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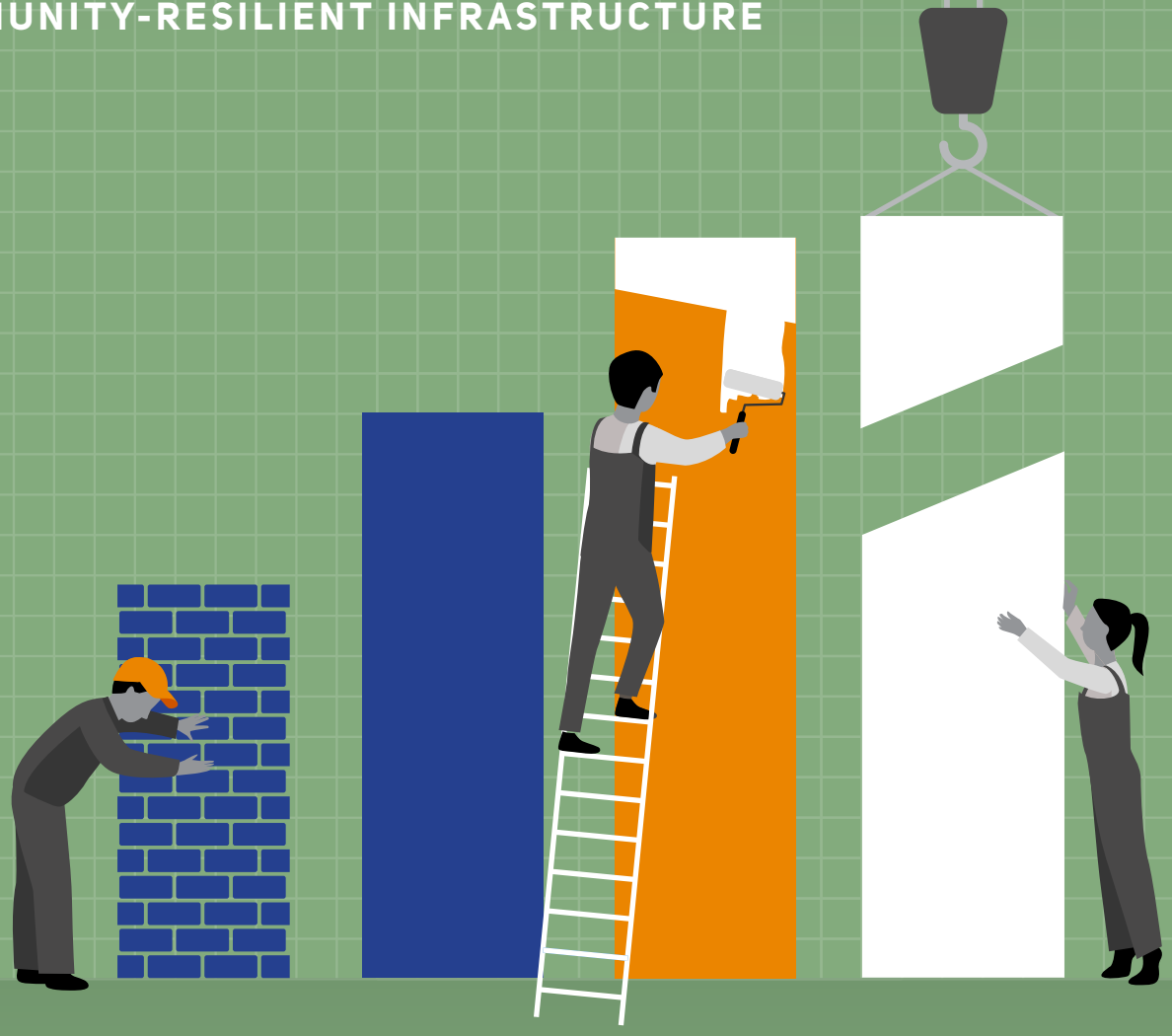
Impact Infrastructure:

LOCAL VIEWS ON BUILDING COMMUNITY-RESILIENT INFRASTRUCTURE



INTRODUCTION

The world's massive infrastructure investment deficit is a fundamental issue for global development — and one that has become even more pressing during the COVID-19 pandemic. According to the Global Infrastructure Outlook, total current investments in infrastructure will fall $15 trillion short of the $94 trillion required by 2040 to keep pace with dramatic economic and demographic changes. Even before the pandemic, the African Development Bank estimated that the annual financing gap in Africa ranged from $68 billion to $108 billion, while the Asian Development Bank estimated that developing Asia would require $1.7 trillion per year through 2030. Estimates increase significantly when the costs of climate change mitigation and adaptation are factored in, notwithstanding the associated costs of achieving the Sustainable Development Goals relating to the universal provision of clean water, sanitation, and electricity.

These eye-watering numbers can imply that in order for infrastructure projects to impact society, they must by necessity be ambitious, large-scale, and expensive: a deep water international port; a high-speed railway; a mega dam. No doubt these projects are critical for social and economic development. But far less attention is paid to community-level infrastructure — smaller-scale and more localized projects that provide marginalized communities with water, shelter, health care, transport, power, and social services. When designed and executed properly, these projects build critical resilience and positively impact communities, helping them withstand all types of shocks - operate effectively during a crisis, recover quickly – and boost economic opportunity and livelihoods.

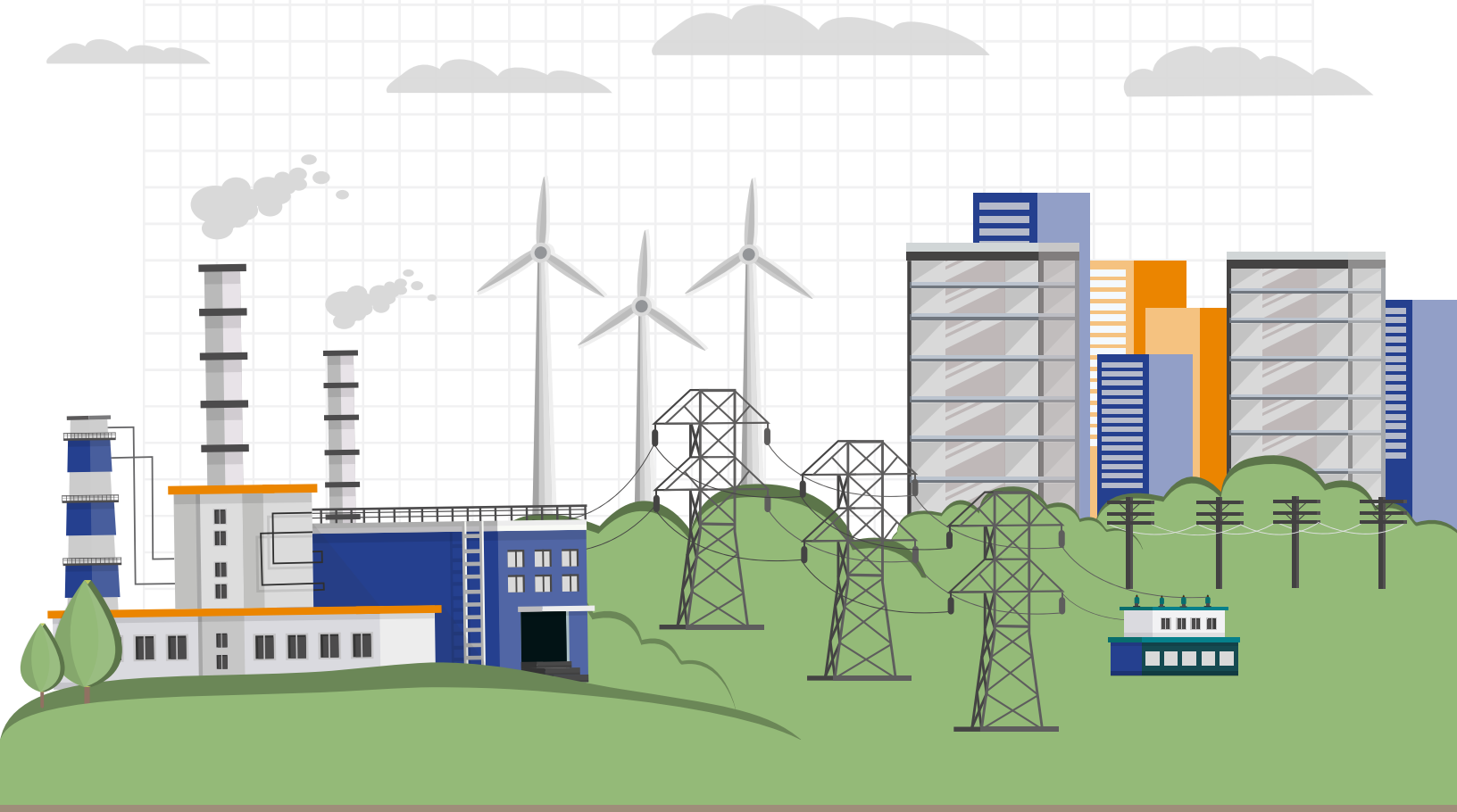
"When we talk about community resilience, it's more than just facing the shocks and stress of today. But it's also how we build up resilient communities for 10-15 years down the road."
— ALLIE SCHLAFER, PERU

Development planners and practitioners currently lack a thorough understanding of the links between local infrastructure development and social impact. We know many community-level projects falter or fail, but we don't really know why. We know technical and social best practices and new technologies exist to support resilient infrastructure development, but that knowledge is rarely shared. We realize these projects require multi-sector collaboration, but we haven't defined the appropriate roles for various stakeholder groups.

