Infrastructure

ISSUE 4: SETTING INFRASTRUCTURE UP FOR LONG-TERM SUCCESS

Building a better future together

Deloitte.

Contents

Front page: Glenlough Bay, County Donegal, Ireland's Wild Atlantic Way. (Source: Getty Images)

Introduction from Luke Houghton

GLOBAL MARKET LEADER, INFRASTRUCTURE & REAL ESTATE

WELCOME TO THE FOURTH EDITION OF DELOITTE'S GLOBAL INFRASTRUCTURE MAGAZINE. IN THIS EDITION, WE EXPLORE HOW INFRASTRUCTURE LEADERS ARE HELPING TO ENSURE THEIR ASSETS ARE RESILIENT AND FUTURE-READY.

As always, I'm delighted to see the breadth and depth of stories that we've curated—from innovative financing and unique collaborations to impactful stakeholder engagement. I'm also thrilled to contribute my own perspectives in this edition, alongside insights from 22 other Deloitte leaders. Together, we examine the pressing challenges keeping infrastructure leaders up at night, the opportunities that excite them, and the trends shaping the future of infrastructure.

As with previous editions, you will see that emerging technology and artificial intelligence continue to play a pivotal role in modernizing and reimagining infrastructure. I hope you find this edition insightful and inspiring, and would welcome the opportunity to discuss any of the stories with you in more detail.

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Let's take a closer look at some inspirational examples from around the world where infrastructure is accelerating the renewable energy transition. Widespread collaboration across the entire infrastructure industry and beyond are key – together with proactive investment, bold strategies, and a determination to work hard towards a net-zero future. Enjoy finding out more below!

Incredible insights

EV charger at dusk. (Source: Getty Images)

BOOSTING STREET-SIDE EV CHARGING ACROSS AUSTRALIA

Curbside charging is critical to support the uptake of electronic vehicles (EVs) across Australia. To accelerate the country's EV infrastructure, in February 2025 the Australian Renewable Energy Agency (ARENA) announced it will provide US$1.4 million in funding to EVX Australia for 250 curbside chargers across 60+ local government areas in Victoria, New South Wales, and South Australia. These chargers—mounted on existing power poles—provide accessible, low-impact EV charging without costly infrastructure overhauls.

ARENA CEO **Darren Miller,** says, "While sales of EVs are increasing, the expansion of public charging is vital in catering for future demand right across Australia."[1] EVX's Australian-designed smart chargers use 100% renewable energy while minimizing grid impact. This initiative is backed by utility providers and local councils and will enhance real-time reporting, flexible tariffs, and a seamless user experience via Wevolt's app. Funded under the Driving the Nation Program, it represents a key step in Australia's sustainable transport future.

1. Australian Renewable Energy Agency (ARENA), "Boosting Street-Side EV Charging Across Australia," ARENA, February 7, 2025, https://arena.gov.au/news/boosting-street-side-ev-charging-across-australia/.

Drax Power Station's Greenhouses thrive on excess heat. (Source: Getty Images)

MAKING BRITAIN A CLEAN ENERGY SUPERPOWER BY 2030

In the UK, **Ed Miliband,** Secretary of State for Energy Security and Net Zero, is prioritizing energy independence, job creation, and system reform.

Key actions include:

1. National Wealth Fund:
US$9.3 billion to catalyze private investment in green industries.

2. Mission Control:
A central hub to accelerate clean power deployment by 2030.

3. Great British Energy:
A publicly owned company leveraging US$10.6 billion to scale offshore wind, carbon capture, and hydrogen.

4. Onshore Wind & Solar:
Fast-tracking stalled projects and tripling solar capacity.

5. Grid & System Reforms:
Enhancing transmission infrastructure and creating a National Energy System Operator.

The record US$1.9 billion funding for renewables will support the country's energy transformation.

 * Currency converted to USD as of 9 April 2025

ACCELERATING THE ENERGY TRANSITION WITH PROACTIVE INFRASTRUCTURE INVESTMENT

In the recent report *Why we must build out energy infrastructure now to drive the energy transition*[1], the International Energy Agency emphasized the need to triple solar and wind capacity to 11,000 Gigawatts (GW), quadruple electricity use in transport to 8 Exajoules (EJ), and increase overall electrification from 20% to 28% by 2030.

However, while renewable projects can be completed in 2-5 years, grid expansions often require 5-10 years, leading to potential delays and higher emissions. Pre-emptive planning and investment are essential to synchronize infrastructure development with renewable energy deployment, ensuring a seamless and efficient energy transition.

Solar power plant maintenance. (Source: Getty Images)

EUROPE'S LARGEST GREEN HYDROGEN PLANT IS IN THE WORKS

Iberdrola has inaugurated Europe's largest green hydrogen plant for industrial use in Puertollano, Spain. This US$164 million facility integrates a 100 megawatt (MW) photovoltaic (PV) solar plant, a 20 MWh lithium-ion battery system, and a 20 megawatt-hour (MWh) lithium-ion battery system, producing up to 3,000 tons of green hydrogen annually.

The green hydrogen supplies Fertiberia's ammonia plant, reducing natural gas usage by over 10% and cutting CO_2 emissions by 48,000 tonnes per year. The project has generated approximately 1,000 jobs and positions Puertollano as a hub for green hydrogen innovation. This initiative exemplifies Iberdrola's commitment to decarbonizing industrial processes and advancing sustainable energy solutions.

Iberdrola Hygroden Plant in Puertollano, Spain. (Source: © Iberdrola)

GLOBAL ENERGY TRANSITION INVESTMENT HITS RECORD US$2.1 TRILLION

In 2024, global investment in the low-carbon energy transition reached a record US$2.1 trillion, an 11% increase from the previous year, according to Bloomberg NEF's Energy Transition Investment Trends 2025 report[2].

Electrified transport led with US$757 billion, encompassing spending on passenger EVs, electric two- and three-wheelers, commercial electric vehicles, public charging infrastructure, and fuel cell vehicles. Renewable energy investments followed at US$728 billion, covering wind, solar, biofuels, biomass and waste, marine, geothermal, and small hydro projects.

China was the largest contributor, driving the majority of the growth in 2024, surpassing investments from the US, EU, and UK. Despite the overall increase, the growth rate slowed compared to the previous three years, which saw annual increases of 24-29%. While mature technologies like electrified transport and renewable energy saw significant investments, emerging technologies such as hydrogen and carbon capture faced challenges, highlighting the need for continued support and innovation in these areas.

TOP 9: COUNTRIES LEADING THE ENERGY TRANSITION

According to Energy Digital[3], the countries listed below are leading in the global shift toward renewable energy.

1. The Netherlands: In 2023, over half of its electricity was generated from clean sources, with significant contributions from solar and wind farms.

2. Germany: Aiming for 80% renewable energy generation by 2030, Germany's capacity stands at 130 GW, with solar and wind power leading the mix.

3. Spain: More than 50% of Spain's electricity comes from renewables, with wind and solar contributing significantly.

4. Greece: Committed to phasing out coal-fired generation by 2028, Greece leverages its sunny weather to produce solar power, with installed PV capacity surpassing other renewable sources.

5. Portugal: Portugal aims to achieve 80% renewable energy in electricity production by 2026, focusing on wind and PV energy, and integrating green hydrogen into its energy mix.

6. Belgium: Transitioning from nuclear-based energy to renewables, Belgium is expediting its energy independence, despite challenges posed by its size for wind farm installations.

7. Switzerland: Renewable energies now account for approximately a quarter of Switzerland's total energy consumption, with its installed capacity evenly distributed between solar power and hydroelectric power.

8. Italy: Italy has committed to phasing out coal use in electricity generation by 2025, replacing it with gas-fired and renewable generation, supported by reinforced transmission infrastructure.

9. Japan: Following the Fukushima disaster, Japan has increased its renewable energy generation to over 20%, aiming for up to 38% by 2030, focusing on reducing CO_2 emissions.

"Japan could achieve its 2050 goal as ammonia and hydrogen are expected to become carbon-free fuels for thermal power and Japan's ultimate weapon on the road to carbon neutrality."

- Takeo Kikkawa, Vice President, International University of Japan.

"The key now is to implement actions to follow through on our ambitions and power our green future." **Tinne Van der Straeten,** Belgian Energy Minister.

Solar farm in Italy. (Source: Getty Images)

The Dam of Contra Verzasca Ticino in Switzerland. (Source: Energy Digital)

Hydrogen storage facility. (Source: Getty Images)

1. Agustin Delgado, "Why We Must Build Out Energy Infrastructure Now to Drive the Energy Transition," World Economic Forum, December 4, 2024, https://www.weforum.org/stories/2024/12/fit-for-future-building-energy-infrastructure-ahead-to-drive-the-energy-transition/.
2. BloombergNEF, *Energy Transition Investment Trends 2025* (New York: Bloomberg Finance L.P., 2025), https://assets.bbhub.io/professional/sites/24/951623_BNEF-Energy-Transition-Trends-2025-Abridged.pdf.
3. Maya Derrick, "Top 10: Countries Leading the Energy Transition," Energy Digital, September 11, 2024, https://energydigital.com/top10/top-10-countries-leading-the-energy-transition.

Discover how **the future of infrastructure** is being revitalized, rebuilt and reimagined.

EXPLORE PREVIOUS EDITIONS OF DELOITTE'S GLOBAL INFRASTRUCTURE MAGAZINE

HOW THREE DUTCH MUNICIPALITIES TRANSFORMED CRAILO

An ambitious sustainable urban development

Kolonel Palmkazerne has been central to Crailo since 1939, with six barracks surrounding a parade ground that remains its focal point. At the far end, the kitchen building stands as the formal highlight.[1]

Crailo's military roots run deep. Long before the Palmkazerne, the area was a strategic battleground. Since the siege of Naarden in 1673, it hosted Prussian and Russian forces, who remained even after Naarden's recapture. By the late 19th century, the heathland's no-man's-land status ended with the construction of a lunette and an offensive structure for the Nieuwe Hollandse Waterlinie—remnants of which still stand south of the Palmkazerne. Before its construction, soldiers trained here in summer tent camps.

Today, Crailo is evolving. A mix of creative businesses, residents, and social spaces will occupy the adjacent buildings. The neighbourhood will become a socially sustainable community offering diverse, high-quality, (affordable) housing for all life stages, along with commercial functions to create a mixed environment.

Kazernekwartier. (Source: www.karresenbrands.com)

1. Kolonel Palmkazerne," *JeOudeKazernen.eu*, accessed July 18, 2025, https://www.jeoudekazernenu.nl/kazernes-m-r/kolonel%20palm/x-kolonelpalm.html.

Crailo, aerial view. (Source: www.facebook.com/buurtschapcrailo)

IMAGINE LIVING AND WORKING IN A REPURPOSED MILITARY BARRACK, GARAGE, OR EVEN A FORMER MUSEUM.

That is the reality taking shape in Crailo, a former Dutch military base near Greater Amsterdam. Once a strategic site during the Cold War, Crailo is now being transformed into a thriving, sustainable community. With 590 homes and five hectares of commercial space, this redevelopment is a model for sustainable urban planning.

This transformation was made possible through an integrated approach and cross-municipal collaboration. Within just five years, the project secured an irrevocable zoning plan, and the first phase of construction is now underway. The first new residents will move in within a few years, with full completion expected by 2030.

A STRATEGIC LOCATION WITH STRONG FOUNDATIONS

Situated at the crossroads of the municipalities of Gooise Meren, Laren, and Hilversum, Crailo benefits from a prime location, surrounded by expansive heathlands while remaining well-connected to Amsterdam via public transit and highways. Recognizing its potential, Deloitte Netherlands engaged with the municipalities in 2016.

Ingrid Wegkamp, partner, Infrastructure & Real Estate, Deloitte Netherlands, explains:

"The Province of North Holland had owned the site since 2006 and was developing an urban planning concept. However, their vision didn't align with the municipalities' ambitions. We advised the municipalities to take the initiative—acquire the land, and shape its future according to their own vision."

This proactive step laid the groundwork for a development that prioritizes sustainability, biodiversity, and energy positivity.

A COMMITMENT TO SUSTAINABILITY, BIODIVERSITY, AND ENERGY POSITIVITY

Before acquiring the land, the three municipalities engaged in complex yet constructive discussions to ensure a unified vision. Their ambition was clear: create a future-proof, energy-positive community that seamlessly integrates housing, employment, and economic activity.

Ingrid Stricker, senior manager, Infrastructure & Real Estate, Deloitte Netherlands, shares insights on the sustainability strategy:

"The project team challenged ourselves daily—exploring cutting-edge energy solutions, embedding circularity, and leveraging government incentives. For instance, we worked with energy specialists to ensure solar panels would be installed across all public areas, and we partnered with electric mobility specialists to integrate shared charging infrastructure."

A SUSTAINABLE FUTURE

Crailo is built on key sustainability principles: healthy living, bio-based and recyclable, energy positive, and smart mobility—and these principles have been translated into four building blocks.

• Preserving a unique identity

Maintaining Crailo's distinct character is a priority. *"The development plan emphasizes identity,"* explains **Jan Nieuwenhuizen,** former Director, GEM Crailo. *"In the Kazernekwartier zone, the focus is on preserving the historic ensemble, while in the 'Op de Hei' and 'Op Zuid' zones the emphasis is on the natural landscape."*

• Enhancing biodiversity

Crailo is designed to integrate with and enrich its surrounding ecosystem. A key initiative is the identification of a 'Big Five'—species such as the squirrel and redstart—that represent the desired natural balance. Actions like pond creation, vegetation planting, and heathland preservation are shaping a rich habitat for local wildlife.

A biodiversity 'menu card' system ensures developers contribute to these ecological goals. *"Points are awarded for measures such as reducing hard surfaces or creating bird habitats,"* explains Jan. Developers should meet a minimum threshold to obtain permits, ensuring nature-first development. As a result, Crailo will feature fewer homes than a typical expansion area—allowing for more green space and natural elevation.

• Reimagining mobility

Crailo is fundamentally rethinking urban transport by treating cars as guests. Pedestrians and cyclists take priority, supported by neighborhood mobility hubs and a central transit hub for visitors. *"The area is designed to be car-reduced, preserving green spaces and prioritizing slow traffic. The plan is to create one hub at the entrance, where residents can park their second cars, and for visitors' cars,"* says Jan. Low parking ratios reinforce this vision, ensuring a pedestrian-friendly community.

• An energy-positive neighborhood

Crailo aims not just for energy neutrality, but energy positivity—generating more energy than it consumes, including powering shared electric mobility. *"Six public locations—including neighborhood hubs, the entrance building, and pergolas—will host solar panels,"* says Stricker.

The community's energy will be managed through Future Grid Crailo, a fully electric infrastructure initiative using heat pumps and solar PV panels. Smart charging stations will not only charge vehicles but also store temporary energy. *"The goal is for Crailo to generate 100% of its required electricity, year-round, which will help balance supply and demand while supporting the Netherlands' 2050 climate goals,"* Stricker notes.

ESTABLISHING A PRIVATE ENTITY TO ACCELERATE PROGRESS

With the land secured, the municipalities needed an efficient governance structure. Deloitte Netherlands recommended the formation of **GEM Crailo BV**, a private limited company jointly owned by the three municipalities.

Ingrid Wegkamp explains: *"By establishing GEM Crailo BV, we streamlined decision-making. Without this, every major choice would have required three separate municipal approvals, leading to delays. With GEM controlling the land, the process became far more agile."*

ENGAGING THE LOCAL COMMUNITY FOR MEANINGFUL IMPACT

Initially, many residents opposed the project, fearing disruption. To address concerns, the team hosted open days and interactive workshops, allowing local stakeholders—including the Gooise Nature Reserve and a neighboring riding school—to contribute ideas. Crucially, residents saw their input reflected in the final plans, fostering trust and a shared sense of ownership.

