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Defining the pathway for decarbonization in the transport sector

Insights with Tanmay Bishnoi,
Jacobs Asia Decarbonization Strategy Lead

Asia Decarbonization Strategy Lead Tanmay Bishnoi talks about our approach to defining the decarbonization pathway, insights from transport's decarbonization journey, and how we're supporting authorities and operators to make the transition.

Did you know that transport, including air, sea and land travel, is responsible for nearly...

25%[1]

OF THE WORLD'S CARBON EMISSIONS

64%[2]

OF GLOBAL OIL CONSUMPTION

As populations expand and economies evolve, global demand for passenger and freight transportation grows, along with transport's emissions footprint. According to the Intergovernmental Panel on Climate Change, this trend shows no sign of abating.[3] Transport-related emissions will continue to rise unless we make rapid, large-scale reductions in greenhouse gas emissions stemming from these activities.

As such, it has become a global imperative for governments, transport authorities and organizations to set the transport sector on track to meet the Paris Climate Agreement targets and avert the worst climate impacts.

In Singapore

80%

REDUCTION IN PEAK LAND TRANSPORT EMISSIONS BY 2050

100%

CLEAN ENERGY VEHICLES BY 2040

Envisioned by the Singapore Green Plan 2030.[4]

In the U.K.

2050

NET ZERO TARGET

In 2021, the U.K. government released its plan to cut emissions across all modes of transport, setting out a roadmap for the sector to reach net zero by 2050.[5]

In the U.S.

100%

CLEAN ELECTRICAL GRID BY 2035

Net zero

CARBON EMISSIONS BY 2050

Detailed in the U.S. federal agencies' National Blueprint for Transportation Decarbonization.[6]

There are many ways the transport sector is stepping up to make this shift - transitioning to renewable energy supply, acquiring green fleets of Electric Vehicles (EV) or hydrogen-powered vehicles, implementing carbon taxes and promoting active mobility modes like walking and cycling. These measures not only help to reduce emissions but also help improve air quality and ultimately, the health and wellbeing of local communities. While there is still much work to be done, the transport sector is taking essential steps toward a cleaner, more sustainable future.

The rapid uptake of net zero targets signifies a hopeful inflection point for the industry; however, achieving these is a complex undertaking that requires a comprehensive suite of solutions addressing multifaceted challenges across infrastructure, operations and governance. Transport decarbonization will require a fundamental rebalancing of the energy environment, development of new supply chains and a significant investment in infrastructure and workforce development. Careful planning and implementation will be needed to realize a green fleet future, whether for an urban transit agency or a small-town municipal fleet.

So, where to begin?

Broadly speaking, decarbonization is an overarching path to a net zero future comprised of two critical pathways:

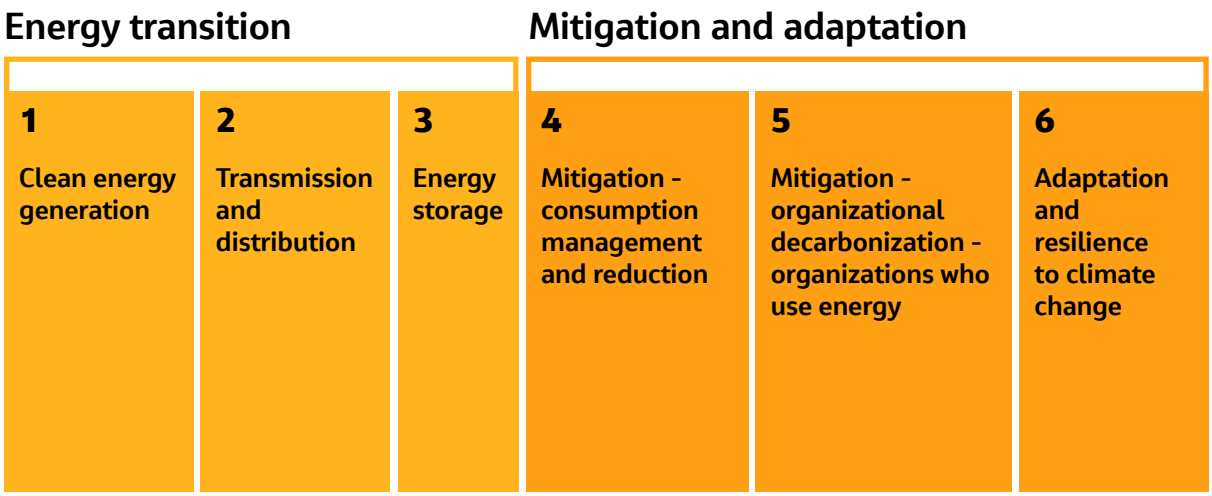
Energy transition

Significantly reducing the release of emissions by shifting to clean energy generation, transmission, distribution and energy storage. In the transport sector, this may include adopting electric mobility, charging infrastructure powered by clean energy, and using Hydrogen/Fuel Cells to power rail and road transport vehicles.

