



Five Bold Bets to Reduce Climate Vulnerability of Informal Communities in Urban India

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Scan to watch video interviews with India's informal workers on how climate change is affecting their lives and livelihoods.

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Foreword



HITENDRA DAVE
CEO, HSBC INDIA

The effects of climate change – be it prolonged heatwaves or erratic rainfall – are a reality today. These climate events are disrupting thousands of lives and livelihoods, with the greatest burden borne by communities that are already vulnerable because of socio-economic factors.

This is especially true for India's cities, where those living in informal settlements or working in informal jobs are the most at risk because they lack the resources and support systems needed to cope with the impact of climate change. As India urbanises rapidly, there is an urgent need to support these communities in becoming more resilient to climate change.

At HSBC India, we are committed to supporting communities to adapt better to climate change. We are engaging with our partners on programmes related to research, on-ground implementation resources, and training and capacity building to design and implement solutions that conserve the environment, preserve our natural resources, ensure clean energy access, and build resilience for climate-vulnerable communities. To that purpose, we launched our Climate and Equity Initiative in 2024 in partnership with United Way Mumbai and The Bridgespan Group. This multi-year initiative aims to drive innovation and investment in climate equity in India by bringing the needs of climate-vulnerable communities to the forefront and supporting solutions that meet those needs at scale. As part of this initiative, we published our report, [*Building Climate Resilience and Prosperity in India: Six Bold Bets for Smallholder Farmers and Farm Workers*](#), last year, to highlight the climate challenges faced by farmers and agricultural labourers.

This year, we are proud to present the second edition of the research initiative, which documents the voices of urban informal communities in the context of climate change. We realise that climate adaptation solutions work best when they are informed by a community's lived experience and are rooted in the local context. These insights can help inform design and decision making around this issue.

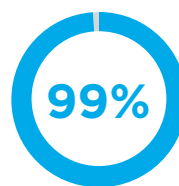
Drawing upon these insights, the report also highlights some innovative “bold bet” solutions for urban climate adaptation and the roles different stakeholders – the private sector, the government, and philanthropy – can play in supporting and scaling these solutions. While there are ongoing efforts, including by the government, the report emphasises the critical roles philanthropy and impact-first investors can play. Their catalytic capital can help spur innovation, absorb risks, generate evidence, and, overall, create the right environment to unlock further investments in the sector.

We hope this report contributes to developing collaborative action for urban climate adaptation so that we can move one step closer to a more equitable and climate-resilient future for everyone who lives and works in our cities.

Hitendra Dave, CEO, HSBC India

Executive Summary

From scorching heatwaves to record-breaking monsoons, rising air pollution to unseasonal cyclones, climate change is manifesting in increasingly dire ways in India's growing cities. But its effects are not evenly distributed. Those most affected are India's vast "informal sector": the 200-million-odd people¹ who live in urban informal settlements such as slums and are typically engaged in informal jobs – street vending, construction, waste picking, domestic work – that form the backbone of every city's economy. They account for roughly 40 percent of India's urban population,² but have little to no access to formal infrastructure and services, and limited financial resources, making them the most vulnerable to the escalating effects of climate change. India is urbanising rapidly, and unless informal urban communities are supported with climate change adaptation, millions more lives will be put at risk over the next two decades.



of respondents
**experienced an
acute climate
event in the
last 10 years.**

Despite this urgent need, funding for urban climate adaptation, be it from philanthropy or the public sector, is still woefully inadequate. To be sure, vulnerable urban communities are receiving a lot of attention, particularly from the government. But there is still a large gap in funding, especially for solutions that address the needs of those most at risk. By our estimates, India needs a staggering \$52 billion (roughly Rs 4.58 lakh crore) annually to meet its urban climate adaptation needs, but available funding is only \$8 billion (roughly Rs 0.71 lakh crore) – leaving a \$44 billion (roughly Rs 3.88 lakh crore) annual gap in adaptation finance.

Bridging this chasm will require both public and private capital. But when we spoke to those who work on climate change in India, most agreed that unlocking private capital for urban climate adaptation has been difficult. Even when there is intent, funders often don't know where to start or which efforts to prioritise. The perception is that climate adaptation is too complex or "too big" to tackle; that it requires significant investment but doesn't always produce measurable results.

The research outlined in this report aims to counter this perception, and show funders and [impact-first investors](#)³ that changing the urban climate adaptation landscape is possible. In fact, "[catalytic capital](#)" from funders today can play a critical role in accelerating adaptation efforts by encouraging innovation in this space and easing some of the challenges that are typically associated with scaling up climate solutions. Not only can these strategic investments pave the way for disrupting the deadly status quo around urban climate adaptation in India, but they can also attract additional capital from both the government and private players to the sector, helping bridge the adaptation finance gap.

Our research, developed with support from HSBC India, builds on the first year of our work which focused on [climate adaptation for smallholder farmers](#) and outlines five different investment opportunities for urban adaptation. We call them "**bold bets**" because we believe, if realised, they can drive transformative change towards making urban informal communities more climate resilient.