SMART LAND ALLOCATION TO FOSTER INCLUSION

Stakeholder feedback and market consultation and research led to a strategic shift in the sales process of the land plots. It was decided that making larger pieces of land available would help achieve a healthy balance with the smaller, less profitable developments, as well as mid-range rentals and premium housing. This approach is intended to attract diverse residents and businesses while maintaining affordability.

The Barracks, a historically rich zone integrating creative and residential spaces, was the first plot to be sold in a competitive tender process encouraged innovation. Rather than dictating a rigid plan, Deloitte Netherlands provided guiding principles while challenging bidders on social housing, rental markets, and commercial viability. The response from infrastructure players was overwhelming—every bid committed to preserving social and mid-range rental housing for at least 20 years.

BPD, the winning developer, repurposed the former kitchen building and surrounding structures, positioning Crailo as a creative and sustainable hub.

THE POWER OF AN INTEGRATED APPROACH

While cross-municipal collaborations are common, forming a private legal entity for joint development was a bold step. Hilversum, Gooise Meren, and Laren leveraged their collective strengths to fast-track progress.

Jurrien Veldhuizen, lead partner, Infrastructure & Real Estate at Deloitte Netherlands, reflects: "Securing an irrevocable zoning plan in just five years is a remarkable achievement in this sector. It's a testament to what can be accomplished with alignment, collaboration, and innovation."

Crailo isn't just an urban development—it's a proof of concept for how sustainable cities can be built through integrated governance, cutting-edge sustainability measures, and genuine community engagement.

Kazernekwartier. (Source: www.karresenbrands.com)

Sustainable public spaces. (Source: www.karresenbrands.com)

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Crailo, aerial view. (Source: www.facebook.com/buurtschapcrailo)

ONE OF THE WORLD'S LARGEST FLOATING SOLAR POWER PLANTS

Solar power from the sea

TAIWAN (CHINA)'S WESTERN COASTLINE, PARTICULARLY NEAR THE HISTORIC PORT CITY OF LUKANG, IS HOME TO ONE OF THE WORLD'S LARGEST FLOATING SOLAR POWER PLANTS.

This innovative facility, developed by Chenya Energy, has been operational since 2020, delivering 181 MW of renewable energy to the grid. Subsequent expansions have increased capacity to 248 MW, supplying electricity to 83,000 Taiwanese households annually.

We take a closer look at the Chenya Floating Solar Project to find out how meticulous planning, robust risk management and a best practice approach to identifying and managing challenges before and during construction resulted in a successful, sustainable way forward.

STRATEGIC PROJECT DEVELOPMENT

The development of this floating solar plant has been a significant undertaking, encompassing permitting, engineering, procurement, manufacturing, installation, and testing phases – and some 200 construction workers. The project spans three sites, covering over 200 hectares, all submerged during high tide. Chenya Energy has established three corporate entities to manage these sites, operating under a 20-year Power Purchase Agreement with Taiwan Power Company. Chenya Energy has also been selling environmentally sustainable electricity to leading corporations through Corporate Power Purchase Agreements (CPPAs).

INTEGRATION WITH THE POWER GRID

To facilitate the distribution of the generated energy, the project is connected to the regional grid via the Changbin Extra High Voltage Substation, located approximately three kilometers from the site. This connection ensures that the renewable energy produced is efficiently transmitted to existing Taiwan Power Company substations, thereby contributing to the stability and sustainability of the local power supply.

COMMITMENT TO ENVIRONMENTAL AND SOCIAL STANDARDS

Chenya Energy has demonstrated a strong commitment to environmental stewardship and social responsibility. The project was developed in full compliance with local regulations in Taiwan (China) and aligned with international standards, including the International Finance Corporation Performance Standards and the World Bank Group's environmental, health, and safety guidelines. Notably, the project site is not located within any protected wetlands or sensitive areas, as confirmed by an Environmental Impact Assessment waiver from the Environmental Protection Administration.

> *"We will leverage the experience we have gained from the Changbin solar power plant at other sites, and we will endeavor to contribute to mitigating global warming by promoting solar power."*[1]
>
> - **Austin Yu,** President, Chenya Energy

PROACTIVE ENVIRONMENTAL AND SOCIAL MANAGEMENT

During the construction period, several potential environmental and social impacts were identified and addressed, including:

- **Noise and air quality:** To mitigate noise from excavation and piling, as well as dust generation, the project team implemented a stakeholder engagement plan. This plan facilitated regular communication with local communities, providing advance notice of construction activities and establishing channels for feedback and grievances.
- **Water quality management:** Measures were taken to prevent water contamination, including the use of turbidity curtains during offshore construction and the selection of non-toxic materials for panels and supporting structures.
- **Soil and groundwater protection:** Construction and operational protocols were established to minimize the risk of soil and groundwater contamination. Emergency response procedures were also developed to address potential spills or leaks promptly.
- **Traffic management:** Recognizing the potential for increased traffic within the industrial park, a comprehensive traffic management plan was devised. This plan included assessing road and bridge conditions, identifying alternative access routes, coordinating with industrial park workers, and restricting construction vehicle movements during peak hours.
- **Biodiversity conservation:** The project area supports various local and migratory bird species, including four nationally protected species, as well as diverse clam populations in the intertidal zone. In response to public concerns, the project team agreed to conduct ongoing environmental monitoring to gather data that could inform future developments and ensure the protection of local biodiversity.

COMPREHENSIVE MANAGEMENT PLANS

To systematically address these considerations, Chenya Energy developed a series of management plans, focusing on:

- Environmental monitoring.
- Emergency response procedures.
- Water and wastewater management.
- Local employment and content.
- Stakeholder engagement.
- Grievance mechanisms.
- Traffic management.
- Worker accommodation.

These plans were designed to mitigate negative impacts and enhance positive outcomes throughout the construction and operational phases of the project.

CONCLUSION

Wilson Lung, partner, Infrastructure & Capital Projects, Deloitte Taiwan reflects on the significance of the project.

"This project exemplifies the next generation of energy innovation in Taiwan (China). With the capacity to supply clean energy to 83,000 homes and reduce 174,000 tons of CO_2 emissions annually, this project stands out as a crucial step forward in reducing the global carbon footprint. The launch of this solar plant has been made possible thanks to extensive public-private cooperation—combining the private sector's technological expertise with Taiwan (China)'s progressive energy policies."

The Chenya Floating Solar Project stands as a testament to innovative renewable energy solutions that harmoniously integrate with the environment and local communities. By adhering to rigorous planning, engineering excellence, and proactive stakeholder engagement, the project not only contributes significantly to Taiwan (China)'s renewable energy capacity but also serves as a model for sustainable infrastructure development worldwide.

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1. Marubeni Corporation, "Chen Ya: Building A More Comfortable World with Fiber," SCOPE, accessed February 28, 2025, https://www.marubeni.com/en/ad-videos/scope/chenya/.

Chenya Floating Solar plant. (Source: © Chenya Energy)

Perspectives from ...

HAMBURG, GERMANY

"As we navigate the complexities of the energy transition, infrastructure and real estate emerge as pivotal elements. These sectors are not just about physical structures; they are about creating communities that prioritize collaboration, connectivity, and human-centric innovation. The sentiment in Davos is clear: progress in sustainability and AI is not only essential but also makes sound business sense. By integrating advanced technologies with sustainable practices, we can achieve a balance that benefits people, the planet, and profits."

Nicolai Andersen
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ACCRA, GHANA

"Africa stands at a pivotal moment. Despite our vast natural resources and a rapidly growing population, our continent continues to grapple with significant infrastructure deficits—across transportation, energy, water, and digital connectivity. The key to unlocking Africa's full potential lies not in aid-focused models, but in sustainably harnessing our resources, fostering regional integration, and driving innovation in financing and governance. Now is the time for Africa to invest in itself, leveraging collaboration and ingenuity to build the infrastructure that will power our future and position the continent as a global force for growth and prosperity."

Yaw Appiah Lartey
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LISBON, PORTUGAL

"It's time to put the circular economy into practice: preventive maintenance, smart design, product as a service, remanufacturing, resource management, with the support of AI and technology, should become business as usual. Deloitte's Climchoice, leveraging Digital Twins and smart sensors, optimizes urban metabolism across energy, mobility, and water, contributing for resilient, sustainable infrastructures and positions Deloitte as a leader in addressing critical challenges."

Inês Costa
managing director, Deloitte Portugal
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MEMPHIS, TN, USA

"The real estate industry is no longer just about 'location, location, location'. To build what's next, real estate organizations can establish more efficient, sustainable businesses, develop new ways to create value, and transform their operations, talent and technology to meet society's needs. I believe there is a generational opportunity to shape a new era for Real Estate, enabling the sector to overcome modern challenges with solutions that can provide certainty and growth with purpose, forging a path to positive impact and value that matters."

Katherine Feucht
Deloitte Global Real Estate Sector leader
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DUBLIN, IRELAND

"The energy transition is too vast a challenge for any sector to tackle alone—success depends on strong public-private partnerships. These alliances unlock the large-scale investments needed, drive innovation in renewables and grid modernization, and ensure efficient execution of critical projects. By working together, we can accelerate the transition to a cleaner, more sustainable future—and turn ambition into impact."

Michael Flynn
Global Infrastructure, Transport & Regional Government leader
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SYDNEY, AUSTRALIA

"Leading the future means reimagining infrastructure—not just what we build, but how we build it. From modular construction or design for manufacture and assembly, to smart grids, AI-driven planning, and circular economy principles, the possibilities are as limitless as they are inspiring. True innovation lies in how we plan, finance, and deliver—through bold thinking, data-driven design, public-private partnerships, and integrated delivery models. The industry should champion infrastructure that constantly adapts to how we live, work, and play—resilient, sustainable, and human-centered. The next generation of infrastructure demands more than construction—it demands imagination, collaboration, and courage."

Luke Houghton
Global Market Leader, Infrastructure & Real Estate
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... the world stage

DUBAI, UNITED ARAB EMIRATES

"Sustainability is gaining increasing awareness in the Middle East infrastructure landscape. As the region increasingly faces both more extreme heat and more frequent heavy rain and flooding events, policy makers and local governments are looking for ways to make communities more resilient. While regulations like CSRD in Europe are not likely in the near future, more and more projects are starting to embed sustainability into their infrastructure planning – whether through renewable energy integration, water efficient urban design, or ecosystem restoration and regeneration. That said, stronger policy frameworks are needed to ensure infrastructure development meets both economic and environmental imperatives going forward."

Laura Jepson
partner, Deloitte North South Europe
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LUXEMBOURG, LUXEMBOURG

"A thoughtful approach to tax structuring and governance is an indispensable part of any strategy. By aligning tax practices with sustainable governance, Asset Managers can ensure consistency and reliability across all business operations, fostering sustainable fund structures that support the energy transition and meet global sustainability targets."

Anne-Sophie Le Bris
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BERLIN, GERMANY

"AI can be a useful tool for sustainability action through renewable integration, smart energy systems, optimized logistics, and more. However, it can lead to a significant increase in energy demand, potentially reaching as high as 1,000 TWh by 2030. We should ensure that its development does not undermine its climate benefits. This requires clean energy and more efficient hardware and cloud technologies, enabling a spatial shift in data center power demand to align with renewable availability."

Prof. Dr. Bernhard Lorentz
Deloitte Global Consulting Services Sustainability & Climate leader
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WASHINGTON, D.C., USA

"The world of infrastructure is evolving faster than many people realize—not through visible transformations, but through advancements beneath the surface. The goal is to make these benefits so evident that leading practices become widespread. So, what's helping to drive this change? AI, digitization, and emerging technologies are empowering infrastructure owners and operators to scenario-plan more effectively and make data-driven decisions with confidence. These innovations can enhance capital investments, resiliency planning, predictive maintenance, and operational efficiency. Infrastructure leaders can connect, protect, and interpret critical data—positioning them to shape a future of greater efficiency and resilience."

Kelly Marchese
Deloitte Consulting LLP, Deloitte US Infrastructure leader
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DENVER, CO., USA

"In an era marked by intertwined challenges—extreme weather, energy demands, rapid technological advancements like AI and economic shifts—the approach to infrastructure should adapt. Utilizing technology is crucial for constructing climate-resilient infrastructure. Public-private partnerships stand at the forefront of this transformation, fostering innovation and pooling resources to help address these multifaceted challenges. By combining the capabilities and strengths of both sectors, it is possible to create adaptive, sustainable solutions that endure over time and contribute to economic growth and societal wellbeing."

Beth McGrath
Deloitte Global Government & Public Services leader
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SINGAPORE, SINGAPORE

"Global Executives are rethinking where they invest and need to consider three key drivers. First, emerging tech like AI, GenAI and quantum computing to harness the power of data to enhance efficiency, expedite decision-making and reduce costs. Second, compliance with evolving and complex sustainability regulations and their progress to net-zero. Third, meeting shareholder expectations while maximizing returns and sustainable capital investments. These factors will likely define how leaders sharpen their competitive edge in infrastructure and beyond."

Jiak See Ng
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FRANKFURT, GERMANY

"At Expo Real, Germany's premier real estate exhibition, Deloitte brought together a powerhouse of specialists to tackle one of the industry's biggest challenges—construction project disruptions. In a dynamic cross-competency workshop, specialists from Real Estate, Disputes, Forensic, and Deloitte Legal dissected the root causes of delays and disputes, from vague project scopes to regulatory hurdles and resource mismanagement. With a focus on proactive solutions, we emphasized the power of robust claims management, advanced negotiation, and formal dispute resolution. This workshop was a great opportunity to show Deloitte's commitment to equipping our clients with strategic tools to navigate complexity and drive successful project outcomes."

Irina Novikova
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LONDON, UK

"Artificial Intelligence is revolutionizing infrastructure—making it more adaptive, efficient, and sustainable. By optimizing energy use, predicting maintenance needs, and integrating renewable sources, AI helps infrastructure assets reduce carbon footprints and accelerates the energy transition. With smart grids, AI-powered demand forecasting, and autonomous systems, we are building resilient infrastructure that meets sustainability standards. From construction to operations, AI enhances resource efficiency, minimizes waste, and refines sustainability reporting. As industries shift towards net-zero, AI is not just a tool—it's a catalyst for transforming infrastructure into a force for environmental responsibility and long-term value creation."

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MCLEAN, VA., USA

"With electrification driving the energy transition, regional and global demand paradigms are changing. From EVs to electrolysis, the proliferation of electro-solutions, along with data center expansion, requires infrastructure development to manage rapidly growing and often unpredictable loads. To maintain momentum, capital investments should keep pace with the adoption of advanced, yet power-intensive, technologies such as AI, and specifically GenAI. As intelligent applications permeate the economy and society, they present both an opportunity and an obligation for public–private collaboration in building the smart, reliable, and resilient infrastructure needed to harness their transformative potential—while meeting their demand for 24/7 low-carbon energy."

Stanley E. Porter
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LAGOS, NIGERIA

"Africa, the world's second-largest continent, is home to over 1.4 billion people with a median age of just 20, making its youthful energy our greatest asset. However, contributing only 2.46%[1] to global GDP underscores the urgent need for transformative change. The African Continental Free Trade Area (AfCFTA) presents a monumental opportunity to reshape our economic landscape. To fully harness its potential, we should bridge the annual infrastructure financing gap of US$68 to US$108 billion[2]—this requires innovative collaboration between public and private sectors, channeling investments into social and physical infrastructure to improve living standards, enhance connectivity, and facilitate increased trade with international partners."

1. World Bank, *GDP, PPP (current international $) – Nigeria*, accessed February 28, 2025, https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD?locations=NG.

