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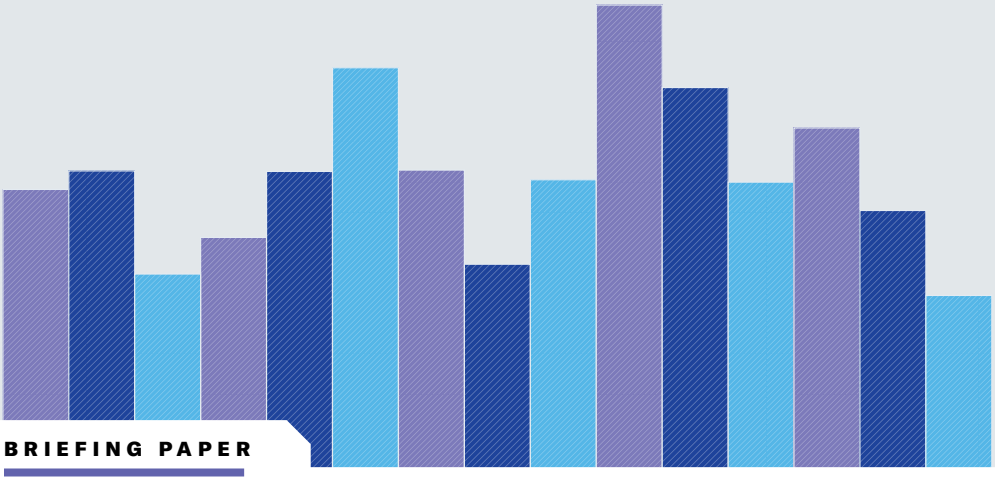
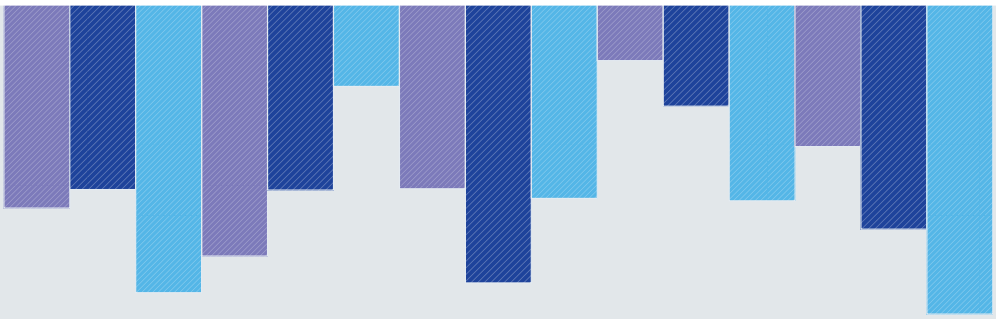


BRIEFING PAPER

Creating a Successful Plan to Electrify Transportation Infrastructure



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Now the challenge is practical, immediate, and local. Transportation officials and local authorities grappling with their mandate to execute green infrastructure projects seek the right starting point—a strategy and approach to plan their net-zero future. How to begin?

As the analyst, think-tank, and academic thought leaders interviewed for this Harvard Business Review Analytic Services report attest, the best starting points rely on deep expertise.

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Frederic Godemel
EVP Power Systems & Services
Schneider Electric

Creating a Successful Plan to Electrify Transportation Infrastructure

Transport is the largest single contributor to global carbon emissions. In 2020, that sector accounted for 27% of greenhouse gas emissions in the United States, according to the U.S. Environmental Protection Agency. A global movement is underway to help the world avoid the worst impacts of climate change by building new, decentralized, and decarbonized transportation infrastructure, which will require $50 trillion of investment globally by 2040, says the Global Infrastructure Outlook, which is published by Sydney-based Global Infrastructure Hub, an infrastructure research not-for-profit firm. Recent U.S. infrastructure legislation and the EU's European Green Deal have allocated $3 trillion and €1 trillion, respectively, for vital infrastructure investments to aid this transition. But executing and sustaining the ambitious goals of these infrastructure programs will fall to local authorities.

Such responsibility puts a tremendous weight on local officials in light of what's at stake when it comes to achieving green infrastructure goals and securing the available funds.

As a result, local authorities need help developing plans that align with policies that have already been set. Indeed, even with access to available funding, knowing how and where to begin moving from outdated carbon-emitting energy systems to low-carbon alternatives can be a daunting prospect.