Mitigation and adaptation

Developing a sustainability strategy related to carbon management by building a comprehensive carbon baseline and carbon abatement measures, as well as adaptation and resilience measures to address the impacts of climate change.

To accelerate the transition and successfully mitigate the worst impacts of climate change, our efforts must address both of these critical pathways. It is also important to highlight that there is no one-size-fits-all solution to decarbonization, and a net zero future will be unique to every organization.



Decarbonization delivery framework

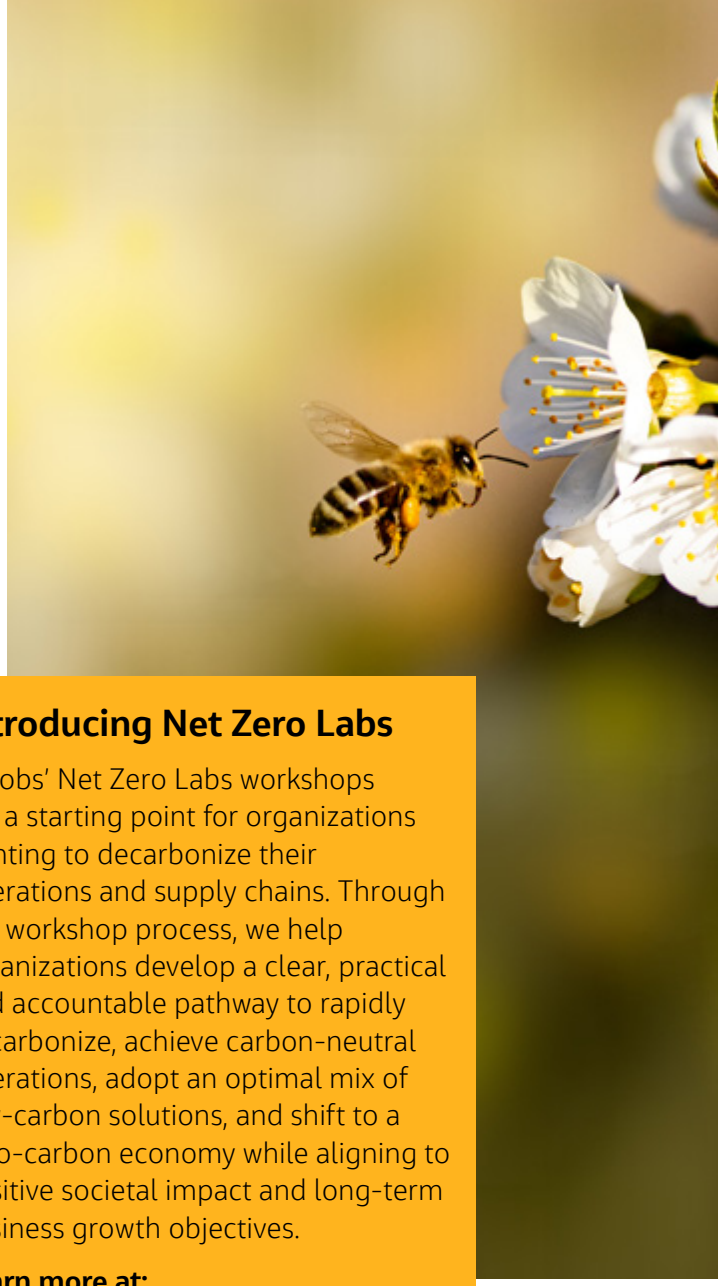
Decarbonization is a complex process and requires input from a broad range of experts and stakeholders.

Teams must collect and report data, calculate emissions, set targets and manage abatement initiatives. Defining and adopting a comprehensive approach to decarbonization will help organizations systematically and effectively tackle emissions reduction, chart a clear pathway to carbon neutral operations and set the stage for a more sustainable future.