2. Akinwumi A. Adesina, "Opening Speech by Dr. Akinwumi A. Adesina, President, African Development Bank Group and Chairman, Africa50 Boards of Directors, at the Africa50 Infra Forum and General Shareholders Meeting, Lomé, Togo, 3 July 2023," African Development Bank Group, July 3, 2023, https://www.afdb.org/en/news-and-events/speeches/opening-speech-dr-akinwumi-adesina-president-african-development-bank-group-chairman-africa50-boards-directors-africa50-infra-forum-and-general-shareholders-meeting-lome-togo-3-july-2023-62611.

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CHICAGO, IL., USA

"Sustainability in the built environment can reach scale when varying disciplines collaborate. While sustainability leaders focus on energy transition and engineers prioritize energy efficiency, their paths ultimately converge. By recognizing this shared direction, collaboration can become the catalyst for driving change. From development to operation, and between owners and tenants, addressing challenges is an important imperative for a sustainable future."

Lauren Pesa
Deloitte US Real Estate Sustainability leader
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RIO DE JANEIRO, BRAZIL

"During the development of the B20 Policy Paper, global leaders and industry stakeholders consistently emphasized that infrastructure is not just an enabler, but a driver of the energy transition. The world's energy transition hinges on a paradigm shift—one that sees climate investments not as obligations, but as economic opportunities. Public and private sectors should converge to build the next generation of green and resilient projects. By expediting approvals, harmonizing global permitting processes, and de-risking investments in emerging economies, we can accelerate the development of infrastructure that delivers long-term value and If governments improve investment conditions, the private sector is ready to grow infrastructure at the pace required to meet sustainability commitments."

Eduardo Raffaini
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BRUSSELS, BELGIUM

"Digital twins and the metaverse are revolutionizing urban planning by enabling data-driven decision-making. Digital twins create real-time virtual models of cities, allowing authorities to simulate scenarios, predict outcomes, and optimize infrastructure. The metaverse enhances collaboration by providing immersive environments where stakeholders can visualize and interact with urban projects before implementation. These technologies drive digitalization, fostering sustainable and resilient cities. By leveraging AI and IoT, city planners can improve energy efficiency, disaster preparedness, and mobility solutions. As smart cities evolve, digital twins and the metaverse will be key to creating more adaptive, efficient, and livable urban spaces."

Inês Ramos
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SAN FRANCISCO, CA., USA

"Leaders should collaborate across the ecosystem to harness smart, sustainable solutions that drive competitiveness and long-term growth. The private sector plays a crucial role—innovating, investing, and collaborating with governments to turn commitments into tangible impact for communities around the world. By leveraging cutting-edge technologies and data-driven insights, we can unlock economic opportunities, accelerate sustainable development, and build a future-ready world."

Jennifer Steinmann
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SHANGHAI, CHINA

"At the inaugural International Infrastructure and Project Leaders Summit in November 2024, I joined over 450 global infrastructure leaders and specialists from more than 20 countries. Our discussions underscored how infrastructure is evolving beyond physical development to drive industry-city integration, with innovative financing, agile development, and global collaboration as key enablers. I look forward to seeing how new innovations and collaborations continue to shape the future of infrastructure, delivering the best outcomes for both project owners and users."

Patrick Tsang
CEO, Deloitte China
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AMSTERDAM, NETHERLANDS

"As cities evolve into smart environments, strong cybersecurity is crucial. In a recent project with a visionary client, we developed a cybersecurity framework to protect key sectors like mobility, construction, and health. Our approach fostered communication among stakeholders and established governance to safeguard critical infrastructure. This project not only benefited our client but also offered insights for other cities. By adopting tailored strategies and fostering collaboration, urban planners can enhance security and sustainability. Prioritizing cybersecurity is essential for building resilient smart cities that thrive in an increasingly digital world."

Dana Spataru
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MELBOURNE, AUSTRALIA

"As infrastructure projects grow in scale and complexity, traditional computer-aided design and manual processes are becoming obsolete. The industry is primed for disruption—not just through digitization, but through AI-powered innovation. Leaders and asset owners should embrace integrated, predictive insights to make informed, real-time decisions with confidence. By applying advancing digital and AI capabilities across the infrastructure lifecycle, we can solve longstanding challenges and build more sustainable, resilient systems. It's time to rethink project execution, adopt smarter methodologies, and drive a new era of efficiency and impact in infrastructure development."

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STRATEGICALLY FINANCING FUTURE SUCCESS

Financing the energy infrastructure transition

THE GLOBAL ENERGY TRANSITION IS ONE OF THE MOST SIGNIFICANT ECONOMIC AND TECHNOLOGICAL SHIFTS IN MODERN HISTORY.[1]

The energy transition will require a global transformation to ensure success, including significant levels of investment and strategic financing models.

WHEN LOOKING TO FINANCE THE TRANSITION, THERE ARE THREE MAIN CHALLENGES:

1. **The pace required for investment:** The global energy transition demands significant capital investment within compressed timeframes. There is a shift away from incremental infrastructure development towards large-scale, transformative projects encompassing both greenfield and brownfield integrated initiatives. The challenge lies in creating financing structures that enable the staged deployment of projects while ensuring financial feasibility, operational agility, and resilience to evolving market dynamics.
2. **Balancing public and private sector investment:** The industry has historically been shaped by government policy, regulatory oversight and private investment. The transition will continue to require this while navigating evolving regulatory and public policy priorities. The public and private sector will likely have to work closer together and more efficiently than ever before. While government policies and incentives can de-risk projects, the private sector's efficiency and innovation should be leveraged to accelerate the transition effectively.
3. **Future-proofing financing structures:** The compressed timelines to build the quantum of projects required, mean a new wave of risks. Energy projects have historically required long-development timelines due to regulatory and permitting processes as well as financing opportunities. The sheer number of projects to come online paired with current heightened financial market volatility, necessitates the need for innovative financing models. Globally, many regions have stuck to financing structures that have worked time and time again. There is now an opportunity for these regions to look at exploring innovative financing structures that may be more fit for purpose in aiding projects to meet outcomes, save time, and effort of governments and private investors.

Christopher Arroyo, associate director, Infrastructure & Real Estate, Deloitte Australia, provides a perspective on global financing approaches:

"Globally, there have been several trends developing in recent history. Some of these have included significant increases in corporate Power Purchase Agreement (PPA) activity in Europe, China expending its Environmentally sustainable electricity Certificate (GEC) trading and South Korea and Australia increasing their use of virtual PPAs and project finance structures.

"These varied approaches have attempted to deal with projects' unique risk profiles and individual market conditions. Despite these differences, there are some common challenges financing structures will need to keep in mind."

GLOBAL OPPORTUNITIES IN ENERGY INFRASTUCTURE FINANCING

There are several areas industry leaders should consider when developing solutions to overcome the challenges of financing the energy infrastructure transition:

1. **Sizing and de-risking:** The capital required for projects will likely push market boundaries on what is possible under current structures. Projects will need to consider how different financing options and structures will allow the appropriate sizing based on scale, complexity, risk and potential latent challenges.
2. **Flexibility:** Projects are increasingly being asked to deal with unknown factors throughout the design, procurement, development, construction and operational phases. Financing will need to be able to cater towards this including the ability to quickly ramp up and down during the procurement and delivery phases, deal with the possibility of longer than estimated procurement cycles and increased supply chain cost pressures while also maintaining an appropriate cost of funds for the risk profile encountered.
3. **Certainty and availability:** In an industry with so many competing investment propositions, projects require absolute certainty that they will have access to funds as they are required. Although there may be seen to be large amounts of capital available and flowing into the industry for investment as of this writing, as a larger number of projects continue to reach financial investment decision and delivery, there will be a huge increase in the competition for this capital.
4. **Integration:** Not only will the financing of projects need to consider the above, but they will need to do so while:
   - Creating public and private finance levers that work harmoniously as projects balance meeting legislated mandates, social license and corporate returns.
   - Ensuring financing structures assist in the driving of and relevant risk sharing across transmission, distribution, generation, and storage assets.

Investors, financiers, developers, and others are uniquely poised to lead the charge in the global energy transition. As this transformation accelerates, it is imperative for these stakeholders to collaborate effectively, ensuring that financing strategies prioritize consumer needs and drive project efficiency. By aligning diverse market perspectives, we can unlock significant opportunities for innovation, making the energy transition not just a necessity but a catalyst for positive change.

Luke Houghton, Global Market Leader, Infrastructure & Real Estate, reflects on the size and breadth of the challenges, and what stakeholders need to address in their planning in the coming months and years:

"Investors, financiers and developers are uniquely positioned to lead the charge in the global energy transition. This transformation requires proactive collaboration, ensuring that financing strategies align with consumer needs and drive efficiency."

SO, WHAT'S NEXT?

To unlock opportunities and drive innovation, stakeholders should:

- **Align** financing models with evolving policy and market demands.
- **Develop** adaptable, scalable financial structures that address risk, flexibility, and capital accessibility.
- **Strengthen** public-private collaboration to create investment environments that support both economic and environmental goals.

The energy transition is not just a necessity—it is a catalyst for positive change.

By embracing forward-thinking financing strategies, stakeholders can shape a more resilient, sustainable energy future for generations to come.

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1. *International Renewable Energy Agency (IRENA), World Energy Transitions Outlook* 2022, 2022, https://www.irena.org/Digital-Report/World-Energy-Transitions-Outlook-2022.

Taking a principled approach to urban growth

A FIRESIDE CHAT WITH SYDNEY'S VISIONARY LANDOWNER BUILDING A NEW, COMPLETE SUBURB

IN 1878, BENJAMIN RICHARDS, A PROMINENT AUSTRALIAN GRAZIER AND ENTREPRENEUR, ESTABLISHED THE RIVERSTONE MEATWORKS NEAR WINDSOR, NEW SOUTH WALES, AUSTRALIA.

His enterprise not only provided employment opportunities but also significantly contributed to the growth and development of Sydney's north-west region. In recognition of his contributions, a new suburb named "Richards" was officially established in 2020.

We had the privilege of speaking with David Bedingfield, Chief Executive Officer of Sakkara, the innovative property development company responsible for bringing this new suburb to life in a way that meets the needs of a well-educated and diverse local population now and in future.

Q1 BENJAMIN RICHARDS WAS VISIONARY FOR HIS TIME. HOW DOES HIS LEGACY INFLUENCE YOUR VISION FOR THE NEW SUBURB?

Benjamin Richards was indeed a pioneer. By establishing the meatworks near the Riverstone Railway Station, he made it possible to efficiently transport meat to Sydney, and he played a pivotal role in revitalizing Australia's frozen meat export industry during a period of uncertainty. His commitment to community and industry growth serves as an inspiration for us. At Sakkara, at this very same location, we are developing a complete suburb to meet the needs of today's residents and businesses while also contributing positively to the broader community.

Q2 THE LAND YOU'RE DEVELOPING IS A SUBSTANTIAL SINGLE LOT – 234 HECTARES. HOW DOES THIS INFLUENCE YOUR DEVELOPMENT APPROACH?

The size and singular ownership of this land present unique opportunities. Unlike developments involving multiple owners, we have the flexibility to implement one cohesive vision – and execute it with confidence. This allows us to pivot in response to community feedback and needs, and explore various development options over time, to make sure we are attracting and adding value to businesses, too.

The more we deliver on that vision, the more credibility we will have – so it is important that we deliver on what we said we would! As a single lot owner, our decision-making process is streamlined, which enables us to focus on achieving the best outcomes – without compromise. It's truly a once-in-a-lifetime opportunity!

Q3 CAN YOU ELABORATE ON SAKKARA'S VISION FOR THIS NEW SUBURB?

Our vision is to create a suburb planned and developed to international and local standards, grounded in the local market with realistic commercial outcomes. We see significant opportunities in enhancing connections with the existing Riverstone town center, contributing to its revitalization. After months of research and engagement with international specialists, we've identified some key themes for the development:

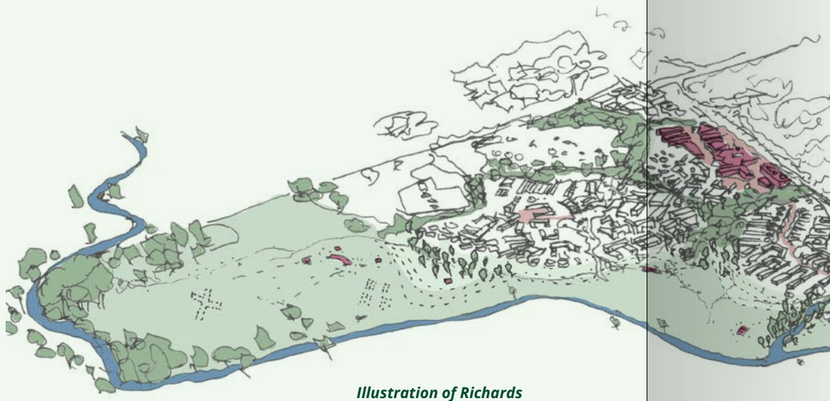

Illustration of Richards balancing growth and sustainability.

- **Nature-based:** Focused on rewilding, in-nature recreation, and wellbeing.
- **Sustainable:** Incorporating peer-to-peer energy, water for cooling, local employment opportunities, and serving as an urban heat refuge.
- **Connected:** Enhancing strong public transport links, reconnecting the disconnected, and revitalizing an accessible town center.
- **Identity:** Building on the local character and taking a values-driven approach to growing the community.
- **Staging:** Evolving the site over time in response to local needs while keeping affordability top of mind, balancing permanent, temporary, and lease uses.

Q4 WHAT FACTORS MADE THIS LOCATION APPEALING FOR DEVELOPMENT?

The existing infrastructure is a significant advantage. The land is adjacent to two existing railway stations and is fully serviced with power and sewage at the boundary, which is quite unusual. The North West Growth Area is experiencing accelerating population growth but lacks sufficient employment opportunities and social infrastructure. With the population expected to double by 2041, this location is ideal for accommodating future growth. We're excited to build a completely new suburb and thriving community that appeals to a diverse demographic of Sydney's citizens and local businesses.

Q5 HOW IS SUSTAINABILITY BEING INTEGRATED INTO THE DEVELOPMENT?

Sustainability is at the core of our planning. We've embraced what was originally the Government's vision to design 100 hectares as open space to serve as a biodiversity zone, providing areas for sports and recreation. Eastern Creek, which borders this open space, adds to its appeal. Our zoning plans also include provisions for social infrastructure like health services, education facilities, and logistics, warehousing, and high-density residential areas near the railway stations – all of which add to the suburb's appeal.

Q6 CAN YOU TELL US A BIT MORE ABOUT HOW YOU APPROACHED STAKEHOLDER ENGAGEMENT?

From the outset, we've prioritized engaging with stakeholders, including local and state governments, community groups, local businesses, existing site occupiers, residents, and academia. We've conducted workshops, planning days, and community events to gather input and ensure our development aligns with the needs and aspirations of the community. This collaborative approach has been instrumental in shaping our masterplan.

Q7 LOOKING AHEAD, WHAT ARE YOUR EXPECTATIONS FOR THE NEW SUBURB?

We anticipate that the new suburb will create approximately 25,000 jobs and become home to around 15,000 residents. Our goal is to continually add value over time, constantly evolving to meet the changing needs of the community and ensuring a lasting positive impact on the region.

Through thoughtful planning and a commitment to community engagement, Sakkara is excited to take the next step on land identified by Benjamin Richards – by developing a suburb that balances growth with sustainability, ensuring a vibrant future for Sydney's north-west.

David Bedingfield
CEO, Sakkara
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Green public space envisioned for the new suburb.

A complete suburb

Render of Richards suburb. (Source: © Sakkara)

A CLOSER LOOK AT INFRASTRUCTURE FUNDING

Addressing the UK'S infrastructure funding challenge

ACCORDING TO THE INFRASTRUCTURE AND PROJECTS AUTHORITY, THE UK FACES A MAJOR INFRASTRUCTURE FUNDING GAP, WITH OVER US$894 BILLION (OVER £700 BILLION) REQUIRED ACROSS ALL UK INFRASTRUCTURE SECTORS.[1]

Public investment alone cannot meet this demand—in the coming decades, the National Infrastructure Commission estimates private investment should increase by around US$13 billion annually.