HIGHLIGHTS

Once local officials have evaluated their energy capacity needs, they can **set firm low-carbon transportation and mobility goals** and chart a plan to get there.

Partnerships between government and one or more private-sector organizations provide local entities with a way to **bridge gaps in financing, delivery, operations, and/or maintenance of low-carbon transportation infrastructure.**

Because municipalities have limited budgets and resources, finding **cost-effective solutions and identifying additional funding streams** to support ongoing expenditures are priorities.

Knowing how and where to begin moving from outdated carbon-emitting energy systems to low-carbon alternatives can be a daunting prospect.

Local transportation and government authorities likely will have to build their own "must do" checklists to create the mobility and transportation infrastructure of tomorrow. This task will require some internal fact-finding, followed by identifying cost-efficient electrification and decarbonization transportation solutions and ongoing funding sources. Local officials may need to seek help from private-sector partners and consultants and to enlist transportation operators and other stakeholders in educating and engaging the public on how a green energy transportation plan aligns with community interests, as well as health, economic, and societal priorities.

Many times, that priority list requires outside help, says Rafael Aldrete, PhD, the senior research scientist at Texas A&M's Transportation Institute in College Station, Texas. "Unfortunately, municipalities don't often get that opportunity or training to implement green projects," he explains. "The analyst or consultant has helped other agencies implement or plan similar projects. They know what the potential issues are and can provide the agency with information to make a plan much better."

This report examines the responsibilities that sustainable infrastructure programs will bestow on local transportation and government officials and the approaches they can take to fulfill those responsibilities. It also establishes best practices for executing the net-zero carbon and other goals set for future transportation investment, including drawing on outside resources such as consultants and community stakeholders.

Auditing a Municipality's Energy Use

In order to achieve a net-zero future, governments are deploying and using renewable energy for a variety of reasons, such as reducing local air pollution, advancing local economic development, lowering operational costs, improving energy access, and bettering the health and well-being of citizens. Overseeing the energy supply and driving the transition to renewables has traditionally fallen under the purview of national governments, which are responsible for national energy policy.

Executing low-carbon transportation infrastructure plans, however, will primarily fall to local authorities, among others, and transportation and e-mobility revamps are among the key components of these climate change initiatives they'll have to tackle first. Since the money will be distributed to state and local governments, they will also have responsibility for how to best use the funds to achieve clean energy goals.

Whether the plan is for enhanced public transportation, electric vehicles, airports, ports, or railway networks, a successful implementation of any future plan starts with a thorough assessment and understanding of the current landscape—which can best be performed by the local authorities who are most familiar with the current platform. Annie Hudson, assistant director at the MIT Mobility Initiative in Cambridge, Mass., says these officials should begin the process by conducting a technical evaluation or audit of the performance of the current platform and how it can be improved to include more green energy.

Transportation experts interviewed for this paper say a local authority tasked with executing the sustainability goals of the infrastructure build-out should start by gathering data about a municipality's energy use, including any planned energy efficiency improvements, to project future demand based on anticipated population growth and expanding economic activity. Local officials then must answer other questions, such as these: What fuels and equipment is the municipality currently using? What are the demands and behavioral patterns of end users? Are there suppressed demands within the community because energy sources aren't able to meet demand? What about affordability? Are there instances when residents are unable to afford the energy they need? Are there specific resources that will improve quality of life for the community?

Mapping Out the Future

At the conclusion of this fact-finding, local officials will need to map out different scenarios and various renewable energy combinations and growth rates. Lori Bird, director of the U.S. Energy Program and the Polsky Chair for Renewable Energy at the World Resources Institute (WRI), a nonprofit global environmental think tank headquartered in Washington, D.C., says it is important to keep in mind that the types of resources available—wind, solar, geothermal—will vary greatly depending on geography and suppliers. "Cities that are served by a regulated utility will have limited clean energy offerings and less ability to negotiate than in a competitive electricity market," says Bird.

Most communities are served by a single regulated utility, which limits the options for obtaining energy resources. "It is likely that some supply will need to be imported from neighboring municipalities, smaller cities, and the wider region," says the MIT Mobility Initiative's Hudson. "The build-out of renewables should be approached as a regional issue and planned in collaboration with regional partners in a way that takes technical capacity, financial viability, and regulatory barriers into consideration."