Baselining emissions is the first critical step toward decarbonization

To achieve net zero emissions, it's important to have a clear understanding of where you currently stand. Measuring baseline emissions is an essential first step to this process. Baselining emissions helps organizations understand the sources and intensity of their scope 1, 2 and 3 emissions, identify the areas where emissions reduction strategies can be most impactful and provides point of reference against which future progress can be tracked.

However, for many organizations, baselining emissions can be a big challenge. The process of tracking and reporting emissions data can be time-consuming and resource intensive, particularly for Scope 3 emissions which are large and indirect. Further, the uncertainties associated with the analysis and interpretation of results can sometimes lead to more questions than answers.



Introducing Net Zero Labs

Jacobs' Net Zero Labs workshops are a starting point for organizations wanting to decarbonize their operations and supply chains. Through the workshop process, we help organizations develop a clear, practical and accountable pathway to rapidly decarbonize, achieve carbon-neutral operations, adopt an optimal mix of low-carbon solutions, and shift to a zero-carbon economy while aligning to positive societal impact and long-term business growth objectives.

Learn more at: jacobs.com/net-zero-labs

Electrifying vehicle fleets is a key priority

Domestic and international transport currently generates 20 percent of global greenhouse gas (GHG) emissions, as per World Bank.[7] In particular, road travel accounts for three-quarters of transport emissions. Most of these emissions come from passenger vehicles such as cars, taxis and buses.

Electric vehicles, hydrogen-powered vehicles, and active transportation such as bicycles and other forms of micro-mobility offer viable alternatives; however, the scale of uptake of zero emission vehicles to date has been modest, and we've got a long way to go.

FLEET MAX

Jacobs has various in-house tools such as **Fleet Max** Energy Modeling software to support the conversion of vehicle fleets from fossil fuels to zero-emission alternatives. By considering various aspects of fleet operation such as transport service, electric power demand and cost, this solution helps organizations optimize their transition to green fleets, reducing emissions and improving sustainability outcomes.

To further accelerate the transition to green fleets, ramping up investment in alternative vehicle technology research, development and deployment, as well as the associated charging or refueling infrastructure must be at the top of the agenda.

10 million

ELECTRIC CARS ON THE ROAD IN 2020

According to the International Energy Agency, ten million electric cars were on the road as of 2020, and electric micro-mobility options are also expanding. Shared electric scooters, electric-assist bicycles and electric mopeds are now available in over 600 cities across 50 countries.[8] Further research reports suggest that the global electric vehicle market saw a 65% YoY growth in 2022 and EVs accounted for over 14% of the world's passenger vehicle sales in 2022[9].

To decarbonize the rail sector, electrification of rolling stock and associated infrastructure is the key, which should then be powered by renewable energy instead of fossil fuels. Another alternative is to increase the uptake of hydrogen fuel cell, batteries and biodiesel for rolling stock.

Measuring impacts of new energy sources, as well as changes driven by performance characteristics of fleets

Transitioning from fossil fuels to lower carbon alternatives has a vital role in reducing transport's climate footprint. Alternative fuels such as biofuels and energy sources such as solar, wind, hydrogen and geothermal, can be explored. As new innovations and technologies are developed and tested, rigorous monitoring of performance, efficiencies and impacts of these solutions is critical to identify areas for improvement.

Numerous methods and tools can be applied to set robust 'science-based' goals at both local and regional levels. This includes defining impact and opportunity by sector or service area if required. If offsetting is required, assurance on approach, principles, ownership and validity will need to be planned.

