obligations under the Paris Agreement. To help make this happen, over the next six years, Atkins and Faithful+Gould will work with the GPA to ensure over four million square feet of public sector office space is brought to enhanced sustainability standards.

CASE STUDY 3: ELEVATE DENVER

Denver, one of the largest cities in the U.S., is five years along its ten-year roadmap for an ambitious program of capital infrastructure improvements. This $937million “Elevate Denver” program comprises nearly 500 separate projects, aimed at helping Denver meet its rapid growth forecasts for the coming decade. The projects include brand-new elements, such as roads and recreation facilities, but additionally, renovating and improving existing infrastructure.

Solution

The City and County of Denver brought Atkins on board in 2018 to build a new visible reporting capability via digital dashboards for all stakeholders, including local communities, and to create a bespoke program management system.

The solution was an embodiment of our people-data-technology approach. Drawing on our wealth of global knowledge, an experienced local team, digital expertise and City leadership, the team created a customized Program Management and Reporting solution.

Target outputs

The new program management system and accessible dashboarding improved coordination and collaboration across the 500 projects, increasing efficiency, clarity of reporting and predictability, resulting in the initial five-year contract being extended five more years.

The full public-facing Program Dashboard launched in August 2022.

CASE STUDY 4: THE EUROPEAN INVESTMENT BANK

As the official investment bank for the European Union, the EIB has a responsibility to fund projects which will promote European economic development. But it must also ensure that its activities contribute to the EU and its member states meeting their climate goals. To do this, it needs a way to identify which infrastructure projects are sustainable and which are not.

Solution

SNC-Lavalin were asked to develop an approach for assessing the performance of transport projects against the levels of decarbonisation required to align with the Paris Agreement objectives. This allows for a consistent and objective approach to the assessment of scheme eligibility as Climate Action and therefore Climate Finance.

Target outputs

Using the methodology developed by SNC-Lavalin, the EIB expects to be able to identify the infrastructure projects which make a positive contribution to the EU’s climate agenda faster and more accurately. Over the next decade, this will enable the bank to significantly cut the carbon emissions associated with the activities it funds.

CASE STUDY 5: THE CANADA LINE

The Canada Line is a 19km, fully automated commuter rail line and part of Vancouver's SkyTrain network, one of the largest of its kind in the world. TransLink, the line's operator, needed ways to improve performance, cut cost and minimize unplanned downtime. It turned to SNC-Lavalin for help with all three objectives.

Solution

TransLink scanned the whole of its track using lidar, ultrasonic and other sensors. The information from these data-capture exercises is then fed into the digital twin — an exact digital replica of the Canada Line and all of its assets.

By selecting an element in the digital twin, users can see what it's made of, its specifications and tolerances, details of when it was last maintained, data that shows its importance to operations — and more. Using this data, engineers can then quickly decide whether maintenance is required and when. If urgent, it can dispatch a crew to the location immediately.

Target outputs

Since working with SNC-Lavalin, the Canada Line has achieved an average availability rate of 99.8%. It has won seven awards for its service and operations, most recently Canadian Council for Public-Private Partnerships Gold Award for Service Delivery Excellence. The Canada Line is setting new standards for customers satisfaction.

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