In response, the new UK government has called for greater private sector involvement in infrastructure investment.

Claire O'Shaughnessy, director, Deloitte UK, notes:

"Since the end of the Private Finance Initiative (PFI) for new projects in 2018, no single funding model prevails. Instead, a range of public-private funding models are used across different sectors."

MAXIMIZING PUBLIC-PRIVATE INVESTMENT

To navigate this evolving funding landscape, Deloitte UK's Infrastructure and Real Estate team highlights two priority areas:

1. **Maximize private investment where best suited:** A strategic, portfolio-based approach should prioritize private investment where viable, reserving public funding for areas where private capital is less feasible. The forthcoming UK ten-year Infrastructure Strategy should outline a clear pipeline of opportunities and indicative funding mixes by sector, boosting investor confidence.
2. **Use the most appropriate funding model:** Funding models should align with project-specific characteristics, leveraging established approaches where possible. Sector-focused playbooks can guide the selection of appropriate models. Deloitte UK's Funding Model Assessment Framework provides a structured approach for determining the best fit.

Hywel Madden, partner, Infrastructure & Capital Projects, Deloitte UK, emphasizes:

"The funding model chosen for each project should reflect the specific characteristics of the project, there is no one size fits all."

THE REGULATED ASSET BASE MODEL

One of the models increasingly used in the UK is the Regulated Asset Base (RAB) model which has been instrumental in attracting private investment for large-scale transport, water and energy projects. RAB models typically grant rights for specified companies to charge utility users regulated prices in exchange for constructing and operating certain infrastructure. This creates predictable revenue streams, lowers financial risk and mitigates investor exposure. Regulated returns also encourage efficiency. The framework enables a balanced distribution of risks among investors, consumers, and the government.

Claire reflects on the funding model and its success in involving consumer contributions towards infrastructure projects across a range of sectors prior to the framework's update to include nuclear power infrastructure in 2022.

"Heathrow Terminal 5, which opened in 2008, used the RAB model to facilitate the recovery of construction costs through regulated charges, which were ultimately borne by consumers via airline fees and ticket prices.

Another example is the Thames Tideway Tunnel which began construction in 2016, where the RAB model was employed to finance this major sewerage infrastructure project in London. Customers contributed to the funding of the tunnel through a charge on their water bills," says Claire.

Hywel agrees that it is an important model and can be extended across sectors:

"The Nuclear Energy (Financing) Act 2022 introduced the option of a Regulated Asset Base (RAB) model to help fund future nuclear energy projects like Sizewell C. Crucially, the developer earns revenues during the project's construction phase, to contribute towards building costs, before electricity generation commences."

These examples illustrate how the RAB model has been applied to fund significant infrastructure projects in regulated sectors, where the return can be controlled. Consumers are contributing from the start of construction to the projects from which they will ultimately benefit from the improved services and facilities.

READ THE REPORT >

UNLOCKING PRIVATE INVESTMENT: THREE KEY PRIORITIES

DELOITTE UK'S DECEMBER 2024 REPORT, *UNLOCKING PRIVATE INVESTMENT IN UK INFRASTRUCTURE,* IDENTIFIED THREE CRITICAL ACTIONS, WHICH NEED TO BE UNDERPINNED BY HIGH QUALITY PROGRAM MANAGEMENT:

1. **Identifying private investment potential:** Maximizing private capital in revenue-generating sectors while directing public funds to areas with limited private investment viability.
2. **Matching funding models to investment opportunities:** Efficiently scaling established models while innovating where necessary.
3. **Selecting the right funding model:** Deloitte UK's assessment framework aids in determining the best funding and financing structure for each project.

1. Infrastructure and Projects Authority. "Analysis of the National Infrastructure and Construction Pipeline 2023." GOV.UK. February 2, 2024. https://www.gov.uk/government/publications/national-infrastructure-and-construction-pipeline-2023/analysis-of-the-national-infrastructure-and-construction-pipeline-2023-html.

London, Heathrow Terminal 5. (Source: Getty Images)

A CLOSER LOOK AT INFRASTRUCTURE FUNDING

Hinkley Point C (pictured) provides a template for Sizewell C. (Source: www.sarens.com)

AS THE UK MOVES TO DECARBONIZE ITS GRID BY 2030, NUCLEAR POWER IS KEY TO ENSURING RELIABLE, LOW-CARBON ENERGY. SIZEWELL C, A 3.2 GW POWER STATION ON THE EAST SUFFOLK COAST, WILL GENERATE CLEAN ELECTRICITY FOR AT LEAST 60 YEARS, CREATING 900 PERMANENT JOBS AND THOUSANDS MORE IN MAINTENANCE.

Marking its first year of construction in January 2025, Sizewell C has delivered US$128 million in local contracts and unlocked US$319 million in regional benefits, fueling economic growth across East England.

A Department for Energy Security and Net Zero spokesperson stated:[1]

"The project will lower electricity system costs, boost homegrown power, and drive major national investment."

PROGRESS AND MILESTONES:

2022

US$128 million government funding (Jan); new RAB financing model approved (Mar); UK Government invests US$894 million, becoming a 50% shareholder (Dec).

2023

US$435 million allocated for site prep and supply chain (Aug); private investment drive launched (Sept).

2024 - 2025

Additional US$1.7 billion government investment (Jan 2024); 300+ UK suppliers engaged with US$3.2 billion in contracts (Jan 2025).

Milestones obtained from: https://www.sizewellc.com/investor/

1. **Department for Energy Security and Net Zero,** quoted in "Sizewell C Nuclear Plant Costs 'Could Double to Nearly £40bn'," *The Independent,* January 14, 2025, https://www.independent.co.uk/news/business/sizewell-c-nuclear-plant-costs-could-double-to-nearly-ps40bn-b2679272.html.

Addressing the UK's infrastructure funding challenge requires a strategic blend of public and private investment.

A portfolio approach optimizes private sector involvement while preserving public funds for sectors with limited private potential.

The right funding models, coupled with strong project management, are essential for effective resource deployment and successful project delivery.

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* Currency converted from GBP to USD as of 9 April 2025

Government Trends 2025

In an era marked by escalating citizen expectations and the whirlwind of rapid technological advancements, often unpredictable in nature, the pressure on governments to deliver has never been more acute.

This year's Government Trends report addresses this challenge and provides a new paradigm—one that is agile, responsive, and capable of meeting the complex challenges of the modern world.

Find out more in Deloitte Development LLC's latest report

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Deloitte.

BALANCING THE ENERGY TRANSITION AND OCEAN HEALTH

From waves to watts: Ireland's seabed mapping initiative

THE NEXT WAVE OF OFFSHORE RENEWABLE ENERGY DEVELOPMENT IS UNDERWAY, AND IT IS PLACING INCREASED EMPHASIS ON DEVELOPING THE WORLD'S OFFSHORE AND OCEAN RESOURCES. AT THE HEART OF THIS DEVELOPMENT IS THE BLUE ECONOMY, WHICH ENCOMPASSES THE SUSTAINABLE USE OF OCEAN RESOURCES FOR ECONOMIC GROWTH, IMPROVED LIVELIHOODS, AND ECOSYSTEM HEALTH.

According to the World Bank, the blue economy is the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem."[1]

Rising renewable energy demand—driven by the need to transition our industrial processes, electrify transport, energy transition of heat through heat pumps, the shift to alternative fuels such as green hydrogen —is helping governments and industries to accelerate the energy transition.

As part of its broader strategy to cut emissions and ensure energy security, the EU has set ambitious targets for offshore wind—88 Gigawatts (GW) by 2030. The North Sea, Irish Sea, and Atlantic waters are prime targets for energy development, with governments fast-tracking leasing rounds and permitting to meet energy transition goals. To meet the energy demand requirements, offshore wind, undersea energy storage, and subsea electricity transmission infrastructure need to expand, forming a critical network that integrates renewable power into national grid network systems.

But there's a catch: many ideal sites for development can overlap with marine protected areas, critical habitats for fish, seabirds, and marine mammals. The EU 2030 Biodiversity Strategy[2] provides that at least 30% of Europe's seas to be protected, with 10% under strict protection.[3]

At the same time, the Corporate Sustainability Reporting Directive (CSRD) now requires companies to disclose the precise locations of biodiversity-sensitive areas affected by their operations. This regulatory push means that offshore wind developers should treat biodiversity as a key consideration—it should be embedded into planning from day one.

So, the rapid development of offshore energy presents a sustainability dilemma: while offshore renewables are essential for energy transition, they also compete for space and resources in an already fragile marine ecosystem.

Balancing the urgent need for clean energy with responsible ocean stewardship will be crucial in shaping a truly sustainable Blue Economy. To achieve this, we need data and insights to optimize the development of infrastructure.

Biodiversity loss, extreme weather, and pollution are pushing ocean health to the brink. How do we rapidly scale offshore energy without compromising the very ecosystems that sustain it?

SMART PLANNING FOR RENEWABLES AND BIODIVERSITY

Offshore wind is one of the most promising tools for deep energy transition, but its success depends on how well it integrates with the marine environment. Actions to support this can include:

- **Strategic spatial planning:** Offshore renewables should be sited strategically to minimize biodiversity impacts while maximizing energy output.
- **Biodiversity-positive infrastructure:** Floating wind farms and nature-inclusive design—such as artificial reefs integrated into turbine foundations—can reduce ecological harm while enhancing marine habitats.
- **Data and insights:** Data-driven impact assessments are important for sustainable offshore development. Marine mapping, real-time monitoring, and cumulative impact analysis ensure that decisions are based on science, preventing unintended environmental and social harm.

The future of offshore renewables isn't just about scaling up—it's about scaling smart. As nations focus on meeting their net-zero commitments, the ocean will play a central role. But if we fail to balance energy expansion with marine protection, a sustainability solution could be impacted. Done right, offshore renewables can power the future while protecting the ocean.

HOW COULD OFFSHORE ENERGY BE RAPIDLY SCALED WITHOUT COMPROMISING THE VERY ECOSYSTEMS THAT SUSTAIN IT?

IRELAND AS A CASE STUDY FOR BLUE ECONOMY DEVELOPMENT

Ireland, an island to the northwest of Europe, has relied on its surrounding waters for centuries of trade, fishing and shipping. Now it is tapping into its marine resources to fuel "blue" economic growth. But can it scale offshore energy, coastal resilience, and conservation without tipping the balance? The answer will define its Blue Economy future.

The Irish Programme for Government: Our Shared Future aims to expand marine protected areas in line with the EU 2030 Biodiversity Strategy with USD$27 million investment behind it, yet only 9.4% of Irish waters are currently protected (as of 2023)—far from the 30% target by 2030.

Bridging that gap while ramping up offshore wind and marine infrastructure will require a delicate balancing act.

Smart, data-driven planning is key. Offshore renewables, fisheries, and marine tourism all depend on seabed mapping and environmental insights to guide sustainable growth. That's where Deloitte Ireland's client, the Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) comes in.

A Government of Ireland funded collaboration between **Geological Survey Ireland** and the **Marine Institute, INFOMAR** is supporting economic expansion and better ensuring it doesn't come at the cost of biodiversity.

The challenge is clear: manage both growth and conservation, or risk jeopardizing the very resources Ireland depends on.

INFOMAR: THE BACKBONE OF SMART OFFSHORE DEVELOPMENT

As Ireland works to unlock the potential of its Blue Economy, INFOMAR plays an important role in enabling the sustainable management of its marine resources. Since 1996, Ireland has undertaken one of the world's most extensive seabed mapping efforts, covering over 440,000 kilometers of Ireland's coastal and offshore waters.

By collecting and integrating physical, chemical, and biological data, INFOMAR provides a detailed understanding of the marine environment.

INFOMAR's data is essential for guiding decision-making across sectors such as:

- **Offshore wind farm development:** Identifying optimal turbine sites while avoiding environmentally sensitive areas.
- **Biodiversity protection:** Ensuring that marine infrastructure development does not disrupt delicate ecosystems.
- **Coastal resilience:** Understanding sediment movement, seabed stability, and water currents to design more resilient offshore projects.
- **Marine spatial planning:** Helping policymakers balance energy expansion, conservation efforts, and economic priorities.

1. World Bank. *Riding the Blue Wave*. 2022. https://documents1.worldbank.org/curated/en/099655003182224941/pdf/P16729802d9ba60170940500fc7f7d02655.pdf.
2. European Commission. *Biodiversity Strategy* for 2030. Accessed May 12, 2025. https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en.
3. European Commission, *EU Biodiversity Strategy for 2030: Bringing Nature Back into Our Lives*, COM(2020) 380 final, May 20, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0380.

Glenlough Bay, County Donegal, Ireland's Wild Atlantic Way. (Source: Getty Images)

* Currency converted Euro to USD as of 9 April 2025

Sean O'Brien, associate director, Infrastructure & Capital Projects, Deloitte Ireland, explains:

"INFOMAR's comprehensive seabed mapping is reshaping our approach to the Blue Economy by providing freely available data that drives sustainable development and informed decision-making across key sectors. By responsibly managing Ireland's marine resources, INFOMAR is unlocking the potential of our waters, supporting the energy transition, and safeguarding their future for generations to come."

Specifically, for offshore wind farm development, INFOMAR's seabed maps provide key information such as water depth, shipwreck locations, and seabed characteristics and features, including bedrock exposure. This helps developers identify optimal turbine sites while avoiding environmentally sensitive areas. Although further mapping is needed before final turbine placement, INFOMAR's data makes this precision mapping more cost effective and ensures that infrastructure is integrated with minimal disruption to marine ecosystems, supporting both sustainable development and biodiversity conservation.

INFOMAR also helps mitigate environmental risks by providing insights into sediment movement, water currents, and seabed stability. These insights help design resilient energy projects that are less prone to coastal erosion or infrastructure damage, ensuring the long-term health of marine ecosystems.

Beyond energy projects, INFOMAR's mapping products support marine spatial planning, environmental impact assessments, and coastal zone management. These tools help policymakers balance competing priorities—such as renewable energy, biodiversity protection, and sustainable fisheries—and monitor how ecosystems evolve in response to extreme weather and human activity.

Stephen Prendiville, Infrastructure & Capital Projects and Sustainable Infrastructure lead, Deloitte Ireland, describes Deloitte Ireland's comprehensive review of the INFOMAR Program.

"We conducted a review of its background, objectives, and progress towards its 2026 goals – alongside a foresight assessment to evaluate the alignment of INFOMAR's data and infrastructure with Ireland's and the EU's socio-economic frameworks.

"The work was rooted in the central role of INFOMAR in unlocking the sustainable development of Ireland's Blue Economy, identifying new opportunities and providing insights to guide resource prioritization, ensuring INFOMAR's ongoing relevance in supporting sustainable marine management and development."

As Ireland taps into its Blue Economy, INFOMAR plays a vital role in ensuring sustainable progress. Its seabed mapping data guides key decisions across sectors like offshore renewable energy and biodiversity protection, helping balance development with ecosystem preservation. As the energy transition and Blue Economy grow, INFOMAR's data and other improved data sources will be essential in shaping the future of Ireland's marine resources, aligning development with sustainability goals.

Thomas Furey, Marine Institute's INFOMAR Joint Programme Manager (with GSI) highlights the value add opportunities associated with INFOMAR data:

"In a world of changing policy, security, energy and environmental challenges and requirements, our ability to adapt seabed mapping activities is critical to enable continued delivery of key data and evidence for sustainable development and decision support. Whether underpinning new sectoral growth in offshore renewables or marine heritage focused tourism, or protecting marine biodiversity with a hundred year lifecycle, the right data enables the right decisions."