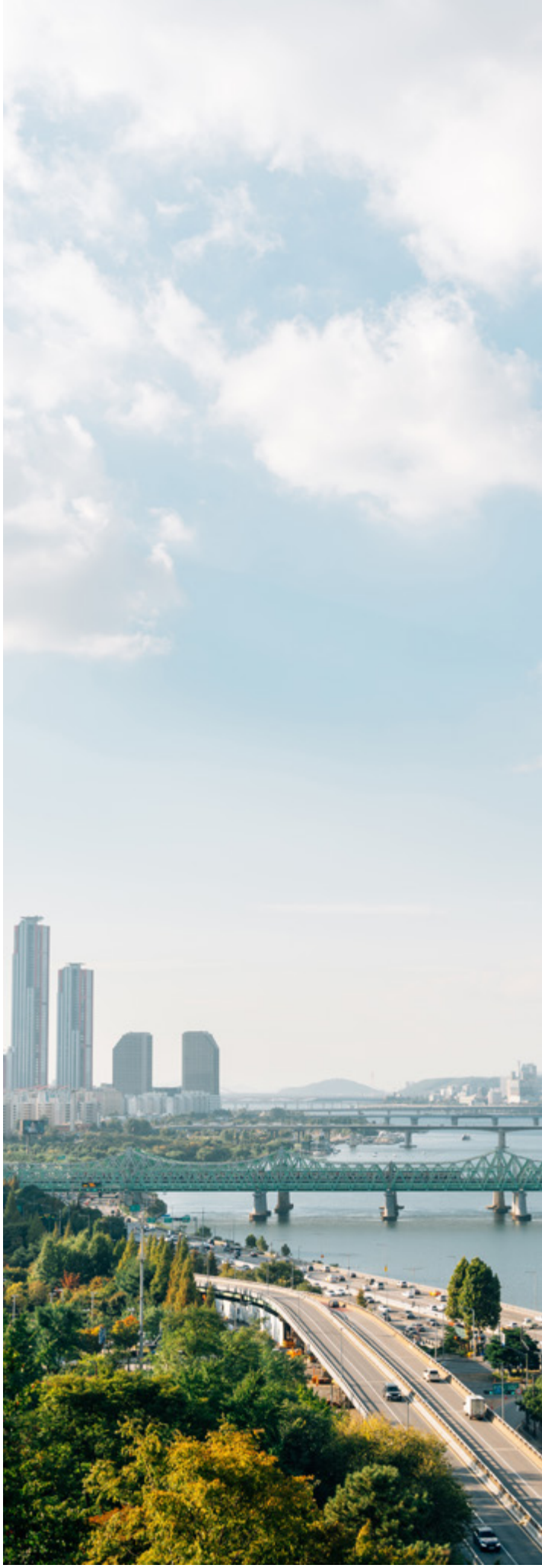
Generating maximum social, economic, and environmental benefits

Decarbonization presents a significant opportunity for transport authorities to collaborate with city stakeholders and local communities to look for synergies across diverse projects, assets and infrastructure to deliver the maximum associated social, economic and environmental benefits. Beyond climate impacts, we must not lose sight of opportunities to contribute to the broader society's quality of life, community wellbeing, equity and economic mobility.

Conclusion

Significant strides are being made to support a transition to a zero-carbon transport system. However, further efforts are required to transform the sector successfully, including:

- Accelerating the broad adoption of zero emission road vehicles and the supporting charging and refueling infrastructure.
- Advancing government policies and regulations and incentivizing industry-led technological advancements are also critical in supporting this transition. Driving original equipment manufacturer coordination, battery technology advancements, and provision of grid reinforcement and infrastructure to enable uptake and consumer confidence.
- Exploring innovative technologies such as Vehicle to Grid (V2G) technology potential to perform a load balancing service and support in managing the variability of renewables.
- Transitioning rail services to full electrification or hydrogen fuels, supported by both efficiencies and increased deployment of renewable energy.
- Clearly prioritizing active mobility and associated infrastructure to enable the transition.
- Adopting a holistic, integrated approach with clear alignment of local policies to achieve carbon neutral goals, reduce congestion, improve air quality and tackle health, wellbeing and equality issues.



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Disclaimer

About the author:

Tanmay Bishnoi is a senior management consultant at Jacobs with a master's degree from Kingston University London and is a Chevening Fellow in Leadership and Excellence from the University of Oxford. He has more than 14 years of cross-continent experience across Singapore, India, the U.S., Central Asia, the Middle East and Europe. He specializes in decarbonization and net-zero strategy, clean energy transition including renewable energy and energy storage, corporate renewable energy procurement, program management, pre-feasibility and feasibility analysis. He has also worked on emerging technologies like green hydrogen and electric mobility.

Tanmay is a Chartered Engineer with the Institution of Engineers, an Associate Member of the Institution of Engineering and Technology U.K., a Life Member of Leaders Excellence at Harvard Square, a Renewable Energy Expert from the European Union Energy Centre and a COBENFITS Specialist in Renewable Energy.

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