In this special report, Devex and Bechtel set out to learn more about challenges and solutions related to "impact infrastructure." Through in-depth interviews with local development experts in five world regions, we examine community-level infrastructure development throughout he project lifecycle, from conception to design, through to execution and maintenance. We look at projects in both urban and rural areas. We assess why some projects succeed and others barely get off the ground or collapse over time. We also ask what impact the pandemic has had on communities' infrastructure needs. And we seek to define the roles different actors, such as local government, civil society, and private sector companies can and should play to help scale up resilient infrastructure for vulnerable communities in low- and middle-income countries (LMICs).

To appraise the challenges and solutions surrounding impact infrastructure development accurately, we must first understand the hazards that local communities face.

According to our interviewees, communities in LMICs confront a range of complex and evolving hazards, both natural and man-made. Our interviewees stress that these threats destroy infrastructure, which leaves them more vulnerable to the next adverse event. Moreover, they say, most communities rely on ad hoc coping mechanisms to deal with various hazard events and lack a longer-term, formal, and systemic approach to resilience. More than half of interviewees cite the impacts of climate change as the biggest risk for the local communities they work with.



How does small-scale local infrastructure contribute to community resilience?

- **33%** Provides community services (schools, shelter, hospitals, WASH)
- **29%** Increases self-reliance of communities through decentralization
- **24%** Improves management of natural resources and livelihoods
- **24%** Raises awareness on the need for quality infrastructure
- **19%** Lessens the impact of disasters
- **14%** Builds new skills that bolsters resilience of communities in the long term

Based on our interviews, we learn that impact infrastructure can help communities mitigate these hazards. Interviewees overwhelmingly confirm that resilient infrastructure is a powerful means to build resilient communities, which is a priority for the global development community. According to our interviewees, impact infrastructure not only defends communities from adverse events, but also builds critical long-term capacity that contributes to socio-economic development.

Impact infrastructure is an emerging concept. This report is not intended to address the many political, technical, and social issues surrounding impact infrastructure, resilience or community-level infrastructure in LMICs. But we hope it offers a unique lens to evaluate infrastructure challenges and opportunities, and begins to close some of the knowledge gaps for development practitioners and communities in need.

METHODOLOGY

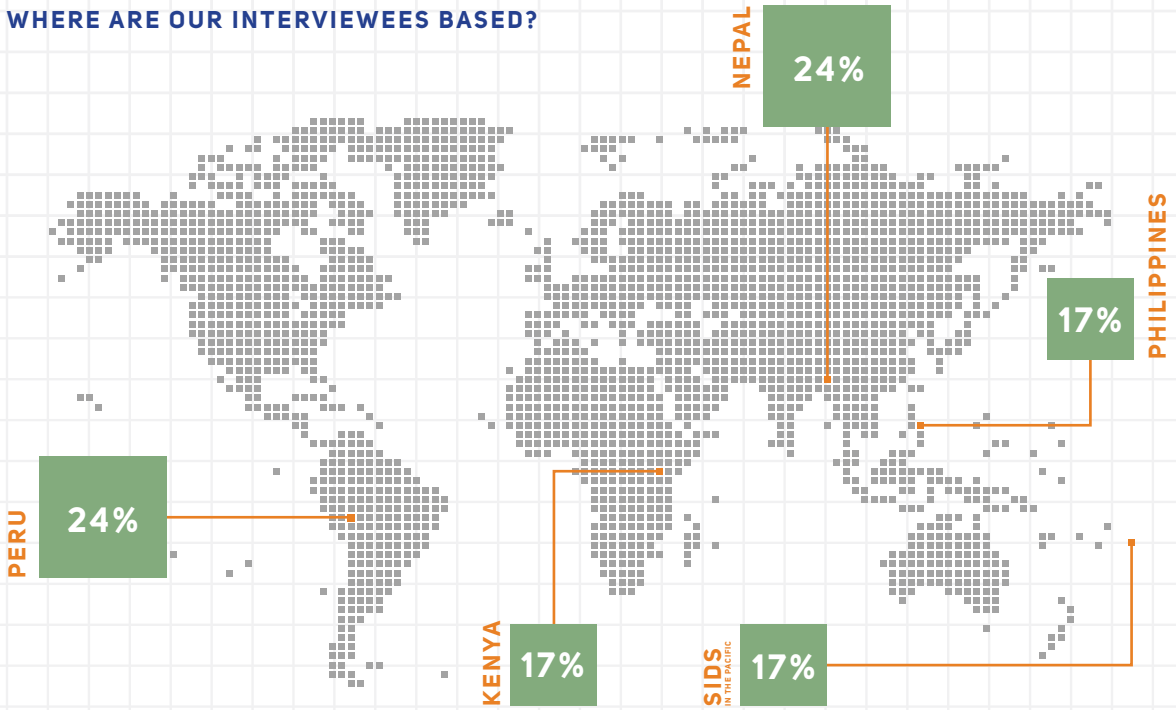
Defining community resilience and impact infrastructure

For the purposes of this report, we define community resilience as the sustained ability of a community to utilize available resources in order to respond to, withstand, and recover from adverse situations, including natural hazards and man-made disasters. This report focuses on the challenges and opportunities to build "impact infrastructure", which we define as infrastructure that is resilient and built at the community-level. Impact infrastructure is small-scale and local — such as scaled-down irrigation systems, schools and hospitals — and able to integrate long-term risks and vulnerability assessments into building flexible infrastructure that reduces the adverse impacts of natural hazards and man-made catastrophes on the communities utilizing them.

Meet the Devex in-depth interviewees

We spoke with more than two dozen development professionals with experience in implementing infrastructure projects at the community level to understand the challenges and solutions associated with resilient local infrastructure. Our interviewees represent a broad range of sectors and work across diverse regions. Chosen for their on-the-ground and practical experience delivering small-scale infrastructure projects at the community level, our interviewees comprised professionals working for different types of organizations, including international and local NGOs, United Nations agencies, multilateral organizations, and bilateral donor agencies.

WHERE ARE OUR INTERVIEWEES BASED?



METHODOLOGY

SMALL ISLAND DEVELOPING STATES (PACIFIC)

Small island developing states, or SIDS, in the Pacific face many development challenges, including limited resources, vulnerability to external natural and economic shocks, and fragile environments. Their small size and remoteness as well as their exposure to environmental challenges increase their vulnerability to the impacts of climate change and natural hazards.

THE PHILIPPINES (SOUTHEAST ASIA)

Infrastructure development has failed to keep up with high population growth and rapid urbanization in the Philippines. This has had serious consequences for the country's economic growth and its efforts to meet poverty reduction targets. The country regularly experiences extreme weather events, such as typhoons, earthquakes, and floods that damage infrastructure. Recurring armed conflicts have also displaced communities, particularly in the country's southern region, pushing them into poverty and limiting access to basic services.

NEPAL (SOUTH ASIA)

Nepal is one of the world's poorest and most hazardous nations. About 80% of Nepal is vulnerable to natural hazards, and the country's rugged topography makes it particularly challenging to build or rehabilitate infrastructure. Every year, Nepal experiences disasters including earthquakes, floods, and landslides which affect thousands of people and damage community infrastructure, including roads, bridges, irrigation canals, and micro hydro plants in rural areas. Around 20% of the rural population lacks access to electricity.