This wider geographic scope means that local authorities must analyze things like existing grid capacity to determine how particular assets and resources fit into the broader regional and state picture and overarching goals, according to Hudson.

Of course, every infrastructure project needs a realistic timeline that takes hiccups into account, says WRI's Bird. "The time frame depends on the type of project and the region," she explains. "We've seen delays or challenges caused by things like issuing and getting responses to RFPs [requests for proposal], contract negotiations with suppliers, and failing to factor in additional costs."

Texas A&M's Aldrete advises clients to expect snafus in procurement, particularly when it involves new and emerging technologies. "All of this available infrastructure money has created a huge demand for electric vehicles [EV], but the market may not be able to provide enough vehicles to meet that demand soon enough," he says. "If you're not familiar with technology and don't have any background to address those characteristics, you may need to consider going small."

Electrification Is the Essential Component

Once local officials have evaluated their energy capacity needs, they can set firm low-carbon transportation and mobility goals and chart a plan to get there, keeping in mind that the most obvious path may not be the best one. For example, if a municipality's end goal is reducing pollution and vehicle emissions, building a comprehensive EV charging system may seem like the obvious solution. On closer inspection, however, such an ambition might not be feasible.

"Most municipalities are part of the bigger state and federal plan, so it doesn't make much sense to build out a robust charging infrastructure if there isn't a larger corridor infrastructure to connect to," says Hudson. "Instead of building out ideas in a vacuum, local municipalities should consider filling in the gaps left by national governments. If your state or region isn't building out charging stations for EV, expanding other alternative modes of transportation like bike lanes may be a better investment of resources."

Almost 88% of the 2,800 industry executives surveyed for Deloitte's "Energy Transition Trends Report 2022" identified electrification as key to unlocking and accelerating the clean energy transition. This finding appears to be the prevailing view on both sides of the Atlantic. Electrification is a large part

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of the U.S. infrastructure law and the European Green Deal. In Europe, the deployment of fully electric buses increased from a 5% sales share in 2016 to 10% in 2021, according to the International Council on Clean Transportation (ICCT). The Netherlands has pledged to convert its entire bus fleet to zero-emission as early as 2030, and, on the city level, Amsterdam and Copenhagen are planning for a fully zero-emission bus fleet by as early as 2025. Just one month after the EU proposed to eliminate all carbon-emitting cars and vans by 2035, the United States unveiled its plan to ensure that electric vehicles account for 50% of all vehicle sales by 2030. These are clear indicators that electrification is the future of global mobility.

In reality, however, there aren't nearly enough charging stations to support these electric vehicles.

Both the infrastructure law and the Green Deal take these shortcomings into account and offer plans and incentives to help local entities connect to a much broader network of charging stations to meet the expected growth in demand. The infrastructure law, for example, also addresses very real concerns about the location of stations, costs, connectivity, and reliability, particularly in areas where daily driving distances are long and people lack dedicated parking spaces at home or at work. But taking advantage of this unique opportunity depends on local authorities' ability to secure and use available funds to effectively advance their clean energy transformation goals.

Finding the Funding

Money is flowing toward projects that can be shown to be lowering carbon emissions and mitigating climate change. According to the World Bank, government support has increased for low-carbon projects, from 3% before 2010 to 51% currently. In the summer of 2022, the EU announced an investment of €5.4 billion in sustainable, safe, and efficient transport infrastructure. The share of sustainably invested assets among investors worldwide was 18% in 2020 and is expected to more than double to 37% by 2025, according to the ICCT.

Because municipalities have limited budgets and resources, finding cost-effective solutions and identifying additional funding streams to support ongoing expenditures are priorities. Much of the federal infrastructure funding will be awarded through highly sought-after and competitive grants. It is vital to create low-carbon mobility and green infrastructure projects that maximize specific co-benefits and are eligible to receive funding from these different initiatives.

When helping clients secure government funding, Aldrete says, the first step is knowing which specific funding to pursue, then putting together a competitive application. "The grant application should convey a keen understanding of the project, familiarity with the technology, and supply availability," says Aldrete. "If you have no familiarity or background in this area, you need to get up to speed quickly."