A ***calf emerging*** from underneath ***mum's watchful eye.*** (Source: Getty Images)

IN CLOSING

The business case for building momentum in the Blue Economy has never been stronger.

Firstly, seabed data is essential—without accurate mapping, offshore wind risks damaging biodiversity and facing regulatory roadblocks. Secondly, regulatory pressure is rising—the EU 2030 Biodiversity Strategy and CSRD require full transparency on marine impacts. And thirdly, collaboration is critical—offshore energy developers should work with marine scientists, policymakers, and conservationists to ensure mutually beneficial outcomes.

The recent report by Deloitte Research Center for Energy & Industrials, *Energy transition: The road to scale,* envisions a future where the energy transition is achieved in harmony with environmental stewardship.

The key to unlocking the full potential of the Blue Economy lies in integrating economic, environmental, and community needs—ensuring our oceans continue to power the future while protecting marine ecosystems.

Find out more in our report, *Energy transition: The road to scale*

READ THE REPORT >

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MODERN ROADS FOR RURAL SPAIN

Bridging the gap

COMMONLY KNOWN AS 'EMPTY SPAIN', REMOTE POCKETS OF THE ARAGÓN REGION WILL SOON BE BETTER CONNECTED BY A SAFER, MORE MODERN ROAD NETWORK.

FOR MANY RESIDENTS OF ARAGÓN'S REMOTE VILLAGES, A SIMPLE TRIP TO THE NEAREST HOSPITAL OR MARKET CAN TAKE HOURS DUE TO AGING, POORLY MAINTAINED ROADS. IN THIS NORTHEASTERN REGION OF SPAIN, WHERE ROLLING VINEYARDS MEET THE DRAMATIC PEAKS OF THE PYRENEES, ACCESSIBILITY REMAINS A SIGNIFICANT CHALLENGE.

Aragón spans 47,720 km²—about 10% of Spain's landmass—but its 1.3 million residents are scattered across vast rural areas, often in small communities ranging from only a few hundred to several thousand people.

Despite being one of Spain's wealthiest autonomous regions, with a GDP per capita above the national average, over half of Aragón's communities struggle with problematic accessibility. The Spanish Road Association reports that Aragón's road safety indicators rank below the national average due to years of underinvestment, making it difficult for rural populations to reach essential services, employment hubs, and trade opportunities.

Recognizing the urgent need for modern infrastructure, the Government of Aragón launched the *Plan Extraordinario de Carreteras de Aragón* in July 2024—an ambitious US$690 million initiative designed to overhaul the region's road network. The Plan, which involves the upgrade of more than 1,700 kilometers of roads, is scheduled for completion in 2027, including improving safety, boosting economic connectivity, and reducing travel times. Strategic investments in road rehabilitation, modernized signage, and new bypasses will divert traffic away from congested town centers.

"This is more than a road project—it's a lifeline for these remote communities," says **Karolina Mlodzik**, partner, Deloitte Spain. *"By integrating large-scale infrastructure improvements with public-private partnerships, we can create safer, more efficient roads while promoting long-term economic development."*

Under this initiative, the government will award investment concessions across 11 itineraries, to different concessionaires, for overseeing construction and long-term operation. Each project focuses on enhancing road safety and connectivity, paving the way for a more accessible and economically integrated Aragón.

Fernando García Canales, director, Deloitte Spain, adds, *"The Plan is the largest public-private partnership concession program in Spain in recent years. This plan will not only improve connectivity and road safety in Aragón but also boost the region's economic and social development, facilitating the transportation of people and goods and contributing to territorial balance."*

SUSTAINABLE FINANCING FOR LONG-TERM SUSTAINABILITY

As Spain works toward the European Green Deal's goal of cutting net greenhouse gas emissions by at least 55% by 2030[1], the Aragón Plan aligns with broader efforts to create sustainable, climate-resilient infrastructure. Road construction and rehabilitation can often come at an environmental cost, but green financing mechanisms are ensuring that sustainability remains a priority in this project.

"The financing of the projects has taken into account the Equator Principles and sustainability criteria, ensuring responsible management of environmental and social risks. This integration not only contributes to the long-term viability of the projects but also strengthens transparency and accountability among all stakeholders," explains Fernando.

Additionally, the project complies with the Green Loan Principles set by international organizations such as the Loan Market Association (LMA) and the Loan Syndications and Trading Association (LSTA). These frameworks guide how funds are allocated, evaluated, and reported, ensuring transparency in environmental and social impact assessments.

The structure financing of itinerary 5 has received a Second Party Opinion (SPO) from S&P Global Ratings, affirming that the financing aligns with sustainability principles. The review considered factors such as enhanced rural connectivity, reduced carbon footprints through modernized roadways, and increased road safety in underdeveloped areas.

BEYOND FINANCIAL COMPLIANCE, ARAGÓN'S INFRASTRUCTURE PROJECT INCORPORATES PRACTICAL SUSTAINABILITY MEASURES, INCLUDING:

- The use of low-emission construction materials to reduce the project's carbon footprint.
- Biodiversity protection strategies, such as wildlife corridors to minimize disruption to local ecosystems.
- Implementation of energy-efficient road lighting to lower long-term energy consumption.

> *"It's not just about building better roads—this enhances connectivity in Aragón, ensuring access to essential services and strengthening road safety. It also boosts local economic development and is carried out with sustainability criteria, guaranteeing a long-term positive impact."*
>
> – Fernando García Canales

With these measures in place, Aragón's infrastructure overhaul is not only set to modernize its road network but also to set a benchmark for sustainable transportation projects across Spain and Europe.

PAVING THE WAY TO THE FUTURE WITH A BOLD AMBITION

Ensuring high-quality infrastructure for local residents is the government's ultimate goal, as modern roads are essential for economic progress and community wellbeing.

Spain's Minister of Public Works, Housing, Logistics, and Territorial Cohesion, **Octavio López,** emphasized the transformative impact of this initiative, stating,

"This Plan will renovate more than 1,700 kilometers of the regional road network—nearly 40% of it. Aragón will no longer be at the bottom of Spain's road rankings but will take the place its people deserve, with a renewed, modern, safer, and more efficient road network."[2]

ROAD SAFETY STANDARDS: SETTING A NEW BENCHMARK

To uphold best practices, the Plan Extraordinario adheres to government regulations and EU directives, including Spain's General Road Safety Law and the EU Road Infrastructure Safety Management Directive.

Maintaining these high safety standards requires:

- Safety impact assessments and audits.
- Advanced risk management measures.
- Strict technical road design standards, covering road width, signage, barriers, and intersection safety to minimize accident risks and enhance mobility.

These measures ensure that Aragón's roads meet the highest standards for safety and efficiency, benefiting all road users.

FROM PLAN TO REALITY: PRIVATE-PUBLIC COLLABORATION

Public-private collaboration is the key to making this ambitious plan a reality. As specialists in Public-Private Partnership (PPP) projects, Deloitte Spain was selected to provide specialized advisory services in three of the 11 itineraries of the Plan, advising three consortia in the process of preparing and closing the economic offer and during the accompaniment to the financial close of the selected concessionaires. Deloitte Spain provided support both in the financial close of two itineraries and in the bid support for another itinerary, ensuring strategic guidance throughout the process.

"Balancing public interests with private sector efficiency and ensuring financial sustainability have been critical aspects of our advisory role. Coordinating multiple stakeholders—including government entities, financial institutions, and private companies—requires strategic planning and long-term commitment," says Fernando.

Despite these challenges, Deloitte Spain's experience in structuring and executing large-scale PPP projects has been fundamental in driving the success of this initiative for three of the eleven itineraries.

With construction underway and financing secured, Aragón's road network is on track for a historic transformation, ensuring a safer, more connected, and sustainable future for generations to come.

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Castillo de Trasmoz and the ***Pico del Moncayo*** from the road. (Source: Getty Images)

* Currency converted Euro to USD as of 9 April 2025

Energy diversification is vital to the future

DUBAI'S RENEWABLE ENERGY-POWERED DESALINATION PLANT WINS INDUSTRY AWARD

THE DUBAI ELECTRICITY & WATER AUTHORITY (DEWA)'S MISSION IS TO PROVIDE GLOBALLY LEADING, SUSTAINABLE, EFFICIENT, AND RELIABLE POWER AND WATER SERVICES, ALONG WITH INNOVATIVE SMART SOLUTIONS, TO SUPPORT A NET-ZERO FUTURE.

This aligns with the Dubai Clean Energy Strategy 2050 and the Dubai Net Zero Carbon Emissions Strategy 2050, both of which aim for 100% clean energy provision by the middle of the century.

One key infrastructure project in DEWA's portfolio is the Hassyan Independent Water Producer (IWP) project—a large-scale, solar-powered seawater desalination plant located approximately 55 kilometers southwest of Dubai Creek, within the Hassyan Power and Water Complex in Dubai, United Arab Emirates. This strategic location is near the Jebel Ali Wetland Sanctuary, a Ramsar-protected site recognized for its ecological significance.

The plant will produce 180 million imperial gallons of desalinated water per day using reverse osmosis (RO) technology, making it the world's largest renewable energy-powered desalination plant of its kind. Already over halfway completed, the project is set for full operation by 2027.

"This project is a model for how we can achieve water security sustainably, aligning infrastructure development with environmental stewardship."[1]

- Saeed Mohammed Al Tayer, Managing Director & Chief Executive Officer, DEWA

HASSYAN'S AWARD-WINNING CHARACTERISTICS

At this year's annual Project Finance International (PFI) awards, Hassyan IWP won the Middle East and North Africa Deal of the Year 2024 – one of the most prestigious awards in global project finance.

In this article, we take a closer look, along with insights from our Deloitte Middle East colleagues who were involved in this landmark deal.

T.M. Sudarshan, director, Infrastructure & Real Estate, Deloitte Middle East, has worked closely with DEWA on its initiatives. He shared some of the project's key achievements:

"The US$937 million, 180 million-gallon-per day Hassyan independent water project in Dubai is the world's largest seawater reverse osmosis technology scheme using 100% renewable energy. The project set a world record for the lowest water levelized water tariff at US$0.365/m3—and it is the first IWP in Dubai."

According to the PFI Annual Yearbook, the scheme was first tendered in 2018 and underwent a subsequent retender. The mandate was awarded to Deloitte Middle East towards the end of 2022. It was then bid as a 120MIGD (million imperial gallons per day) scheme with an alternate bid of 180MIGD, which was awarded to an ACWA Power-led consortium, ahead of TAQA. The project is backed by a 30-year water purchase agreement.

FINANCING THE NEW DESALINATION PLANT

The project secured US$749 million in financing from a diverse group of local, regional, and international lenders. Notably, it marked the first involvement of Saudi Export Credit Agency (Saudi Exim) in a project financing deal in the region.

"DEWA holds 60% of the project equity, while ACWA Power and US-based investor EIG collectively own the remaining 40%. The two entities announced a joint investment venture in 2023," adds Sudarshan.

The 32.5-year soft mini-perm financing was led by MUFG and Standard Chartered and includes participation from 11 banks from across the world.

HARNESSING A 30-YEAR BUILD-OWN-OPERATE MODEL

Strategically located near the Dubai-Abu Dhabi highway, 55 kilometers southwest of Dubai Creek, the Hassyan project is being developed under a 30-year build-own-operate (BOO) model. The first phase, producing 60MIGD, is scheduled to come online in April 2026, followed by another 60MIGD in October 2026, with full operation expected by February 2027.

COMBINING THE BEST OF PRIVATE AND PUBLIC SECTOR EXPERTISE

The Hassyan IWP project serves as a model for integrating renewable energy, adopting efficient technologies, fostering public-private collaborations, and prioritizing environmental conservation in the pursuit of sustainable water solutions.

Vishal Rander, partner, Project & Infrastructure Finance, Deloitte Middle East, is proud of the award win and the significance of the project:

"From the outset, DEWA has been a visionary client. DEWA is committed to developing best-in-class, efficient projects that minimize fuel consumption and emissions while adhering to the most stringent environmental regulations. Deloitte Middle East proudly advised DEWA on this successful project deal, which is pivotal in Dubai's pursuit of net-zero carbon emissions due to its integration of advanced desalination technology with renewable energy sources."

THE SUSTAINABILITY OF SEAWATER DESALINATION

By utilizing seawater reverse osmosis (SWRO) technology, which consumes less energy compared to traditional multi-stage flash distillation methods, the Hassyan project exemplifies Dubai's commitment to integrating sustainable practices within its infrastructure.

This initiative plays a crucial role in the emirate's journey toward achieving net-zero emissions.

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The extended project team on a site visit. (Source: ACWA Power LinkedIn post)

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The Jebel Ali plant in the United Arab Emirates. (Source: TIME Magazine)
This sprawling power and desalination plant on Dubai's coast produces almost 8,000 megawatts of electricity and over 550 million US gallons of water a day.

THE POWER OF GEOSPATIAL PLANNING

Strengthening transportation resilience with geospatial intelligence

VRU crash heat map. (Source: Deloitte Infrastructure Insights Pro)

ENHANCING INFRASTRUCTURE IN COASTAL FLORIDA

Broward Metropolitan Planning Organization (BMPO) is at the forefront of transportation planning and funding allocation in Broward County, Florida, US, home to over two million residents across Fort Lauderdale and 30 municipalities. However, congestion and population growth may disrupt economic performance and infrastructure stability, making urban planning an urgent priority.

While various state, regional, and local organizations are working to enhance infrastructure resilience, fragmented data and siloed information have hampered coordination. BMPO recognized the need for a dynamic, geospatial-driven scenario planning platform—a tool that would unify stakeholders, provide a single source of truth, and enable effective decision-making on transportation, and economic development.

THE POWER OF GEOSPATIAL COLLABORATION: DELOITTE'S SCENARIO PLANNING AND MONITORING PLATFORM

Deloitte Consulting LLP provided a transformative solution. Our Geospatial and AI Platform for Scenario Planning and Monitoring, powered by Google Earth, Google Earth Engine, and Generative AI from Vertex AI, is designed to harness geospatial data to drive sustainable decision-making. This cutting-edge platform allows policymakers, planners, researchers, and community leaders to analyze any infrastructure vulnerabilities, assess transportation infrastructure, and model economic impacts with precision.

According to **David Friedman,** principal, Deloitte Consulting LLP, the platform has transformative potential for organizations like BMPO.

"Like many regional planning authorities, BMPO needed to develop a holistic understanding of the various impacts of weather hazards, resiliency measures, and transportation projects. To gain insights, they required robust capabilities—ranging from data visualization and descriptive analytics to advanced simulation and modeling of future scenarios. Our platform creates a single source of information, empowering BMPO leaders to make easier, faster, and more informed decisions."

This collaborative approach is already transforming how Broward County is bolstering its infrastructure and allocating its infrastructure investments. With seamless access to geospatial data, stakeholders can monitor risks in real-time, simulate the effectiveness of proposed solutions, and enhance regional resilience strategies.

NAVIGATING ROAD SAFETY CHALLENGES IN CALIFORNIA

Across the country, the California Department of Transportation (Caltrans) faces a different, yet equally pressing challenge: managing the safety and efficiency of one of the busiest transportation networks in the United States. With nearly 36 million registered vehicles traveling over 50,000 miles of highway and freeway lanes, analyzing traffic patterns and mitigating congestion is a monumental task.

Every day, an average of 12 Californians die on the road, a tragic statistic recently highlighted by **Toks Omishakin**, California Transportation Secretary. Since 2020, pedestrian and cyclist fatalities have surged to a 40-year high, while traffic congestion costs the economy US$87 billion annually. These challenges demand a data-driven, geospatially enabled response.

Caltrans has taken bold action to harness AI and geospatial insights for safer roads. In 2024, it awarded its first Generative AI vendor contracts in Californian history. These contracts mark the beginning of a comprehensive effort to leverage AI-powered geospatial analytics to:

- Identify high-risk crash locations.
- Monitor real-time traffic conditions.
- Detect incidents and generate alerts.
- Predict emissions.