KENYA (SUB-SAHARAN AFRICA)

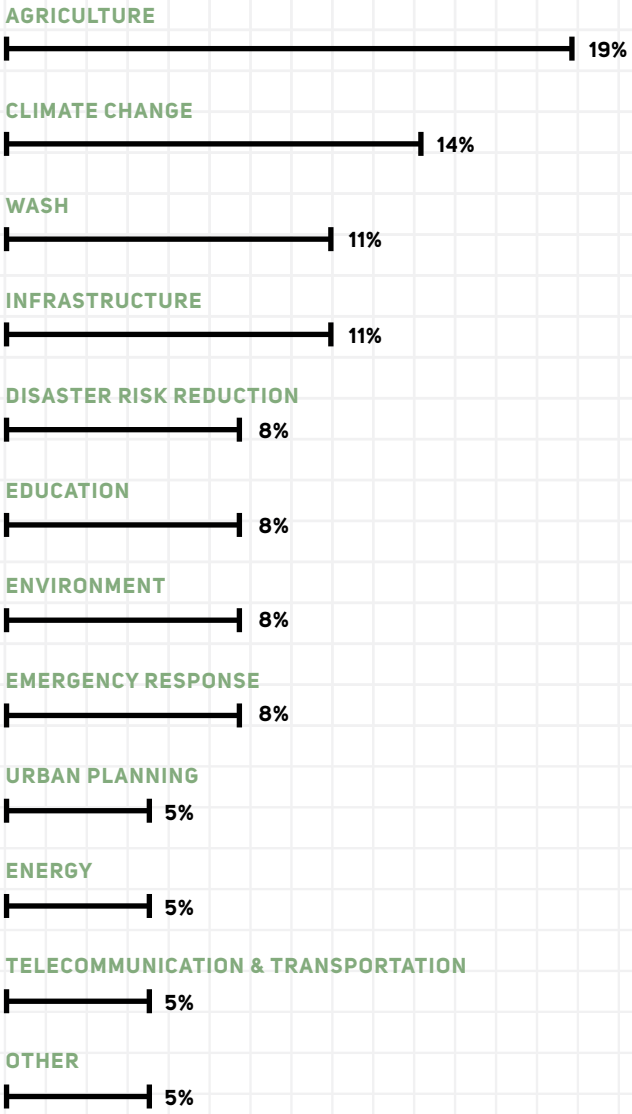
Drought is the most prevalent natural hazard in Kenya, whereas wildfires, floods, and landslides seasonally affect and threaten infrastructure development in various parts of the country. Agriculture comprises more than a quarter of the economy and employs almost 75% of the population. Lacking irrigation systems, almost all agricultural activities are rain-fed and highly susceptible to climate change and rapidly changing weather patterns.

PERU (LATIN AMERICA)

Peru experiences high seismic activity and frequent earthquakes that often result in damage to homes, schools, and health care facilities built on high-risk geographic locations. Peru also suffers from deforestation, flooding, watershed degradation, tsunamis, volcanic eruptions, and landslides that regularly impact the local transport sector, sometimes cutting off access to poor communities in remote rural areas. While Peru is considered a middle-income country, 8 in 9 rural Peruvians lack access to basic infrastructure, including clean water and electricity.

IN WHICH SECTORS/AREAS DO OUR INTERVIEWEES WORK?

While our interviewees all work on community-level infrastructure, together they represent a diverse group of professionals from a wide range of sectors spanning agriculture, climate change, education, environment, and transportation, among others. Below is a breakdown of the most prominent sectors:



CHALLENGES

Not where you most expect them

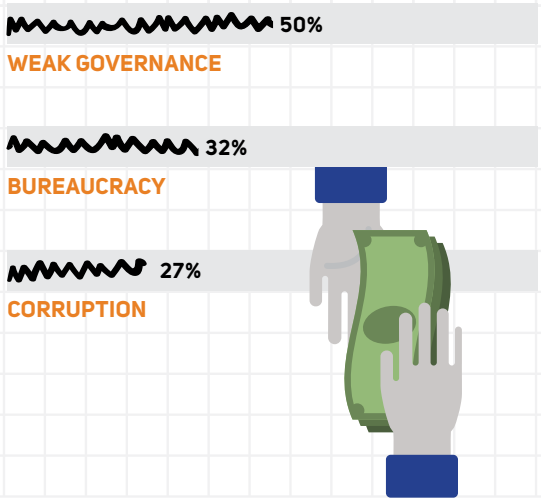
Building impact infrastructure in LMICs is difficult. Governments lack funding and struggle to manage political priorities, bureaucracy, and corruption. Communities are chronically underserved and in remote areas lack even basic road access. Technical know-how and capacity is limited, while legal, regulatory, and administrative challenges exacerbate problems. There is such a multitude of challenges — many of them situation and location specific — that it is impossible to assess all of them. But by speaking to the experts closest to project implementation on the ground, Devex has uncovered that the biggest challenges are not necessarily where you most expect them. Our interviews reveal that materials, technical design, and the physical aspects of building local infrastructure are rarely the most significant stumbling blocks. Infrastructure experts insist that the most serious challenges occur when hard infrastructure meets soft social problems. Here are some of the most compelling challenges we discovered.

"The technology is often the easy part, it is working with people's lives that is the challenging part and where you need to dedicate significant resources."

— CAITLYN PEAKE, PERU

WEAK GOVERNANCE, RAMPANT BUREAUCRACY, AND CORRUPTION ARE THE BIGGEST THREATS...

Government challenges:



Given the critical roles local and national governments play as facilitators and enablers, involving government officials is key for local, community-level infrastructure development. However, **76%** of Devex interviewees note that weak governance, bureaucracy, and corruption form the biggest challenges for project implementation. Infrastructure experts lament that relevant and necessary policies and regulations are often lacking, while rampant bureaucracy causes expensive delays to project implementation. At the same time, corruption constantly undermines local infrastructure development. According to Transparency International, nearly a third of total global infrastructure budgets are lost to corruption every year.

"The resource capture is often driven at the local level by political interests. Areas led by proactive leaders secure more public resources for their constituencies and interests."
— ARUN RANA, NEPAL

"Impact assessments are ignored and natural processes are not genuinely considered in the design and construction phases.

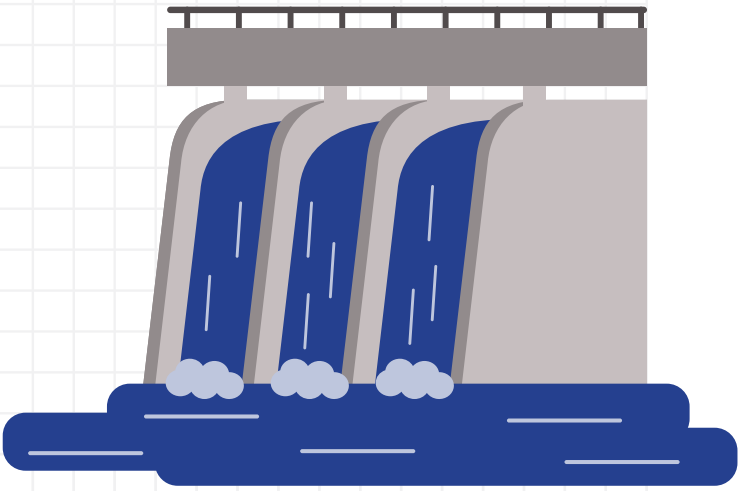
This is when environmental problems occur – damaging coral reefs, mangroves, seagrasses, aggravating coastal erosion, obstruction of sediment transport, etc."
— JOCEL PANGILINAN, PHILIPPINES

... WHILE A LACK OF SKILLS, CAPACITY, AND FUNDING NEGATIVELY IMPACTS QUALITY AND SUSTAINABILITY

90% of Devex interviewees believe that local governments and communities face serious capacity constraints. Implementation of infrastructure projects is hindered by a lack of local technical skills and available workforce. Among Kenya's population, for instance, youth have the highest unemployment rate at 67%, while every year, over 1 million young people enter the labor market without any formal skills. Similarly, out-migration of skilled labor — particularly from rural areas — has significantly affected the ability of communities to retain the knowledge and skills necessary to build local infrastructure. Compounding the problem, infrastructure maintenance is typically very costly. **79%** of Devex interviewees cite limited fiscal capacity and lack of government funding as a key constraint to building and maintaining impact infrastructure at the community level.

"In the past, very remote Pacific islands were almost completely isolated. Now through technological advances and increased connectivity, remote islands can be connected. This provides enormous opportunities for young people in remote islands but also in turn increases their expectations of life in rural communities in terms of employment, services and opportunities. Many young rural people unfortunately do not have a choice but to migrate in search of gainful employment and education."
— RON HARTMAN, SIDS PACIFIC

"In our context of a poor and developing country, resilience is not a question. For example, you need food or drinks all the time, therefore, you prioritize getting food and water. But disasters are not frequent so it falls under the last priority, because you don't have the capacity or the resources."
— HARI DARSHAN SHRESTHA, NEPAL



COVID-19 DELAYS PROJECTS

Supply chain disruptions and limits on movement delayed the implementation of many large-scale and some community-level infrastructure projects at the height of the pandemic in 2020.

Although many smaller projects were able to quickly resume as restrictions lifted, interviewees report a need for flexibility, with some forced to adapt their operating model.