For example, the European Commission selected 135 transport infrastructure projects for grants from the Connecting Europe Facility, the EU's funding instrument for strategic investment in transport infrastructure. Similarly, the U.S. Department of Transportation (DoT) funds green infrastructure projects that improve transportation networks. Disaster recovery and relief funding is available for projects that mitigate the effects of current and future disasters. Projects that benefit low- and moderate-income individuals and address an urgent community need may qualify for a Community Development Block Grant, and Energy Efficiency and Conservation Block Grants are available for projects that reduce carbon emissions and total energy use.

In August 2022, U.S. Transportation Secretary Pete Buttigieg announced the first recipients of more than $2.2 billion from the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) program, a part of the infrastructure law.

The grantees were chosen based on a number of factors, including how their projects will improve accessibility for all travelers, bolster supply chain efficiency, and support racial equity and economic growth in historically disadvantaged communities and areas of persistent poverty. The DoT's choice of grant recipients provides a clear indication of the types of projects the administration not only values but also is most likely to fund.

Meanwhile, in Europe, the European Commission manages and finances the InvestEU Advisory Hub, a free online tool

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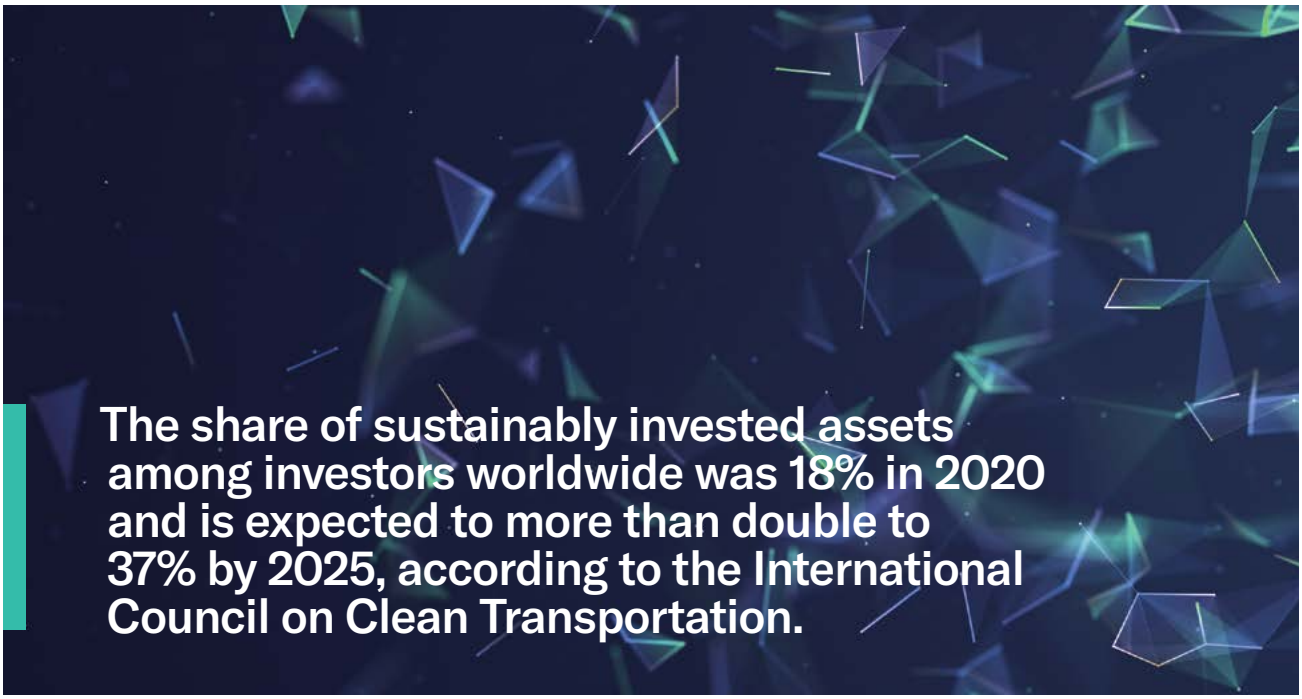

that serves as the central entry point for project promoters and intermediaries seeking advisory support, technical assistance, and connections with investors worldwide.

The Benefits of Public-Private Partnerships

Since many transit agencies are regional, municipalities often struggle to align all those priorities. Partnerships between government and one or more private-sector organizations provide local entities with a way to bridge gaps in financing, delivery, operations, and/or maintenance of low-carbon transportation infrastructure. They also allow local governments to make significant upfront capital investments without straining their municipal debt limit.