Tony Tavares, Director of Caltrans, underscores the agency's forward-thinking approach:

"Caltrans has historically been an early adopter of new technology. Our work with GenAI is another example of this innovation. We are optimistic about the ideas and solutions these vendors are bringing to enhance highway safety and limit gridlock in our busiest corridors."

INTRODUCING INFRASTRUCTURE INSIGHTS PRO: AI-POWERED TRAFFIC MANAGEMENT

In collaboration with Google, Deloitte Consulting LLP has launched Infrastructure Insights Pro, an advanced geospatial-AI scenario planning tool designed to revolutionize traffic management.

By integrating vast data sources—including traffic sensors, cameras, incident reports, and third-party data streams—the platform provides intuitive, map-based and graphical visualizations for real-time operational intelligence and future planning.

INFRASTRUCTURE INSIGHTS PRO KEY CAPABILITIES:

- **Predictive analytics** to identify high-risk areas for accidents and congestion.
- **AI-powered monitoring** for real-time traffic conditions and safety hazards.
- **CO_2 emissions tracking** to support environmental sustainability.
- **Optimized traffic operations** to alleviate bottlenecks and streamline urban mobility.

BUILDING A DATA-DRIVEN FUTURE FOR GLOBAL INFRASTRUCTURE

BMPO in Florida and Caltrans in California's commitment to using and managing data better highlights how geospatial intelligence is reshaping the future of infrastructure planning.

By integrating geospatial data, AI, and advanced scenario modeling, public and private sector leaders can make smarter, more sustainable investments—ensuring that infrastructure is not only resilient but also adaptable to the evolving needs of communities.

THE ROAD AHEAD

As governments worldwide strive to balance economic growth, infrastructure resilience, and public safety, the adoption of geospatial-AI solutions will be a game-changer. Whether it's combating infrastructure stability threats in Florida or reducing traffic fatalities in California, data-driven planning is the key to building smarter, safer, and more resilient infrastructure for future generations.

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Topographic Map of Long Beach, California, USA. (Source: Getty Images)

LATIN AMERICA'S LAST-MILE DELIVERY REVOLUTION

Green miles: Transforming urban freight

ELECTRIFYING LAST-MILE FREIGHT TRANSPORTATION IN LATIN AMERICAN CITIES IS NOT MERELY AN ENVIRONMENTAL IMPERATIVE, BUT A STRATEGIC BUSINESS DECISION THAT PROMISES SIGNIFICANT OPERATIONAL, FINANCIAL, AND REPUTATIONAL BENEFITS.

LATIN AMERICAN CITIES SUCH AS BOGOTÁ, MEDELLÍN, RIO DE JANEIRO, CURITIBA, QUITO, AND MEXICO CITY ARE LEADING THIS TRANSITION – EACH NAVIGATING UNIQUE CHALLENGES AND OPPORTUNITIES.

THE ELECTRIFICATION IMPERATIVE

The electrification of last-mile freight vehicle fleets is emerging as a pivotal strategy in Latin America's journey towards sustainable urban logistics. In particular, the shift to EVs in last-mile delivery offers numerous advantages:

- **Environmental benefits:** Without a combustion engine, EVs significantly reduce urban noise pollution—and they produce zero tailpipe emissions, leading to improved air quality and a reduced carbon footprint.
- **Social impact:** EVs may positively impact public health and employment.[1] For example, because their emissions are lower, this can reduce the local population's prevalence of respiratory and cardiovascular diseases. Additionally, expanding the EV industry can generate new jobs in areas such as manufacturing, maintenance, and charging infrastructure, thereby fostering economic growth and creating employment opportunities.
- **Operational efficiency:** EVs offer substantial savings in fuel and maintenance costs, enhancing profitability.[2] For example, they consume less fuel, and experience less mechanical degradation associated with the engine, both factors contributing to more cost effective and efficient fleet management.
- **Reputational gains:** Demonstrating a commitment to sustainability can enhance brand image and meet the growing consumer demand for responsible business practices. As a result, adopting EVs can attract eco-conscious consumers, providing a competitive edge and strengthening market position.

THE ROAD TO ELECTRIFICATION

Both the public and private sectors play crucial roles in accelerating the transition of last-mile delivery vehicles towards electromobility.

On the one hand, the public sector is responsible for providing incentives and developing public policies. Currently, the public sector is implementing various incentives, particularly tax exemptions or reductions, to encourage the adoption of electric vehicles. Three examples include:

Colombia: under Law 1964 to 2019, an exemption from import duties for EVs, a reduced Value Added Tax (VAT) rate of 5% for EVs, exemptions from circulation restrictions in major cities, and preferential parking and a 10% discount on mandatory insurance premiums.[3]

Brazil: at the federal level, Brazil exempts EVs from the Tax on Industrialized Products (IPI) and the Tax on the Circulation of Goods and Services (ICMS).[4]

Mexico: the Mexican government provides various incentives to promote EV adoption, including exemption from the federal tax on new cars (ISAN), income tax deductions for the depreciation of EVs, and discounts on tolls in certain regions.[5]

Public policies aimed at promoting electromobility can differ significantly from one city to another, reflecting local priorities and conditions. The public sector should start to focus its efforts on expanding the charging infrastructure network, which can make the cost-benefit advantages of EVs a reality for businesses and consumers alike.

On the other hand, the private sector focuses on establishing partnerships and innovative business models to promote the EV adoption. Already, private companies are taking the lead in the transition to EVs, driven by the need for operational efficiencies and sustainability. Examples include brands developing their own EV trucks and successfully piloting the use of EV vehicles to reduce carbon emissions and operational costs.

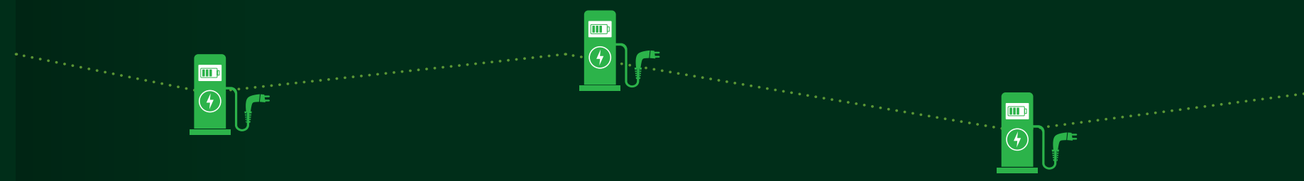
Broadly speaking, businesses are adopting EVs through innovative strategies and business models designed to enhance efficiency and reduce their carbon footprint. These private sector initiatives are important in advancing the adoption of electromobility and setting a precedent for sustainable practices in the industry.

SPEEDBUMPS ON THE ROAD TO ELECTRIFICATION

Despite the benefits of last mile electrification, several challenges impede the widespread adoption of electric freight vehicles:

- **Inconsistent policy and regulatory frameworks:** Latin American governments should consider creating robust, regulatory frameworks to encourage the electrification of freight transport by establishing energy transition targets, and providing financial incentives for key stakeholders. Additionally, these policies should ensure adequate technical support and responsible talent migration—considering the significance of SMEs and single-man trucks.
- **Limited infrastructure and technology:** A comprehensive charging network should be established with strategically located, accessible charging points to support last-mile transport operations. In addition, the energy grid should be upgraded to handle increased demand from electric mobility and integrate renewable energy sources, helping to ensure that urban freight transport electrification supports the energy transition and improves air quality.
- **High initial costs:** Financial alternatives should be developed to facilitate the adoption of EVs, which are currently more expensive than their diesel counterparts, while also expanding the availability of vehicles tailored to organizational needs. Collaboration among stakeholders—including vehicle manufacturers, logistics companies, governments, financial institutions, and energy providers—is important to ensuring a successful transition.

These roadblocks can be overcome by adopting a combination of strategies, including comprehensive collaboration with involved stakeholders to manage expectations and accelerate adoption, exploring innovative business models such as partnerships or collaborative frameworks, leveraging financial incentives and investing in technology and training.



A NEW PATHWAY TOOL FOR ELECTRIFYING LAST-MILE FREIGHT IN LATIN AMERICAN CITIES

C40 CITIES IS A GLOBAL NETWORK OF MAYORS OF THE WORLD´S LEADING CITIES WHO ARE UNITED IN ACTION TO CONFRONT SUSTAINABILITY CONCERNS. AS PART OF THE LANESHIFT INITIATIVE, AIMED AT TRANSITIONING FREIGHT TRANSPORT IN LATIN AMERICA AND INDIA, C40 RECENTLY COMMISSIONED DELOITTE COLOMBIA TO CONDUCT A COMPREHENSIVE STUDY.

The team was briefed to develop a Pathway Tool to assess and compare the Total Cost of Ownership (TCO) of electric freight vehicles versus internal combustion engine (ICE) vehicles in six Latin American cities: Bogotá and Medellín (Colombia); Rio de Janeiro and Curitiba (Brazil); Quito (Ecuador); and Mexico City (Mexico).

Dafna Siegert, partner, Sustainability & Climate Change, Deloitte Colombia explains the project's objective: *"The primary goal was to create a comprehensive tool to inform both private and public sector stakeholders about the financial implications of transitioning to electric freight vehicles, thereby facilitating informed decision-making in the electrification of last-mile freight transportation."*

The development process involved extensive data collection from diverse sources, ensuring a robust analysis of variables affecting TCO, such as acquisition costs, maintenance expenses, energy consumption, and potential incentives.

Stakeholder engagement was also vital to a successful outcome, so both the public and private sectors could benefit from the new tool:

- **Private sector:** The tool addresses the needs of shippers, carriers, enterprises, financial institutions, insurance companies, and manufacturers, providing them with detailed TCO analyses to guide investment and operational decisions.
- **Public sector:** It also equips government agencies and policymakers with data-driven insights to formulate incentives and policies that promote the adoption of electric freight vehicles.

Juan Felipe von Walter Prieto, manager, Infrastructure & Public Sector, Deloitte Colombia, shares the team's insights.

"Our analysis revealed that, despite higher upfront costs, electric freight vehicles can achieve cost parity or even offer savings over ICE vehicles when considering lifetime operational and maintenance expenses. In addition, supportive policies and incentives significantly influence the financial viability of electric freight vehicles, underscoring the importance of governmental involvement in the transition process."

The Pathway Tool serves as a catalyst for informed discussions among decision makers, highlighting critical variables and facilitating the evaluation of appropriate business models for last-mile freight transportation. Its application could accelerate the adoption of electric freight vehicles across the studied cities, contributing to sustainable urban logistics in the region.

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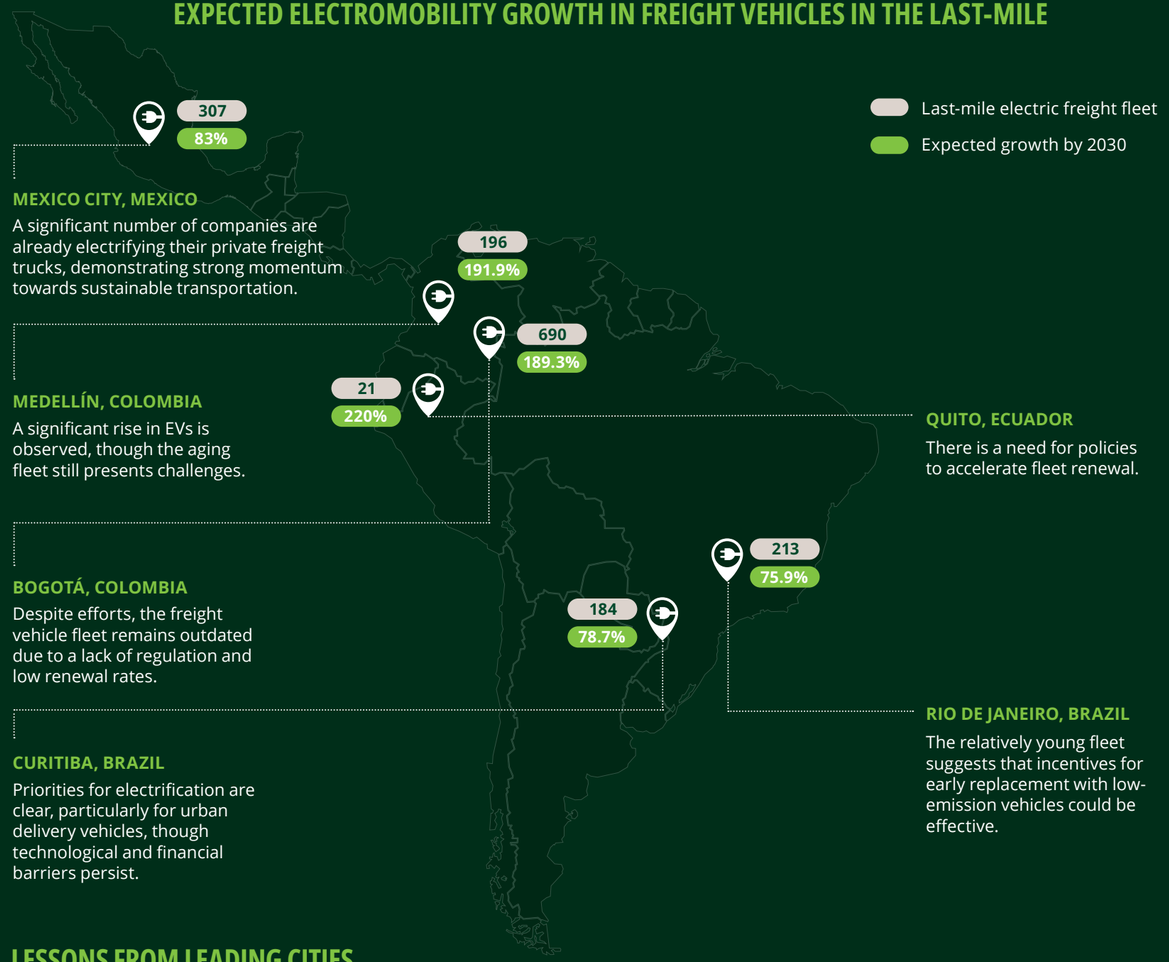
EXPECTED ELECTROMOBILITY GROWTH IN FREIGHT VEHICLES IN THE LAST-MILE



MEXICO CITY, MEXICO
A significant number of companies are already electrifying their private freight trucks, demonstrating strong momentum towards sustainable transportation.

MEDELLÍN, COLOMBIA
A significant rise in EVs is observed, though the aging fleet still presents challenges.

BOGOTÁ, COLOMBIA
Despite efforts, the freight vehicle fleet remains outdated due to a lack of regulation and low renewal rates.

CURITIBA, BRAZIL
Priorities for electrification are clear, particularly for urban delivery vehicles, though technological and financial barriers persist.

QUITO, ECUADOR
There is a need for policies to accelerate fleet renewal.

RIO DE JANEIRO, BRAZIL
The relatively young fleet suggests that incentives for early replacement with low-emission vehicles could be effective.

LESSONS FROM LEADING CITIES

INSIGHTS FROM THE SIX CITIES STUDIED BY DELOITTE COLOMBIA REVEAL DIVERSE APPROACHES TO ELECTRIFICATION

As shown in the infographic, the expected growth in electromobility in the six cities that formed part of the Deloitte Colombia study is exponential.

Juan says, *"These forecasts tend to be based on a business-as-usual premise; so, the normal economic growth we expect to see in these cities.*

Public and private actors should consider developing different actions to accelerate growth—including growth enablers like policies, incentives, private investment, among others."

THE FINAL MILE

Electrifying last-mile freight transportation in Latin America presents a compelling opportunity for businesses to enhance efficiency, reduce costs, and bolster their commitment to sustainability.

By understanding the challenges and strategically engaging with stakeholders, business leaders can drive this transition, reaping substantial benefits while contributing to a more sustainable future.