"Lockdowns and travel restrictions have had a significant impact on construction works, and restrictions on seminars and training has impacted capacity-building activities."
— ARUN RANA, NEPAL

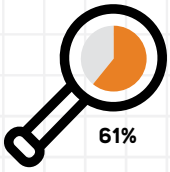
"We were heavily dependent on funding that was linked to hosting volunteer groups that were involved in the execution of solar energy projects. Volunteers were not able to travel during 2020 and hosting volunteers in the near future is too risky, for the volunteers and the communities. In 2021, we established new corporate relationships to execute solar projects without volunteers."
— CHRIS JENSEN, PERU

"We had to shift our approach from one that focused on infrastructure projects like the building of boats or classrooms towards the provision of digital tools, such as getting computers, printers and tablets to our adopted communities so that the teachers can continue providing education."
— JAY JABONETA, PHILIPPINES

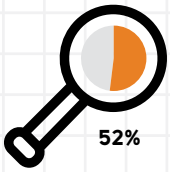
MISGUIDED FEASIBILITY STUDIES LEAD TO POOR DESIGN, PLANNING, AND EXECUTION

Feasibility studies are crucial for infrastructure projects because they help identify local needs and priorities and shape the project planning process within the local context. But Devex interviewees believe that feasibility studies often lack a clear understanding of local cultures and dynamics, fail to engage communities, and lack thorough evaluation of project sites. This hampers project planning and implementation. For example, in Vanuatu, land disputes and community chiefs' customary power can become a challenge to infrastructure development when projects fail to consult and coordinate with community leaders. In Nepal, local belief dictates the day on which it is appropriate to start building. Failing to take such customs and traditions into account can cause significant delays to projects.

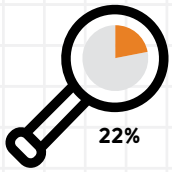
Feasibility studies: The biggest problems



ONE SIZE DOES NOT FIT ALL Too often, feasibility studies are based on standard models and fail to account for different local context and needs, including social dynamics and technical know-how.

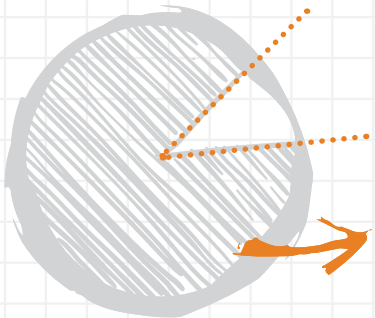


POOR STAKEHOLDER ENGAGEMENT In many cases, project design lacks adequate community and stakeholder consultation processes, leading to misaligned goals, false expectations, and even duplication of efforts.



UNSUITABLE LOCATIONS Sometimes feasibility studies fail to fully evaluate the location of infrastructure projects, leading to negative impacts on neighboring communities, or abandoned infrastructure.

"There needs to be an understanding of the different assets that a community can bring. For example, people, resources, the ability to work, and the different types of decision making that are already in place." — MIKE WOLFE, SIDS PACIFIC



79% OF INTERVIEWEES BELIEVE THAT FEASIBILITY STUDIES OFTEN LACK A CLEAR UNDERSTANDING OF LOCAL CONTEXT, COMMUNITY ENGAGEMENT, AND EVALUATION OF PROJECT SITES.

"Science combined with local government and community consultations are essential in coming up with any adaptation solutions that benefit vulnerable communities. For our green-grey project, we conducted a technical feasibility study which looked at natural and social processes to prioritize sites and identify the green grey solutions. This was done in partnership with Bechtel which provided technical advice on the engineering design component. We actively involved communities to encourage project ownership and ensure sustainability beyond the project."

— JOCEL PANGILINAN, PHILIPPINES

"In some of the communities in Nepal, they look at the calendar because there are certain dates during which you cannot start building, but there are also dates that are good. People believe that laying the foundation on certain dates is good for longer-term sustainability. This is based on their religious belief."

— HIRA DHAR CHUDALI, NEPAL

GENDER DYNAMICS IN PERU

The Q'Ori Warmi cooperative — a project led by Lutheran World Relief in the southern highlands of Peru — focuses on livelihoods for women from cocoa farming and processing. Women have access to 3-4 hectares of land and use different types of irrigation and processing methods that require electricity from small-scale generators.

Although women own and are supposed to maintain this electricity infrastructure, local customs dictate that men are in charge of technology, creating a challenging project implementation environment.

Understanding the local context and integrating mitigation strategies into project design was critical for the success and sustainability of the Q'Ori Warmi cooperative.

"When you are working with different gender dynamics — because it is the women who are leading those cooperatives — it is pretty countercultural. The idea that a woman is the person responsible for developing and maintaining infrastructure can be challenging. These obstacles are something intangible but they are really relevant."

— ALLIE SCHLAFER, PERU

IN RURAL AREAS, LACK OF PHYSICAL ACCESS REMAINS A KEY PROBLEM...

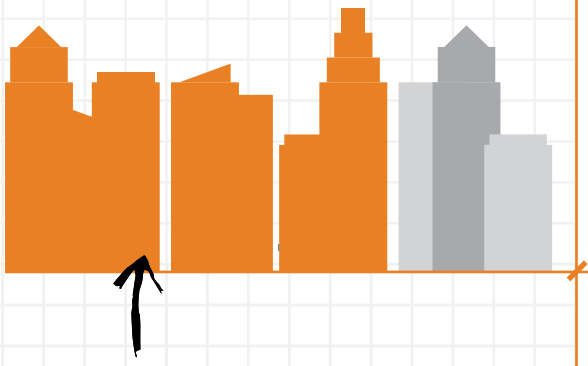
Across the world, 1 billion people lack access to all weather roads. Unsurprisingly, over **90%** of Devex interviewees stress that in rural areas, physical access remains a critical obstacle to infrastructure development. This affects resource allocation and project implementation with government funding often allocated to more accessible areas and logistical challenges driving up project costs. For the Quechua indigenous groups living in Sunec, a village in Peru's central highlands, for instance, access is a major challenge. Poor road conditions mean that the village is unreachable by motorized vehicles, impacting the availability of tools and even basic building materials.

"It is the remoteness and smallness which makes it tough to deliver infrastructure and services. Logistically it is extremely complicated which adds costs and demands on small governments. So to build a simple thing, something you can build in the Philippines cheaply, in the Pacific the same thing would be far more complicated and expensive.
— ROSS BUTLER, SIDS PACIFIC

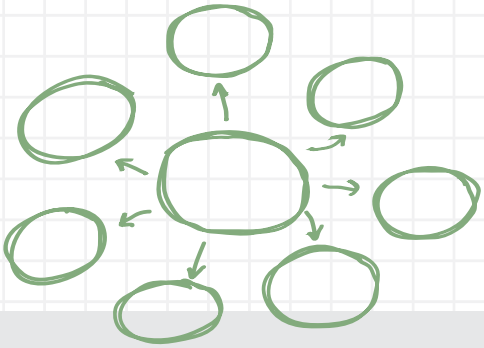
"Usually urban areas are closer to the policymakers or decision-takers, such as the local governments. In rural areas, because they are more distant or isolated, it is more difficult for communities to receive the resources from the government to fulfill their needs."
— SOFIA GUERRERO GAMEZ, PERU

...WHILE IN URBAN AREAS, FRAGMENTATION OF STAKEHOLDER GROUPS HINDERS DEVELOPMENT

The number of people moving from rural to urban areas has grown exponentially. In 1950, only 751 million people lived in cities compared to over 4.2 billion in 2018. This trend has instigated many challenges, from congested streets to crowded informal settlements that add additional layers of complexities for local infrastructure projects. According to Devex interviewees, navigating the interests and activities of multiple stakeholder groups is a key challenge in urban settings. Complicating the situation, projects in urban areas are also often components of larger infrastructure projects, involving governments, the private sector, contractors and subcontractors, and various management teams. In the Tondo Foreshore, the largest informal settlement in Manila, the Philippines, and home to over 180,000 people, connecting to basic municipal services such as water and sanitation is complex. Before any infrastructure can be built, project implementers require intercommunity lobbying, petitioning national service providers for connections, overcoming bureaucratic challenges, and receiving clearance from government departments and negotiation with private sector contractors and subcontractors.



7 out of 10 interviewees find that in urban areas, implementation and management of small-scale infrastructure is hindered by a crowded field of local stakeholders and decision-makers.