Besides having the ability to attract private capital investments, private-sector partners usually have the technical expertise to deliver more cost-effective results on a faster timeline.

Hudson believes there are many benefits that make forming a public-private partnership a no-brainer for most municipalities. "I actually think that public-private partnerships are really the only way to go about building a lot of this infrastructure for EV charging, and it definitely makes more sense for the private sector to maintain them," she explains. "It really doesn't make sense for the public sector to own or operate EV charging stations, because long-term maintenance is so intense."

Bird points to a partnership between Amazon and the city and county of Arlington, Va., as an example of a win-win situation for both parties. After the online retailer and web services provider identified Arlington as the location for its second headquarters, it set out to power its four-million-square-foot campus with 100% renewable energy from its privately owned energy producers across the state. About two-thirds of the renewable energy generated will go to Amazon, while Arlington County will get the rest.

"The benefits for the county and city were obvious," Bird explains. "The city benefited from negotiating a larger project that they otherwise weren't able to afford."

Canada has many great examples of the benefits of public-private partnerships. One example is the Canadian pension fund, CDPQ, which is investing in Montreal's new light rail system with public co-investors and holds a right to commercialize last-mile transit solutions and link stations to the commercial areas the fund is also developing.

The Value of Specific Expertise

Energy consultants are well versed in low-carbon energy and infrastructure technologies. They can help with both broad planning and implementation and provide data-driven insights on energy management and mobility electrification to help accelerate the transition to clean energy and renewables.

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A global movement is underway to help the world avoid the worst impacts of climate change by building new, decentralized, and decarbonized transportation infrastructure, which will require $50 trillion of investment globally by 2040, says the Global Infrastructure Outlook.

"External consultants understand the available options for renewable energy sources, the level of support from private investors, and the business models and financial instruments that cities can use to implement clean energy projects and policies," says Hudson. "Because they do a lot of work bringing different groups together to talk through what the city needs and what the utility can supply to meet their goals, consultants can be an important support mechanism to help the city determine their risk and the potential cost of different types of transactions as they're going through this process."

While the ultimate decisions are made by municipal leaders, consultants also bring an arm's-length perspective and can provide a reality check to make sure the proposed project makes sense.

Remembering Stakeholders

In addition to consultants, involving stakeholders—utilities, large energy-using institutions, relevant civil society groups, the public—is a requirement, not an option, because these projects involve significant amounts of public money, Aldrete explains. It also will help the public better understand how a green energy transportation plan aligns with community interests.

In fact, among the things to consider when it comes to societal benefits are long-standing inequities in the distribution of energy costs and benefits that require thoughtful and targeted intervention to make sure the green revolution doesn't leave anyone behind or exacerbate racial, gender, and geographic inequities.

The U.S. infrastructure law is the first-ever program with the stated goal of reconnecting communities divided by transportation infrastructure. According to Bird, some cities are addressing equity issues by directing infrastructure money to create good-paying jobs for workers in rural areas and historically disadvantaged communities, those displaced by energy transformation, and those who don't have a college degree.

Similarly, the European Green Deal acknowledges that EU member states and regions that rely more on fossil fuels will face the greatest challenges in transitioning to a clean energy economy. The plan is to invest at least €1 trillion in sustainable investments over the next decade and set in place funds and specific mechanisms to ensure an equitable transition.

Plans on both sides of the Atlantic can also serve as a template for how local authorities can incorporate equity-related improvements into their own plans to lessen pollution and make infrastructure more resistant to climate change.

Conclusion

The growing global consensus around the threats posed by climate change has brought many nations together to find and fund workable solutions, particularly in the transportation sector.

As regional and local government authorities become more central to leading the way on carbon reduction, they will be required to take on many more responsibilities. They must be fact finders when it comes to evaluating their communities' energy and transportation needs and how low-carbon mobility and transportation infrastructure can help meet them.

They will also have to enlist outside help from consultants, private-sector partners, and stakeholders such as utilities and the public itself. Outside expertise will help identify and implement the decentralized and decarbonized transportation infrastructure required to build the green energy city of the future.

"A good practice would be to let everyone know early on about the commitment to become greener and be as energy efficient as possible," says Aldrete. "That provides an opportunity to make the public aware so that by the time that money becomes available, the community is already aware of where things are heading."

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