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AI IS REVOLUTIONIZING HOW CITIES ANALYZE DATA, CREATE CONTENT, AND PERFORM TASKS.

Deloitte, ServiceNow, NVIDIA, and ThoughtLab came together for a pioneering study of how AI is reshaping cities around the world.

250 cities
78 countries
734 million residents
9% of the global population

"AI has the power to catapult cities into the future. By leveraging data-driven insights, AI can revolutionize urban planning and resource management, from predicting trends and managing traffic to making cities more resilient and sustainable.

Michael Flynn
Global Infrastructure, Transport & Regional Government leader

AI-Powered Cities of the Future

DISCOVER MORE INSIGHTS >

servicenow | Deloitte. | NVIDIA | In collaboration with: ThoughtLab

INFRASTRUCTURE FOR GOOD

Antwerp's ring road is closing the loop

A GROUNDBREAKING RESEARCH INITIATIVE, INFRASTRUCTURE FOR GOOD IS TRANSFORMING HOW WE PERCEIVE INFRASTRUCTURE DEVELOPMENT. THIS FIRST-OF-ITS-KIND PROGRAM SEEKS TO DRIVE AWARENESS OF THE BROAD-BASED BENEFITS OF SMART AND RESPONSIBLE INFRASTRUCTURE, DEFINE WHAT 'GOOD' LOOKS LIKE, AND CREATE A GLOBAL ROADMAP FOR BETTER DECISION MAKING.

Launched in June 2023, Infrastructure for Good was developed by Economist Impact and supported by Deloitte and Duke University's Nicholas Institute for Energy, Environment & Sustainability. It provides a fresh perspective on infrastructure planning through its research centerpiece, the Infrastructure for Good (IFG) Barometer—a detailed benchmarking tool that measures infrastructure ecosystems in 30 countries worldwide. By analyzing a wide range of social, economic, and environmental factors, the barometer sets the stage for improved infrastructure around the globe.

In 2024, Antwerp, Belgium, became a model for this initiative, working with Deloitte Belgium to use the barometer as a basis to complete an impact assessment to evaluate and enhance one of Europe's most ambitious infrastructure projects—the Oosterweel project.

The views expressed in this article are those of the authors. They are an independent analysis of the survey data produced by Economist Impact and do not reflect the views of Economist Impact.

ANTWERP'S RING ROAD: CLOSING THE LOOP

Built in the 1960s, Antwerp's ring road was originally designed to ease traffic congestion and facilitate economic activity.

However, as the city grew beyond its original borders, the infrastructure struggled to keep up, leaving a critical gap in the northwest—known as the Oosterweel connection—near the city's bustling port. This missing link led to severe traffic bottlenecks, increased pollution, and diminished quality of life for residents.

Enter the Oosterweel project, a transformative initiative launched in 2018 to complete Antwerp's ring road and enhance mobility in and around Flanders' largest city. With an expected completion by 2033, the Oosterweel project is the largest road infrastructure undertaking in Europe today, introducing a series of sophisticated engineering solutions:

- **Canal tunnels** to optimize transport routes.
- **A new Scheldt river crossing** to improve urban access.
- **The Oosterweel junction,** a strategic interchange connecting key road networks.
- **Green infrastructure,** including ring parks, to improve air quality and reduce noise pollution.

This ambitious effort aims to create a more connected and livable Antwerp while significantly reducing traffic congestion and environmental impact.

MODERNIZING ANTWERP FOR A SUSTAINABLE FUTURE

According to **Stijn Vandeweyer,** Infrastructure, Transport & Regional Growth leader, Deloitte Belgium, the Oosterweel project is a vital investment in Antwerp's future. Managed by Lantis (Livable Antwerp through Innovation and Collaboration), the initiative aligns with the broader Antwerp Mobility Master Plan, which is spearheaded by the Flemish government, Stijn says:

"With a budget exceeding US$11 billion, financed by the Flemish government and a US$1.1 billion loan from the European Investment Bank, the Oosterweel project exemplifies a major infrastructure investment with long-term sustainability goals. By 2033, at least half of all city journeys should be made using sustainable alternatives such as bicycles, trains, or trams. The project integrates cycling infrastructure and public transport enhancements, further bolstering the city's environmental commitments.

Beyond transport benefits, the project is set to strengthen the Port of Antwerp-Bruges, Europe's second-largest port, ensuring its continued global competitiveness. This, in turn, will support economic growth and job creation."

THE BAROMETER'S ROLE IN DRIVING BETTER INFRASTRUCTURE

The Infrastructure for Good Barometer played a crucial role in evaluating Oosterweel's impact, allowing Deloitte Belgium to conduct an in-depth impact assessment. This analysis measured the project's effectiveness in governance, social impact, economic benefits, and environmental sustainability.

Results revealed that the Oosterweel project outperformed Belgium's national average across most barometer pillars, achieving an **overall score of 68.6**, placing it third globally—just behind Canada (70.4) and the United Kingdom (69.6). Key highlights include:

- **Governance & Planning (Pillar 1):** Strong project management and strategic oversight.
- **Social & Community Impact (Pillar 3)**: Enhanced urban living conditions and reduced congestion.
- **Environmental Sustainability & Resilience (Pillar 5)**: Innovative hinderance-reduction measures and green corridors.

However, one area for improvement was **Sustainable Financing (Pillar 2),** where Lantis scored lower than both Belgium and the barometer's average. Unlike some global counterparts, Oosterweel's financing has yet to integrate green loans or outcome-linked funding, which tie investment returns to sustainability performance.

Stijn adds, *"The best thing about these scores is that they inform strategic priorities and provide a foundation against which the Oosterweel can be measured against in future."*

A GLOBAL MODEL FOR INFRASTRUCTURE DEVELOPMENT

Stijn emphasizes the significance of the impact assessment and the data it provides to make informed decisions: *"By conducting a project-specific analysis, we were able to align Oosterweel's performance with global best practices and identify areas for further improvement."*

Caroline Vanwanseele, Head Corporate Services Lantis, echoed this sentiment:

"This benchmarking exercise has provided valuable insights into how our project contributes to the economy, environment, and society. We have a better view on best practices and "good governance" which will help us further develop our sustainability performance moving forward."

A BLUEPRINT FOR THE FUTURE

The Infrastructure for Good Barometer has proven to be a game-changer, providing Antwerp with a clear framework to measure its infrastructure progress.

With the Oosterweel project setting a new standard for large-scale infrastructure planning, other cities and countries can leverage similar methodologies to ensure their own infrastructure investments drive sustainable growth and long-term benefits for their communities.

> *"The Infrastructure for Good Barometer is a solid tool for identifying good practices and areas for improvement. Following this initial assessment, Lantis can now think about monitoring the annual evolution of the Oosterweel project and evaluate its performance against KPIs. Applying the barometer to different infrastructure projects like this one will only strengthen asset owners' ability to conduct consistent international benchmarking. It's a very exciting time!"*
>
> - **Michael Flynn**, Global Infrastructure, Transport & Regional Government leader

As Antwerp moves closer to completing its ring road, the city stands as a shining example of how smart, responsible infrastructure can reshape urban landscapes—paving the way for a more connected, sustainable, and economically vibrant future.

The Oosterweel project commenced in 2018, and is expected to finish in 2033. (Source: © Lantis)

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* Currency converted Euro to USD as of 9 April 2025

Momentum is building behind Indonesia's growth ambitions

AN EXCLUSIVE INTERVIEW WITH ENTREPRENEUR AND POLITICIAN, HASHIM S. DJOJOHADIKUSUMO

Indonesia stands as the world's fourth most populous country. As of 2025, its population is approximately 285.7 million, dispersed across over 17,000 islands. About 59.6% (approximately 170.4 million people) reside in urban areas, while the remaining 40.4% (around 115.3 million people) live in rural and coastal regions. Java is the most populated island, home to some 55% of the population.

SEVERAL MONTHS AFTER THE INAUGURATION OF INDONESIA'S EIGHTH PRESIDENT, PRABOWO SUBIANTO, WE HAD THE PRIVILEGE OF AN EXCLUSIVE INTERVIEW WITH HASHIM S. DJOJOHADIKUSUMO—THE PRESIDENT'S YOUNGER BROTHER AND A SERIAL ENTREPRENEUR AND RESULTS-DRIVEN POLITICIAN.

Together, these formidable brothers are ushering in the new era in Indonesia's political and economic landscape, emphasizing infrastructure development, social welfare programs, and international partnerships. Hashim exudes the confidence and vision of a seasoned global leader, adept at navigating complexities to drive exponential growth for the benefit of all Indonesians, the economy, and the environment. His ambition and optimism paint an exciting future for Indonesia as it consolidates to become a pivotal gateway to Asia.

As Head of Indonesia's COP29 delegation and Special Envoy for Energy and Climate to President Prabowo, Hashim outlined Indonesia's commitment to accelerating the climate agenda with a dedicated focus on taking action, with key priorities including unlocking the potential of carbon markets, targeting energy subsidy reform, promoting affordable green housing, and rehabilitating degraded forests.

In our exclusive interview, we asked Hashim to share his insights into two of the nation's monumental infrastructure endeavors: the Giant Java Sea Wall and the Three Million Affordable Housing Program. These projects are integral to a comprehensive national strategy aimed at responding to rising sea levels, improving living conditions and surpassing 8% annual GDP growth in the coming years.

ADDRESSING RISING SEA LEVELS WITH THE GIANT JAVA SEA WALL

First conceptualized in 1994, the Giant Java Sea Wall has recently been prioritized by President Prabowo to combat the dual challenges of rising sea levels and the submersion of arable land along Java's northern coast, which is home to 50 million people and contributes 20.7% of Indonesia's GDP.

"This is both a physical and financial challenge that we need to get right," asserts Hashim. "The proposed sea wall will extend approximately 700 kilometers, stretching from Banten in the west to East Java. We estimate the project will require an investment of around Rp700 trillion (approximately US$50 billion) over a span of 20 years."

While the Indonesian government could solely fund the project, the strategy is to alleviate fiscal pressure by attracting both foreign and domestic investments. Hashim has proactively engaged with international partners to secure funding and expertise, accelerating this critical infrastructure initiative.

"We need to allocate about US$2.5 billion annually over two decades, which we anticipate will directly boost our GDP growth by approximately 0.5% each year," explains Hashim.

"The initial phase will focus on constructing coastal and river embankments and implementing a pump and polder system in Jakarta's northern coastal area.

"This will necessitate substantial resources, materials, and labor, providing sustained economic stimulus vital for our people, environment, and future."

Recognizing the potential impact on local fishing communities, the government has devised plans to provide improved facilities and enhanced social infrastructure in nearby areas to support affected groups and their families.

"We anticipate the development of new and improved floating homes in North Jakarta, resilient to fluctuating sea levels. This model has proven successful already, with 200 affordable floating homes constructed in recent years."

International collaboration is pivotal to the sea wall's success. To this end, Indonesia has engaged closely with the Netherlands, Japan, and China, drawing lessons from cities in these countries, as well as in North American cities like Miami that face similar climate challenges.

ESTABLISHING MOMENTUM WITH A DEDICATED AUTHORITY

To realize the vision of the Giant Java Sea Wall by 2045, the government is establishing a specialized agency to oversee this national priority, coordinating efforts among various ministries, central authorities, and the five Javanese provinces directly affected. Stakeholder engagement will be essential to maintain momentum.

"The preliminary engineering studies are complete, designs are being finalized, and we are collaborating with experts to incorporate global best practices," shares Hashim. "This is fundamentally a government-led initiative that will thrive on close cooperation with the private sector."

"I am confident we will realize this vision. It's a transformative solution to rising sea levels. Although conceptualized decades ago, the new administration is committed to its swift implementation. I am eager to support the new authority in assembling the right leadership and team, cutting through bureaucracy, and bringing our plans to fruition for the benefit of Java and Indonesia as a whole."

EMPOWERING COMMUNITIES THROUGH THE THREE MILLION AFFORDABLE HOUSING PROGRAM

Addressing the nation's housing deficit, President Prabowo's administration has unveiled an ambitious plan to construct three million homes annually for ten years, totalling 30 million new homes. This ambitious initiative addresses the nation's significant housing deficit, which includes approximately 9.9 million households lacking permanent housing and an additional 26 million homes that do not meet minimum habitation standards.

The new National Housing Program aims to provide affordable housing, stimulate economic growth, and improve living standards across the archipelago. A new Public Housing Task Force, chaired by Hashim, is leading the initiative, working closely with the newly established Ministry of Housing.

To support this endeavor, Hashim has leveraged his international networks to secure international funding, attracting foreign investors from countries such as China, Qatar, and the United Arab Emirates, who combined have already pledged to finance the construction of six million houses.

"Our goal is to build two million houses in rural and coastal areas and one million units in urban regions each year," outlines Hashim. *"This approach ensures balanced development and addresses the diverse needs of our population."*

To support this massive undertaking, Bank Indonesia, Indonesia's Central Bank has introduced measures to enhance liquidity for property sector loans, freeing up approximately 80 trillion rupiah (US$4.9 billion) by reducing reserve requirements for banks. This strategy is designed to boost credit growth and align with the government's housing objectives.

"The housing sector is a cornerstone of economic development," emphasizes Hashim. "By facilitating access to affordable housing, we not only improve quality of life but also generate employment and stimulate related industries such as manufacturing of home furniture and white goods."

In addition to financial reforms, the government is exploring innovative funding mechanisms, such as issuing housing bonds to attract overseas investments from Indonesians abroad and mobilizing capital from state institutions that manage large-scale funds.

The Island of Java, topographical diagram. (Source: Getty Images)

This is aimed at attracting international investors without crowding out local labor. *"We will ensure small local contractors are used to build the rural and coastal homes, with larger conglomerates focused on the urban home targets. That will strike the right balance so everyone benefits,"* explains Hashim.

With respect to land availability in urban areas for public housing, Hashim considers Transit-Oriented Development (TOD) as one of the cornerstones of Indonesia's National Housing Program, aiming to integrate residential areas with efficient public transportation networks. This approach not only addresses the nation's housing shortage but also promotes sustainable urban growth and improved quality of life.

"To secure the land for the new homes, we're focused on integrating transit and housing. TOD reduces reliance on private vehicles, alleviates traffic congestion, and enhances accessibility to essential services. This model also encourages high-density, mixed-use communities that support environmental sustainability and economic vitality.

"The success of TOD projects hinge on the collaboration between central and regional governments, the private sector, and local communities. This collective approach ensures that developments are well-planned, adequately funded, and aligned with the needs of the populace," explains Hashim.

When reflecting on the National Housing Program's contribution to the economy, Hashim refers to 185 linkages.

"Consider this: building three million homes per year, which will each require between four or five beds each—let's say between 10 and 15 million beds a year—furniture, TVs, fridges, internet connectivity... the list goes on. Constructing and completing these new homes will have a ripple effect on adjacent industries, like Jepara's impressive furniture manufacturing, and boost GDP growth by up to 2% per year. Together with the giant sea wall and several other national initiatives like the Free Meals Program, Indonesia is in a great position to deliver at least 8% GDP growth within the next few years."

A VISION FOR SUSTAINABLE AND INCLUSIVE GROWTH

Indonesia stands on the cusp of transformative growth. With strategic government policies, robust international partnership, and targeted economic stimuli, the nation is poised to become a dynamic hub for millions. These two nation-building projects, combined with President Prabowo's Free Meals program which is in full swing, will play a vital role in achieving and exceeding the country's ambitious 8% GDP growth target.

Deloitte Indonesia looks forward to supporting the Government and Hashim S. Djojohadikusumo in particular with these essential nation-building programs.