"And then there is of course the challenge of meaningful participation on urban issues and community driven informal settlements upgrading and resilience building: The number of stakeholders within the communities, the diversity of stakeholders within communities, the number of stakeholders in terms of national and local government, utilities, private sector and so on is in most cases much, much larger than in the rural context, and therefore the consultation process becomes more complex."
— BERNHARD BARTH, SIDS PACIFIC

MEDIATING LAND ACCESS, OWNERSHIP, AND RIGHTS

Understanding access to land and land rights in relation to decision-making processes is fundamental to infrastructure projects at the community level in both rural and urban areas. According to Devex interviewees, land ownership and rights is a particular challenge in the Pacific, where customary land is the most dominant form of land tenure. A widespread lack of formal recognition and protection of indigenous and community land can be the source of conflicts across the region. Vanuatu, for example, doesn't have formal land demarcation in rural areas, which can result in overlapping territorial claims from clans and communities and makes it challenging to build infrastructure.

In 2017, World Vision helped construct a large-scale water system in East Malo, Vanuatu. However, water resources are prone to community disputes and land tensions generally run high. With only one source of water on the entire island, the government initially designed a system that failed to benefit the community from where the water originates. Local communities also felt strongly about pipes crossing their lands that provided no tangible benefits to the local population.

World Vision stepped in as mediator to overcome tensions. The organization's pre-existing relationships with community members across the island — including leaders and village chiefs — served as entry points into the communities. World Vision staff spent several months living with members of various communities. This helped establish trust and enabled a clear understanding of local context, which was critical to effectively mediate and facilitate dialogue between community groups and decision-makers. In addition, the experience of World Vision's area manager, a woman that grew up on Malo Island, was fundamental to the contextual understanding of local power dynamics.

After months of consultations, all issues regarding access to land were formally addressed through custom ceremonies that signal official agreement between parties. While normally only one ceremony is necessary, five ceremonies had to be held, signifying the extent of conflict and the amount of work required to broker genuine and meaningful agreements between various factions and communities on the island. As a result of contextually appropriate agreements on land access, the largest water system in Vanuatu was able to be successfully constructed, and remains functional today.

LIMITED UNDERSTANDING OF DISASTER RISK REDUCTION AND RESILIENCE PRINCIPLES

"We have a resilient cities profiling program and we also have a rapid resilience assessment program, and what's actually showing is that there are large capacity gaps in local governments and communities in preparing for unforeseen events. We are currently reaching out to any of these cities to do a capacity assessment, a diagnosis of these communities and settlements to see what they need in terms of improving resilience."
— ANDRE DZIKUS, KENYA

Disaster risk reduction, or DRR, bolsters infrastructure resilience by reducing vulnerabilities and diminishing the potential damage caused by natural hazards, such as earthquakes, floods, droughts and storms. DRR has become integral to community resilience, especially amid threats related to climate change. In 2018, extreme weather events affected an estimated 60 million people, and climate change is expected to increase the frequency and intensity of severe weather related hazards in the next decades. DRR lessens the impact of climate change which in turn maintains the sustainability of community infrastructure. However, lacking education, knowledge, skills, and training, local contractors and community members struggle with building resilient and innovative infrastructure. According to local infrastructure experts, access to information on DRR and resilience building remains an often unaccounted barrier.

The challenges of resilient principles:

- LACK OF KNOWLEDGE ABOUT DISASTER RISK REDUCTION
- LACK OF ACCESS TO INFORMATION
- ADAPTING LOCAL SKILLS & KNOWLEDGE

69% of Devex interviewees believe that local communities and governments lack a basic understanding of disaster risk reduction and resilience principles.

"There is inherent knowledge in the communities, they know how to build well, and have been doing so for hundreds of years — they use local materials and designs which are built around their livelihoods and climatic conditions. However, as more people move to cities and building techniques change, exposure to climatic hazards are likely to increase, putting people at risk."
— ELEANOR BAINBRIDGE, NEPAL

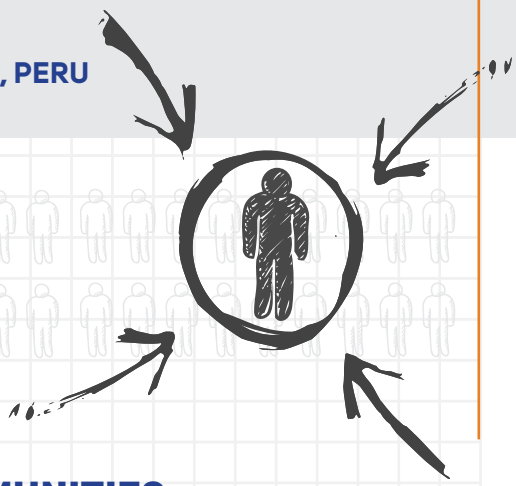
SOLUTIONS

Hyperlocal and community driven

Building lasting and resilient infrastructure at the community level requires a combination of innovative strategies, community engagement, smart design, and local expertise and know-how. Our interviews show that there are different solutions for different situations and locations. Although there is no one-size-fits all model, there are valuable lessons to be learned from examining the many success factors of local, small scale infrastructure projects. By talking to people on the ground, we identified some of the most common themes.

"It is key that our interventions respond to an integral approach where the person is at the center. The nature of our work reveals that these threats do not affect everybody equally; on the contrary, it disproportionately and negatively affects indigenous people, rural women, and youth; therefore, we have specific methodologies and interventions that are tailored to them."

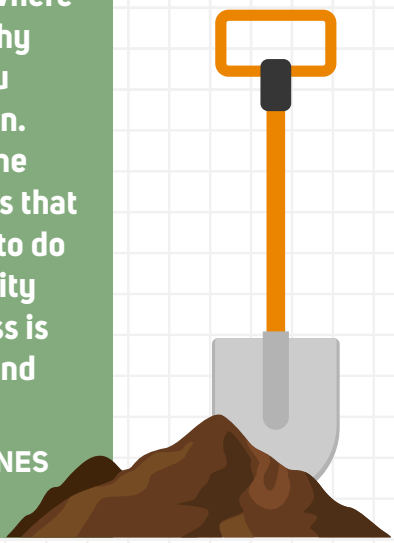
— JESUS QUINTANA, PERU



"We try to practice using human-centered design, where you go in and build empathy with the people before you build and impose a solution. Come in and understand the problems and the solutions that they want to have. I think to do that and give the community ownership over the process is one of the best practices and models that I've seen."

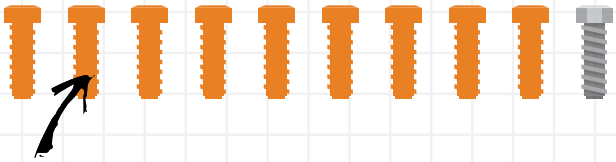
— KATE LANDRY, PHILIPPINES

INVESTED COMMUNITIES ARE CRITICAL ...



Most local communities, both urban and rural, are made up of complex and fluid social interactions. Diverse stakeholders, numerous power structures, and multiple decision-making processes all contribute to this complexity. Local infrastructure experts note that community buy-in is a key ingredient of successful infrastructure projects. Engaging community stakeholders from the start builds trust and understanding of local context, customs, and traditions, and ensures community ownership that is essential for the long-term sustainability of projects.

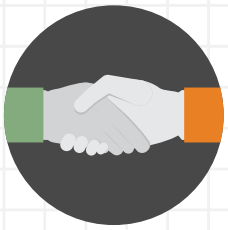
"The involvement of the community in the design is very important for sustainability, because they own the project, take responsibilities, and undertake self-initiated development activities."
— GRACE MWANGI, KENYA



90% of Devex interviewees believe that community ownership and engagement is the most important ingredient for successful local infrastructure projects.

... AS ARE LOCAL CHAMPIONS

Engaging with communities can be difficult. In many situations, authority figures such as local politicians, community leaders, and clan elders are respected individuals that can help navigate the intricacies of community dynamics. These champions can also serve as unifying voices, able to speak on behalf of the community, and as a main point of contact throughout the duration of local infrastructure projects. Devex interviewees believe that identifying local champions is essential to streamline feedback processes, build trust with the larger community, and ensure that projects run smoothly.



Over 48% of local infrastructure experts recommend engaging with local authority figures.

"Civil society and local organizations can influence the policies and the framework, and mobilize resources.

They can mobilize the community into accepting the purpose of sustainability and develop activities that are proper for the communities. They can ensure that the communities don't become dependent, but in time, they are able to develop themselves to become even more independent."
— GRACE MWANGI, KENYA

"You have to have good communication with the community. Start off by letting the local officials understand why you are there, and allow them to choose what they think they need in their community. The local officials then have to develop their own community. As an organization from the outside, we're operating with technology and alternatives. But at the end of the day, it is their choice."
— CHRIS JENSEN, PERU

BEST PRACTICE

Involving communities from the start

COMMUNITY CONSULTATIONS — Although setting up community consultation processes takes time and resources, consultations are critical to earn the community's trust and project buy-in.

FLEXIBLE TIMETABLES — When working with community members, it is important to allow for adequate time and flexibility in timelines, as it is impossible to set a schedule for how a community faces an issue.