Cemarajaya Village, Karawang regency in West Java is affected by rising sea levels. (Source: www.akutmag.ch)

Left to right: Jane Tjahjono, Ike Levick, Hashim S. Djojohadikusumo, Raj Kannan and Ivo van de Griend. (Source: © Arsari)

Java Sea, River Delta aerial view. (Source: Getty Images)

INDONESIA SUCCESSFULLY LAUNCHES ITS NEW INDONESIA ECONOMIC SUMMIT

A refreshed focus on Indonesia's growth and prosperity

THE INDONESIA ECONOMIC SUMMIT (IES) 2025, ORGANIZED BY THE INDONESIAN BUSINESS COUNCIL (IBC), CONVENED ON FEBRUARY 18-19, 2025 IN JAKARTA. THIS INAUGURAL HIGH-LEVEL FORUM ATTRACTED OVER 1,500 PARTICIPANTS FROM 48 COUNTRIES, INCLUDING POLICYMAKERS, BUSINESS LEADERS, 'CAPTAINS OF INDUSTRY', SPECIALISTS, AND ACADEMICS.

IES 2025 centered on two primary themes: growth and prosperity. The Summit aimed to serve as a catalyst for actionable strategies across various sectors, fostering high, inclusive, and sustainable economic development in Indonesia.

Over the two-day event, discussions emphasized the importance of collaboration between the public and private sectors to achieve economic growth, address challenges and opportunities, and build a compelling business case for both domestic and international private investment.

As the recently invited member of the Indonesian Business Council, Deloitte Indonesia is proud to be a member of this important new institution and played a significant role inthe Summit.

Raj Kannan, Infrastructure & Real Estate leader, Deloitte Asia Pacific & South East Asia, led a panel titled, *"Building More and Better: How can Indonesia attract more private infrastructure investment."*

KEY PANEL INSIGHTS

- **Public-Private Partnerships (PPPs):** Raj kickstarted the panel's debate with Indonesia's impressive infrastructure achievements over the past 10 years, including the construction of 366,000 kilometers of village roads, 1,900 new bridges, 1.1 million hectares of irrigation systems, 40 new dams, 44 ferry terminals, 28 new airports, 28 seaports, and 55 new railway lines. He emphasized that while public-sector-led development has been pivotal, embracing PPPs will be crucial for the new government to sustain and accelerate infrastructure growth.
- **Airport management and concessions:** The panel discussed the evolving nature of airport operations, suggesting that private sector entities are well-positioned to manage airport facilities efficiently. By granting concessions, governments can retain control over airspace and national security, while optimizing performance through private management. This approach not only enhances operational efficiency but also builds investor confidence and allows governments to use their budget for other national priorities.
- **Special Economic Zones (SEZs):** Drawing parallels with countries like China and Vietnam, the panel underscored the potential of SEZs in driving Indonesia's economic growth. These designated areas offer incentives such as tax breaks, simplified licensing, and enhanced infrastructure, aiming to attract investment, stimulate industrial growth, and promote regional economic development. By diversifying the economy beyond traditional sectors, SEZs can enhance Indonesia's global competitiveness.
- **Asset concessions:** The panel also advocated for the strategic use of government asset concessions to unlock private sector financing. By offering concessions, the government can allow private operators to manage assets, thereby optimizing performance without relinquishing ownership. This model has been successful globally, as seen in examples like Gimpo International Airport in South Korea, where new strategic partnerships with private operators have enhanced financial performance.

IN CLOSING

IES 2025 underscored Indonesia's commitment to positioning itself as a global growth center, particularly for Nickel based industries, including EVs. By facilitating dialogue among international stakeholders—in sessions like the above panel and various keynotes—the summit aimed to align public policies with private sector initiatives, fostering a resilient and competitive business ecosystem in the region.

The discussions and insights shared over the two days highlighted actionable strategies to attract private investment in public infrastructure, essential for Indonesia's sustained economic growth and prosperity.

The focus should now be on building on this momentum and inspiring the necessary action to achieve Indonesia's inspirational growth ambitions.

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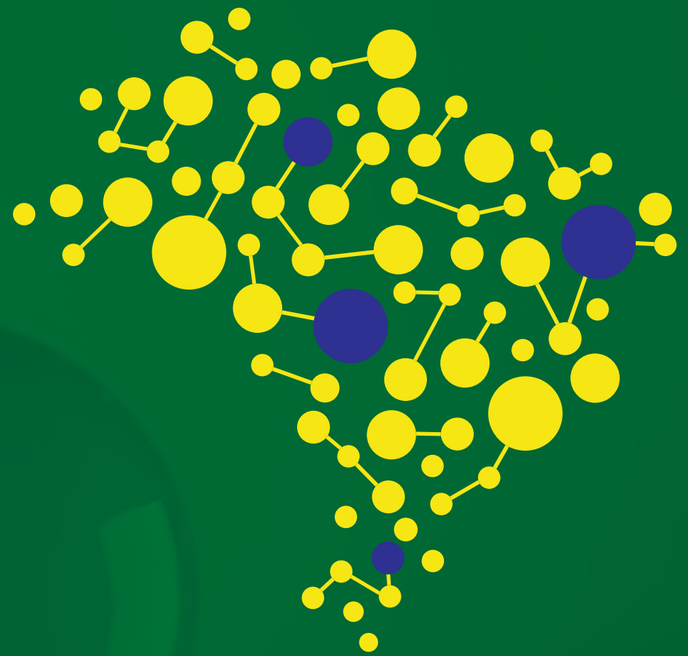
Jakarta, cityscape at sunset. (Source: Getty Images)

ENERGY TRANSITION IN THE HYDROGEN CHAIN

Hydrogen's role in Brazil's energy transition efforts



HYDROGEN IS EMERGING AS A PIVOTAL ELEMENT IN GLOBAL ENERGY TRANSITION EFFORTS, OFFERING A VERSATILE ENERGY CARRIER CAPABLE OF REDUCING EMISSIONS ACROSS VARIOUS SECTORS.

According to the International Climate Initiative (IKI) in Germany, its potential lies in decarbonizing hard-to-abate industries such as steel, cement, and chemicals, where direct electrification is challenging. Additionally, hydrogen-based fuels are being explored for long-haul transportation, including shipping and aviation, due to their high energy density.

Brazil is strategically positioning itself as a leader in the transition to low-carbon hydrogen, leveraging its abundant renewable resources to integrate this versatile energy carrier into its economy.

We asked our Deloitte Brazil colleagues to share their insights into the hydrogen studies they have been conducting with their clients.

LEGISLATIVE CHANGES ARE DRIVING ACTION

There is no doubt that Brazilian government policy is influencing the renewed interest in hydrogen and its potential in facilitating green energy. In September 2024, Brazil enacted Law No. 14,990/2024, establishing the Low-Carbon Hydrogen Development Program (PHBC).

This program offers tax credits to promote the production and utilization of low-carbon hydrogen, aiming to support energy transition initiatives and set targets for developing the domestic low-carbon hydrogen market.

PUTTING HYDROGEN UNDER THE MICROSCOPE

Deloitte Brazil has been conducting broad studies to assess the low-carbon hydrogen economic chain, encompassing production, transportation, distribution, storage, and application technologies across various sectors, particularly hard-to-abate industries. In 2024, the team developed a model in just three months to accommodate different hydrogen supply chain scenarios, considering factors such as cost, water footprint, and emissions.

Ana Pinzon, manager, Energy Transition, Deloitte Brazil, emphasizes the importance of analyzing each segment of the hydrogen value chain—and the exploring the potential of low-carbon hubs to manage risks and enhance efficiency:

"We carefully study every link in the hydrogen economic chain, and its application in different industries and sectors. This involves comparative analysis of different technologies and exploring the mass and energy balances. We also look at logistics and the different combinations of production and transportation, and the various greenhouse gas effects on the hydrogen chain."

Eduardo Raffaini, Deloitte Brazil Infrastructure & Real Estate leader, highlights the significance of the energy transition in business strategies, and Deloitte Brazil's commitment to developing optimal hydrogen solutions for clients:

"In Brazil, legislative progress has been made with the Senate's approval of rules for the Low-Carbon Hydrogen Development Program, aimed at promoting the development of low-carbon hydrogen technologies. So, it comes as no surprise that many of our clients are focused on their energy transition, which is increasingly becoming part of their business strategy focus.

"In response, we have built a specific sector team here in Brazil to focus on developing the optimal hydrogen chain.

"The team is currently deep diving to thoroughly understand different methods of hydrogen production and distribution – so they can advise on optimizing the hydrogen chain and its role in energy transition."

For example, for one client, the team studied the precise location of where hydrogen could be produced safely – exploring factors such as the site's proximity to other existing locations, and how other industries could benefit from using that same hydrogen facility.

Ana says, *"In some cases, developing a low carbon hub is the answer to manage risks and maximize efficiency. By sharing the infrastructure with adjacent competitors, given that several industries are using hydrogen, this would help to share risks across industries, minimize costs and maximise value. The transportation link would also be solved with shorter distances."*

The industry is moving away from color-based classifications (green, blue, pink) to focusing on 'low-carbon hydrogen,' aligning with Brazil's technological neutrality in its legal framework.

HYDROGEN PRODUCTION: A CLOSER LOOK

Assessing the carbon impact of various hydrogen production technologies is important to ensuring low emissions throughout the hydrogen chain, regardless of the method used.

For example, the way hydrogen was produced always mattered in the past, such as choosing electrolysis or carbon capture and storage (CCS). But to guarantee low emissions, the technology you use doesn't matter; it's important that you have carbon impact in your chain.

"A key focus is trying not to define the use of hydrogen by the available technology. For example, the oil and gas industry is interested in producing hydrogen and capturing carbon," says Ana.

There is no doubt that government and private sector adoption is driving momentum – and the team is excited about what the next 12 months holds while momentum is building.

With legislative support and proactive industry participation, Brazil is poised to become a leader in the global low-carbon hydrogen economy, driving momentum in the hydrogen sector.

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Hydrogen molecule. (Source: Getty Images)

THE URGENCY OF ENERGY TRANSITION

Transforming the built environment for a more sustainable future

Stephen Penderville, Infrastructure leader, Deloitte Ireland, is passionate about accelerating building sustainability:

"We should accelerate the delivery of retrofitting solutions right now if we are to have any chance of meeting our collective climate ambitions. We know what is necessary and unlocking finance structures that reduce barriers to implementation is one of our core focus areas. The time to act is now."

Michael Flynn, Global Infrastructure, Transport & Regional Government leader:

"Governments have an opportunity to provide market leadership, achieving sustainability ambitions while utilizing its own buildings to catalyze the growth of a new industry sector—creating jobs and economic benefit."

THE BUILT ENVIRONMENT—OUR EXISTING BUILDING STOCK—SHOULD PLAY A CRITICAL ROLE IN DELIVERING ON AMBITIOUS GLOBAL SUSTAINABILITY TARGETS. 80% OF TODAY'S BUILDING STOCK WILL STILL BE IN USE BY 2050[1].

Meanwhile, the World Green Building Council[2] has identified that buildings contribute a staggering 39% of global energy-related carbon emissions: 28% from operational emissions—energy needed to heat, cool and power them—and another 11% from materials and construction.

This makes one thing clear: retrofitting existing buildings to be net-zero, or 'Net Zero Ready,' is important for the energy transition.

THE POWER OF SUSTAINABLE RETROFITTING

Sustainable retrofitting involves upgrading existing buildings with energy-efficient systems that drastically reduce energy consumption and emissions. These upgrades can be as simple as installing LED lighting, upgrading windows and insulation or as extensive as integrating state-of-the-art heating and cooling systems.

While sustainable retrofitting alone won't solve climate change, the built environment remains one of the most significant carbon emitters, and its operational emissions should be tackled urgently. Rapidly scaling retrofitting interventions is essential to reaching 2050 energy transition targets[3].

While making buildings sustainable is relevant for both public and commercial sectors, the drivers to implement can be different. In the commercial sector, valuations and the ability to let a building tend to be key drivers. Tenants are now demanding efficient sustainable buildings to rent and own. While a sustainable building may have had a positive valuation impact in the past, making buildings sustainable may now be necessary to protect value.

In the public sector, Governments have generally made commitments to reduce national emissions and need to show leadership. Targeting their own building stock has a number of benefits—reducing emissions in these buildings, supporting and growing a new sector in the economy, and economic upside from the retrofitting spend and the multiplier effect into the wider economy.

OVERCOMING THE CHALLENGES OF BUILDING ENERGY TRANSITION

Transitioning to sustainable buildings is complex and faces several barriers:

1. **Funding constraints:** The significant upfront investment required for retrofitting remains a major roadblock. The public sector generally has limited funds, and while both the public and private sector can borrow the required funds, this presents challenges. Lending institutions support energy transition in principle, however are often hesitant to finance measures based solely on projected energy cost savings. Any additional capital required should therefore fit within their existing parameters, for example – lending security requirements and loan to value ranges, with limited appetite for funding on efficiency measures or expecting operating or energy cost savings alone. As a result, building owners can struggle to secure capital, creating a financial bottleneck that slows retrofitting adoption.

2. **Knowledge gaps:** While there is generally expertise in segregated elements of the retrofit process, there is limited expertise and experience in managing the full retrofit process and gaining the required efficiencies across both public and private sectors. Robust training programs to upskill professionals as well as growing the number of market players is required to avoid delays and inefficiencies.

3. **Supply chain limitations:** The market for sustainable materials and technologies remains underdeveloped, leading to higher costs and supply shortages. Inconsistent regulations across regions further complicate retrofitting efforts, making it difficult for suppliers to create global scale and cost efficiencies.

4. **The commercial incentive to act:** Currently, building owners are primarily driven to retrofit buildings when valuations and rent levels are being impacted. Value preservation involving substantial capital outlay will always be delayed until they're unavoidable. This is where Government can lean in, by incentivizing the transition and being a leader by retrofitting its own buildings, helping the various market challenges to get solved through action.

5. **The split incentive problem:** In commercial buildings, the costs and benefits of retrofitting can be misaligned. Owners fund capital upgrades, while tenants benefit from reduced utility costs. Since tenants are typically unwilling to pay higher rents for sustainability improvements under existing leases, many retrofitting projects are deferred until vacancies occur. Some form of benefit sharing to fund the retrofit costs could assist on this but would need to be included in tenancy agreements.

PUBLIC SECTOR OFFICE BUILDINGS: A CATALYST FOR INDUSTRY-WIDE TRANSFORMATION

Office buildings, particularly public-sector owned ones, offer a strategic starting point for large-scale sustainable retrofitting. The scale of the public sector portfolio; and the fact that these buildings are generally owner-occupied, and the Government's ability to shape incentives to align with requirements, should allow the sector to invest to grow capacity and experience. This can then be used in the wider commercial office market as well as other assets requiring retrofit including housing. Retrofitting government buildings in the UK is estimated at US$32 - 38 billion—similar scale estimates are expected in other countries. This level of spend will create jobs and economic return as well as generating market momentum, foster innovation, and establish leading practices for broader industry-wide application.

DRIVING INNOVATION: DELOITTE'S SUSTAINABLE RETROFITTING SOLUTION

Deloitte has developed a comprehensive Sustainable Retrofitting Solution designed to help building owners manage their retrofit process, including sourcing the required finance to achieve energy transition.

Our approach leverages energy savings to repay financing, effectively making the process self-funding and reducing traditional budgetary constraints. Through an integrated suite of services—including feasibility studies, financial modeling, energy audits, customized sustainability plans, regulatory compliance, financing, project management, and procurement—Deloitte provides seamless delivery of fully retrofitted, decarbonized buildings.

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Modern ecological architecture, 3D rendering. (Source: Getty Images)

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* Currency converted GBP to USD as of 9 April 2025

The Jebel Ali plant in the United Arab Emirates.
(Source: TIME Magazine)

THE GLOBAL ENERGY TRANSITION IS ONE OF THE MOST IMPORTANT ECONOMIC AND TECHNOLOGICAL SHIFTS IN MODERN HISTORY

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