COMMUNITY GROUPS — Setting up community groups such as saving or loan groups, or working through already-established groups, enables organizations to communicate through organized structures and simplifies working with the community.

"At the community level, it's not about economics, it's about improving the quality of life. This is not economic infrastructure but social infrastructure. Women have more stake in social infrastructure than men."

— CHARLES ANDREWS, SIDS PACIFIC

WORK WITH WOMEN — Organized communities make ideal partners to develop and sustain impact infrastructure. Communities with a management system in place, such as a history of collecting bills, are often more likely and capable to maintain facilities beyond project completion. Without evidence of communities helping themselves, infrastructure ventures are in most cases not sustainable. Women's involvement is a great indicator of an invested community. As women in many places remain the sole carer of households, they are often more genuinely interested in community development that also benefits their own family situations.

What are the different roles of stakeholders?

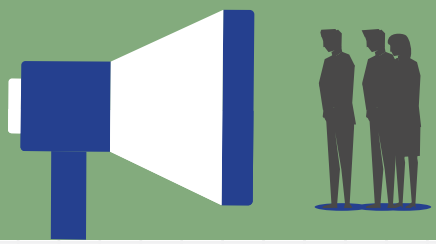
Designing, planning, and building impact infrastructure requires cooperation and coordination across many different stakeholders. But we don't always know the proper roles of various actors. So we asked our interviewees to identify the roles local governments, civil society, donor agencies, and private sector companies can and should play to scale impact infrastructure in vulnerable communities. Here is what they think:

Organization	Key Roles	Watch out for
Local Government	• Overall development responsibility • Financial resources • Maintenance • Scale projects • Set policies and regulatory/enabling environment • Enforce standards • Facilitator for different stakeholder groups • Provides authority, legitimacy and trust • Enables long-term sustainability • Source of data • Main service provider for communities	• Capacity constraints • Lack of strategies (e.g. local resilience plans) • Lack of resources • Corruption • Bureaucracy
Civil Society	• Facilitator and negotiator • Source of funding • Project implementation/management support • Capacity building/Mentorship • Awareness raising • Social mobilization • Watchdog/monitoring body • Bridge between communities and funders • Scale impact through networks • Serve as repositories of local knowledge • Promote resilience to policy makers	• Lack of technical and administrative capacity • Limited resources and staff • Sometimes fragmented
Private Sector	• Innovator of technologies/tools • Sets standards and best practices • Source of funding • Technical expertise, skills and knowledge • Builds local capacity • Delivers/distributes products to remote/rural areas • Influences government policy • Partners with government through PPPs	• Often focused on urban development rather than rural development
Aid Agencies / Development Banks	• Introduces unavailable technologies • Funds projects • Finance awareness campaigns • Influence global policy • Builds government capacity • Supports project development, implementation and management • Secures rural people's access to productive resources • Strengthens rural organizations • Shares knowledge from successful projects	• Not nimble enough to accommodate infrastructure projects in smaller communities • Focuses on large-scale projects • Lacks community-based approach

THE COMMUNITY DRIVEN DESIGN MODEL STANDS OUT...

"Most of the communities actually know the right solution or the right model that will work but policymakers (from the capital or donor agencies) rarely listen to them. What the communities need is policymakers who listen and are willing to co-create the solutions with the communities."

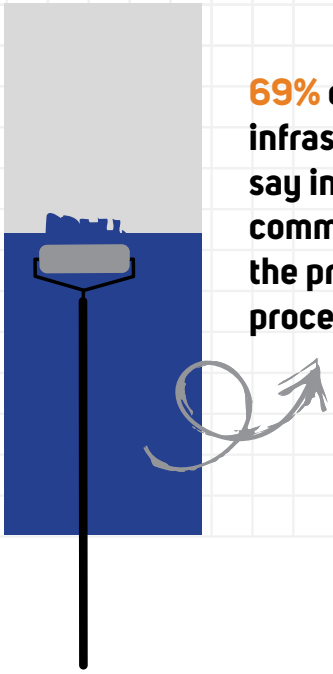
— JAY JABONETA, PHILIPPINES



Communities are diverse entities, each shaped by unique social, economic, geographic, historical, and environmental factors. Across the board, interviewees assert that effective solutions require good design that is based on local context. Understanding the local situation helps not only identify the right technological solutions, but also offers insights into social aspects that enable infrastructure projects to work. In parts of Kenya, for example, resource-related conflicts mean that local infrastructure projects need to incorporate conflict mitigation, peace building, and resource sharing components to succeed.

72% of Devex interviewees cite understanding local context and needs in the project design phase as critical to addressing community resilience and sustainability.

Devex interviewees stress that successful project design focuses on the hyperlocal and is community driven. Integrating communities in the project design process and co-creating solutions ensures that infrastructure is tailored to the unique needs of the community. This bottom-up approach also provides more security to vulnerable communities than the top-down implementation models that conventional infrastructure projects rely on.



69% of local infrastructure experts say integrating communities in the project design process is critical.

"So messages around peace building, around resource sharing, around being able to identify resource related conflict and how that can be mitigated are critical for successful projects."

— REBECCA AMUKHOYE, KENYA

LOCAL INNOVATION

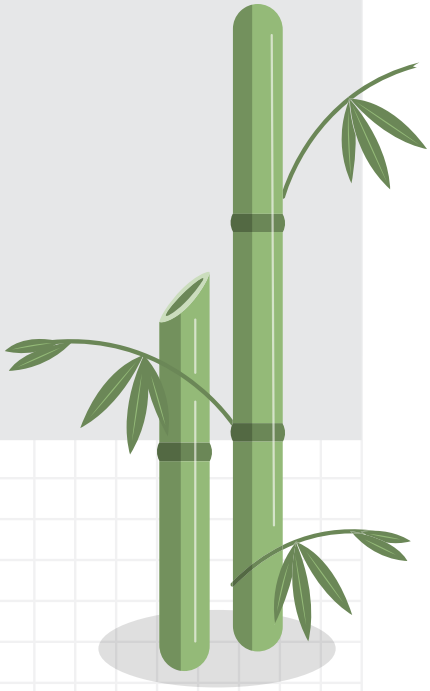
The bamboo tippy tap

Community-led solutions are often the most appropriate innovations. Some have also proven instrumental in the Covid-19 response.

Over 30 years ago, Dr. Jim Watt in Zimbabwe invented the "Tippy Tap" — a simple, inexpensive device to wash hands in areas that lack running water. It is commonly operated by a foot lever that tips a water-filled plastic bottle. Only 40 milliliters of water are required to wash hands compared to about 500 milliliters when using a cup or mug.

To tackle water shortages and promote better hygiene practices in Yelkis and other communities around southwest Tanna in Vanuatu, World Vision worked with local community members to construct bush toilets and tippy taps. However, some community members, including Tom Yaken, lacked available plastic bottles. Recalling how his grandfather used to fetch water with bamboo, Yaken decided to make a tippy tap out of bamboo for his family. He removed the inside nodes from the bamboo and drilled a tiny hole at the bottom where water exits when a plug is pulled. His simple device stores more water than the commonly used plastic bottles and has since then been introduced to other communities on the island.

More conventional tippy taps have also become vital interventions to reduce virus spread during the COVID-19 pandemic. In South Africa, Unicef launched its #TippyTapChallenge. This encouraged young people to build the devices for their communities in return for digital rewards that could be redeemed through the Zlto platform for food, electricity and airtime vouchers. To help combat youth unemployment, they were also able to record the experience as a work asset in a verified CV.



...WHILE FOCUSING ON COMMUNITY RESILIENCE IS THE BEST DRIVER FOR OUTCOMES

Most infrastructure developers approach community resilience as an afterthought when designing and building infrastructure projects. Yet, Devex interviewees believe that resilience needs to be built into the technology from the start to ensure that the infrastructure can cope with hazards and adequately addresses the needs of the community. This includes taking a long-term view and considering environmental changes that will affect the infrastructure in the future, such as climate change, intensifying weather patterns or rising sea levels. Utilizing community-resilience as the driver of infrastructure projects helps build impact infrastructure that can cope with future changes.

"Small scale infrastructure also typically takes a participatory approach, and a community's historical knowledge of water resources and their reliability is essential in designing infrastructure that is appropriate for the local community's needs. This, however, is less certain given increasing climate variability."
— MEGANN MIELKE, KENYA

"I believe the best innovation in this field can come from building the right attitude of the communities towards what resiliency truly means. As the world faces bigger natural calamities, the best way to prepare communities is by educating them about the challenges and possible safeguards that they can take on their own."
— JAY JABONETA, PHILIPPINES

72% of infrastructure experts say that resilience needs to be built into infrastructure projects from the start.

You have to understand the community, their capacity, the local material, local techniques, and you mix this with the technology and techniques to make it resilient with the minimum intervention. Don't go with the robust design and robust construction."
— HARI DARSHAN SHRESTHA, NEPAL

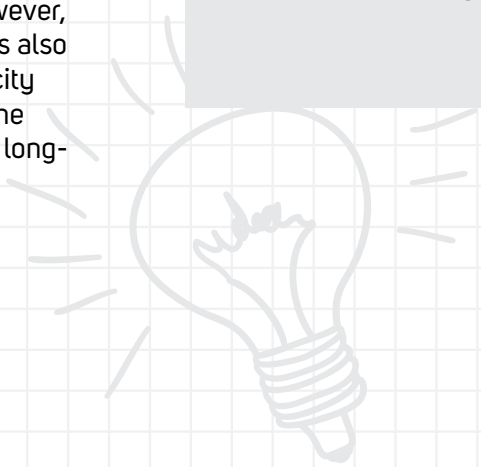
EFFECTIVE TECHNOLOGY IS LOCAL, SOCIAL AND SIMPLE...

Community infrastructure experts note that too often, infrastructure projects fail to take technology transfer into consideration. Over-designed and complicated technology cannot be maintained at the community level. On the contrary, the most successful solutions are often locally sourced, simple to operate, and take social conditions into account. Incorporating local designs and materials cuts down on costs, while simplified technology and modified innovations that employ easy-to-maintain equipment are ideal for turnover to the community. But it is the social aspect of communicating with the community and investing in training and education that can really affect behavior change and result in long-term technological adaptation. Effective community training goes beyond the simple use of infrastructure and includes comprehensive skills development, from finance to hygiene.

... BUILT WITH THE COMMUNITY ...

Integrating community members in the building and management process of local infrastructure projects is an effective way to reinforce ownership and funnel resources back into the community. According to infrastructure experts, employing local contractors, construction workers, and technicians, and investing in training community members where skills are lacking, is directly related to the long-term sustainability of projects. In rural areas in particular, bringing in a competent consultant to build local capacity enables communities to maintain infrastructure beyond project completion. Similarly, consultants can deliver missing technical expertise, ideas, and solutions. However, our interviewees stress that projects also need to take into account the capacity of local supply chains and ensure the availability of spare parts to ensure long-term sustainability.

"At UN-Habitat we've done community contracting. We've actually developed legal mechanisms for partners to contract these communities. There's community ownership and it ensures that the donor resources actually reach the community. We have a tracking system which we developed with the donors."
— ANDRE DZIKUS, KENYA



INNOVATIVE TECHNOLOGY

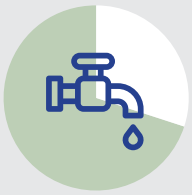
Local, social, and simple

LOCAL: COMPRESSED EARTH BLOCKS
The rebuilding efforts following the 2015 Nepal earthquake face logistic challenges in bringing construction materials to remote communities. To get around this, communities are working with compressed earth blocks, made with a simple technique of mixing and pressing on-site materials such as sand or soil with cement. The resulting bricks are strong, stable, water-resistant, and long-lasting. This reduces cost and environmental impact, minimizes transportation challenges for materials, and increases efficiency and sustainability.

SIMPLE: LITER OF LIGHT
Liter of Light is a global, grassroots movement that aims to provide affordable and sustainable solar light to people with limited or no access to electricity. The Liter of Light uses an innovative design that is low-cost, simple, and easily replicable: A transparent 1.5-2 liter plastic bottle is filled with water, as well as a little bleach to inhibit algae growth, and fitted into a hole in the roof. During the day, the water inside the bottle refracts sunlight and can light up a room. First launched in the Philippines, this initiative has expanded to more than 350,000 bottle lights in over 15 countries.

SOCIAL: COMMUNITY CAPACITY BUILDING FOR MICRO-HYDROPOWER SYSTEMS
Across Nepal, micro-hydropower systems form part of an initiative to bring power to remote communities. But initial returns on government-subsidized micro-hydropower systems were low as communities struggled to run profitable enterprises. The U.N. Development Programme stepped in with the rural energy development program, focusing on training local communities on business practices, technology use and environmental management. This capacity training enabled communities to adequately utilize the infrastructure and build successful businesses that ensure long-term sustainability.

Most Promising Infrastructure Innovations:



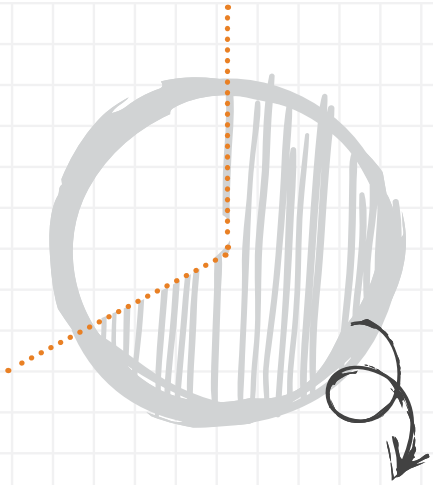
32%
WASH SOLUTIONS
(eg. irrigation systems, filters, and septic solutions)

32%
STRUCTURAL IMPROVEMENTS
(eg. green-grey infrastructure, retrofitting existing infrastructure)

24%
DIGITAL SOLUTIONS
(eg. apps or mobile systems, blockchain)

24%
BEHAVIOR CHANGE
(eg. changing attitudes)

20%
RENEWABLE ENERGY
(eg. solar power, hydro power)



Two-thirds of Devex interviewees insist that using local contractors and building community capacity is critical for sustainable infrastructure projects.

"There's an issue around construction quality in general because there's a lack of resources, oversight and skilled labor. It's difficult to expect high quality, resilient infrastructure as a standard when you're working in an area that's already challenging. Just to build a road in some of the hills is technically difficult, and requires expertise. Community projects need high quality design, adequate funding, engineering expertise, and oversight, as well as contracting and procurement transparency. Translating this into practice is very difficult. Communities are aware of what needs to be done but they are often lacking the resources to do it."

— ELEANOR BAINBRIDGE, NEPAL

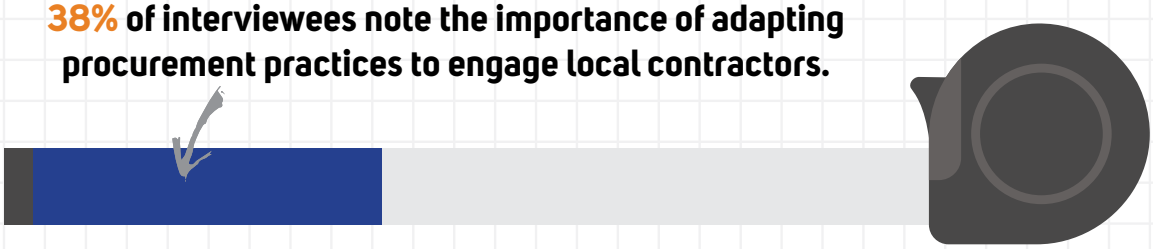
...AT THE LOCAL PACE

"Use local procurement practices. You don't want to hand them a 200-page contract they just won't understand. Once you get into the construction stage, spend money on construction with vision."

— CHARLES ANDREWS, SIDS PACIFIC

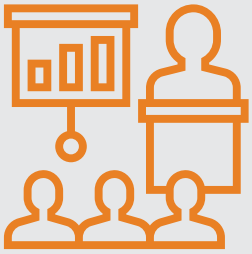
Devex interviewees believe that poor communication is the biggest roadblock when engaging with local contractors. Contract administration and project management are often underprioritized. In order to build effectively at the local level, it is essential to navigate local procurement practices, avoid overly technical jargon, and use local language. Adapting to the capacity and speed of local contractors is equally important. Contract packages need to be broken down to suit the capacity of local contractors. Devex interviewees also emphasize that while supervision is critical, processes need to be transparent and projects should maintain flexibility with the enforcement of contracts.

38% of interviewees note the importance of adapting procurement practices to engage local contractors.



BEST PRACTICE

CIVIL SOCIETY ORGANIZATIONS MAKE EXPERIENCED PARTNERS FOR FIELD-BASED TRAINING



In many communities, capacity gaps are two-fold: Technical skills are lacking, while there is a limited understanding of disaster risk reduction, resilience or sustainability principles. Infrastructure experts on the ground suggest exploring the role of civil society organizations and private sector groups to provide mentorship and technical education for communities. NGOs are well-versed in localizing approaches and can function as key vehicles to raise awareness on resilience and sustainability issues. Similarly, organizations that specialize in capacity-building programs, including vocational training, and target vulnerable groups, can be effective partners.

THE IMPORTANCE OF HARDWARE

Community access to hardware and supply chain challenges are an often overlooked aspect of local infrastructure projects. Appropriate technology takes replacement parts into account and equipment that is easy to maintain. For example, in Tuvalu in the South Pacific, a local electricity project used solar panels and hybrid batteries from Germany. However, after only a short period, the infrastructure stopped working because of a faulty sensor in the system. Lacking the necessary knowledge, skills, and spare parts to make the minor repair, the infrastructure was abandoned. While some maintenance requires external support, ensuring that a local operation and maintenance system is in place is vital to the long-term sustainability of local infrastructure.

INTEGRATED PROJECT MANAGEMENT TIES IT ALL TOGETHER

Too often, implementers check in with a community a year or two after project completion, only to find that structures are poorly maintained or abandoned. Local infrastructure experts note that integrated project delivery lies at the heart of sustainability. This approach takes a long-term view and includes the many lessons outlined throughout this report, from constructing simple infrastructure, to empowering communities, building technical capacity and skills, ensuring access to spare parts, training manuals and guides, and linking projects to the livelihoods, health, education, and natural environment of the local community.

Elements of integrated project delivery

- Project management
- Project due diligence
- Master planning
- Engineering design review
- Procurement management
- Construction management
- Environment, safety, and health
- Capacity building and training
- Stakeholder engagement
- Risk assessment
- Sustainability performance
- Organizational development
- Monitoring and measurement
- Research and data analytics
- Modeling

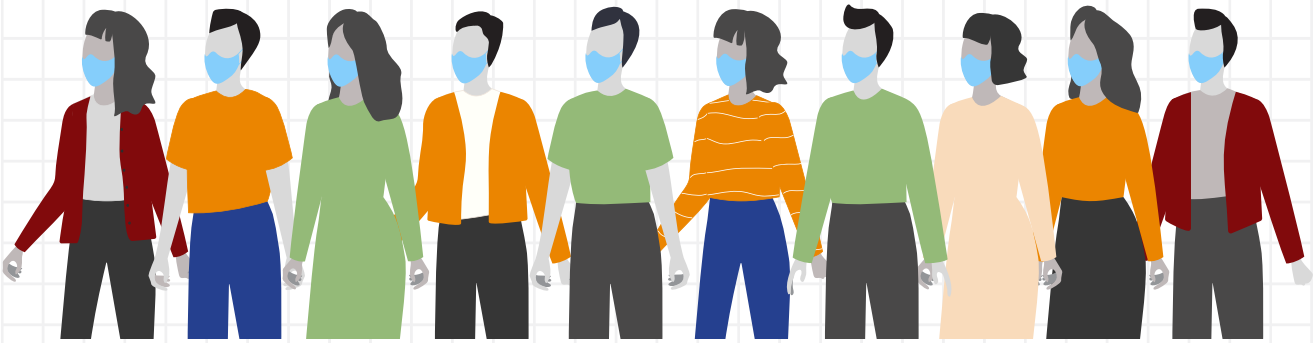
"You may have a solution today but not tomorrow. There are a lot of factors that influence a project's success; making sure that rural people are empowered, that the institutions serving rural people are strengthened, that people have access to information, that there is accountability to ensure that rural people are engaged effectively and fairly with markets and service providers, that technologies they receive are appropriate and resilient, that the provisions of sustainability are built into the technical design and implementation of any development approaches. A view from the beginning of how this will continue to benefit rural communities is really important."
— RON HARTMAN, SIDS PACIFIC

COVID-19 EXPOSES INFRASTRUCTURE DEFICIENCIES

The most vulnerable and marginalized in society have been hit hardest by COVID-19, and deficient infrastructure has played a significant role. Cramped, poorly ventilated housing, workplaces and public buildings have accelerated the spread of infection. So too has the lack of clean water and sanitation, especially in informal settlements. The sick have gone without sufficient care where local medical facilities were either absent or inadequate. Disruption of already scarce public transport has made it harder to access essential services and protect livelihoods. Poor connectivity to electricity and internet services has threatened business continuity and forced children to miss out on education as schools were closed.

"The most vulnerable groups — the urban poor, women, children and the elderly, people with disabilities and indigenous communities — have been most severely affected by the consequences of the pandemic, both in terms of health and livelihoods. These groups heavily depend on resilient infrastructure to regain access to socioeconomic opportunities and critical services."

— ANDRE DZIKUS, KENYA



A human-centered, intersectional approach

The pandemic has also demonstrated the intersectionality of crises, with many countries simultaneously battling the impacts of climate change. Designing and implementing sustainable, low-carbon, inclusive, accessible infrastructure that responds to the threat of future pandemics and accelerating climate change in the decades ahead will therefore be vital to community resilience.

This will require a human-centered approach that places communities and their diverse voices at the heart of recovery policies through participatory processes.

DUAL-OBJECTIVE INFRASTRUCTURE

Northern Thailand suffered severe droughts in 2020, creating an irrigation crisis for farmers. At the same time, millions of people lost their jobs or were unable to find work upon graduation due to the pandemic.

To help tackle both, the Pid Thong Lang Phra Foundation hired around 500 unemployed people to build 103 small-scale water projects for farmers in the northeastern provinces of Kalasin, Udon Thani and Khon Kaen.

They renovated existing reservoirs and irrigation systems, and developed an upgraded delivery system to help ensure farming areas had sufficient water. Farmers were also trained in sustainable farming methods.

An opportunity to build back better

Building resilient, sustainable infrastructure is therefore more important than ever to help at risk communities and their economies recover from the pandemic and withstand future health crises and other shocks.

There is now an opportunity to build back better, focusing on social infrastructure including schools and hospitals, and solutions that facilitate low-cost and low-carbon transportation for both rural areas and cities.

Infrastructure that either incorporates digital technology to reduce project cost, environmental harm and community disruption, or which helps accelerate the adoption of digital tools, will also help boost resilience.

The pandemic has also demonstrated the value of adaptable, flexible and multi-purpose infrastructure.

"The private sector and national and international stakeholders should be involved in this process, as they are able to provide the innovations, capacity building, financing and exchange of best practices to support communities in designing and implementing context-specific, tailor-made resilient infrastructure."

— ANDRE DZIKUS, KENYA

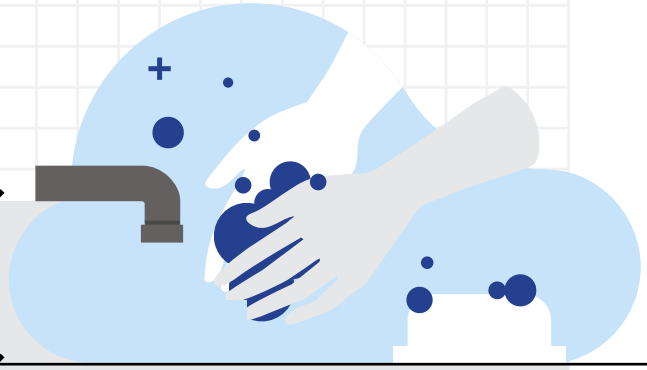
Funding

Governments in many developed countries continue to roll out massive stimulus programs to aid their COVID recovery. A significant portion of this spending is expected to be directed at infrastructure, which is seen as key to rebooting economies.

In many LMICs, however, the pandemic has drained already limited government funds, especially at a local level. The capacity to implement infrastructure is severely constrained, which will increase the need for communities to form partnerships with donors, NGOs, multilateral organizations and private-sector players to support and co-invest in projects.

It is also more critical in such settings that scarce resources are directed only towards projects that are sustainable and climate resilient and which provide maximum benefits to those most in need.

"The main lesson from the pandemic is that risk reduction and strengthening resilience capacity through resilient infrastructure projects and better access to improved services for communities are long-term tasks that require planning, coordination, research, innovations, capabilities and funding, but that these investments pay off in terms of enhanced adaptation, adequate risk management, and better protection of livelihoods and assets."
— JESUS QUINTANA, PERU



HANDWASHING STATIONS

Four out of 10 people globally do not have access to soap and water at home for handwashing. And in least developed countries, nearly three-quarters of people lack even basic handwashing facilities at home. Plugging this gap has become more critical during the pandemic to mitigate the risk of infection spread.

In March 2020, UN-Habitat and partner agencies built handwashing stations at Kenya's Dandora dumpsite under the African Clean Cities Platform. The facilities were introduced to help slow the spread of the virus among the more than 3,000 waste pickers that work there. In the longer term, they will also improve hygiene standards for the hundreds of urban poor who live around the site.

ABOUT

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bechtel.org's project management solution is people-focused, reaches vulnerable communities, empowers local partners, and scales for a higher impact. As Bechtel Corporation's social enterprise, we are sharing our innovation to help communities in the developing world build better and grow stronger.

ACKNOWLEDGEMENTS

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