To arrive at these bold bets, we surveyed more than 1,000 informal settlement-dwellers and informal workers across eight Indian cities, asking them whether and how climate change has affected their lives and livelihoods. We found almost all survey respondents have acutely experienced the effects of climate change in the past decade. Most commonly, they reported heatwaves, excessive rainfall, and pollution deteriorating their living, working, and health conditions. We also asked respondents which solutions they think will work best to reduce the negative consequences of climate change on their lives. Using these responses as the starting point, and corroborating them with insights from more than 40 funders, government stakeholders, and nonprofits, we developed the five bold bets that are outlined in this report.

To make these bets as investment ready as possible, we have also identified, for each bet, the potential impact (how many people this opportunity could help) for every Rs 100 crore (roughly \$12 million) invested as well as how much additional funding from government and commercial sources each bold bet can unlock. **By our estimates, if all five bold bets were to be fully realised, it could unlock close to Rs 4 lakh crore of adaptation finance – roughly \$47 billion.** Below is a table with an overview of these numbers and a snapshot of our recommendations on how best the catalytic capital from funders can be put to use. In the report, we've also showcased an example that demonstrates how each bold bet will play out on the ground.

Overview of Five Catalytic Bold Bets

Bold bet	Role of catalytic capital from funders and impact investors	Impact potential <i>Number of people impacted per "bet" of Rs 100 crore/ \$12 Mn</i>	Catalytic multiplier <i>Commercial/ government capital unlocked by every catalytic rupee</i>	Full leverage potential <i>Number of bold bets to fully leverage commercial/ government capital</i>	Full impact potential <i>Number of people impacted by fully leveraging commercial/ government capital</i>
Support climate-smart housing modifications for better heat protection	Support research and development (R&D) to develop localised, cost-effective solutions; fund pilots to generate evidence and show commercial viability	9.2 K	5.7x	815	7.5 Mn
Invest in climate-indexed wage insurance to supplement income during climate crises	De-risk initial investment for private players; support the creation of localised climate datasets for more accurate payouts; create easy-to-use payment solutions	79 K	3.6x	16	1.2 Mn
Build sustainable urban drainage systems to improve water supply and reduce urban flooding	Help generate localised hydrogeological data; fund proof-of-concept pilots; offset set-up costs	2.7 Mn	8.6x	6	16.8 Mn

Bold bet	Role of catalytic capital from funders and impact investors	Impact potential <i>Number of people impacted per "bet" of Rs 100 crore/ \$12 Mn</i>	Catalytic multiplier <i>Commercial/ government capital unlocked by every catalytic rupee</i>	Full leverage potential <i>Number of bold bets to fully leverage commercial/ government capital</i>	Full impact potential <i>Number of people impacted by fully leveraging commercial/ government capital</i>
Create distributed renewable energy systems to reduce reliance on conventional energy sources	Support early adopters to spur demand; drive R&D to develop more affordable solutions; train local service providers	4.1 K	2.7x	231	950 K
Promote climate-resilient micro-entrepreneurship to reduce outdoor exposure and create green jobs	Support business incubation for green entrepreneurship solutions; invest in technology for skill building	13.5 K	5.9x	504	7 Mn

The time for audacious climate action is now. We hope this report provides you, as funders and investors, a starting point to invest in building climate resilience. These efforts today can have a positive impact on the lives of millions of urban informal workers and steer the trajectory of India's cities towards a more equitable future.

Introduction: Why We Set Out to Do This Research

As summers get hotter each year, 40-year-old Rumki Mullick, who lives in the densely populated slums of Dhakuria, Kolkata, struggles to cope. She and her husband have to spend several hours outside in the gruelling heat – she as a domestic worker and cook, he as a street-food vendor – and they come back feeling physically and mentally drained every day. “The tiles on the roof get so hot during the day, the room feels like a furnace, even at night,” she recounts. “I get dizzy, we can barely eat, or sleep. All we can think about is the heat. I don’t remember it being this hot even a few years ago.” The monsoons offer no respite. Her small house can barely survive the unpredictable storms that come more frequently, and her home inevitably floods. “A few years ago, there was a cyclone, and it took most of my roof. We put up plastic sheets, but our house still got flooded. There was water everywhere.”

Halfway across the country, in Delhi’s Bilaspur Camp area, auto-driver Deenbandhu Dubey agrees that weather conditions are worsening, and it has left him and his family facing impossible choices. With temperatures touching 50 degrees Celsius, it is becoming increasingly difficult for him to spend all day outside in his auto. “But if I don’t go to work, we don’t eat. It’s not like a salaried job, where you can take a day off,” he says. “But, on the other hand, if I go out and get a heatstroke, I will have to take 10 days off to recover. There are no good medical facilities nearby either. I really don’t know what to do if this continues.”

As India continues to urbanise,⁴ its cities are left grappling with the complex and escalating effects of climate change. India’s cities are warming at a rate that is nearly double that of the rest of the country, with over a third of it directly linked to urbanisation, principally because paved surfaces absorb and retain heat, and more urban activity adds to the heat.⁵ As a result, extreme weather events are now becoming the norm, with heatwaves claiming hundreds of lives⁶ in cities like Delhi, where temperatures are now touching 50 degrees Celsius in summer, and cities like Mumbai and Guwahati seeing record-breaking monsoons and unseasonal cyclones. In fact, in 2024, India faced extreme weather events on 322 out of 366 days: a trend that’s only been rising over the past three years.⁷

Crucially, though, these climate risks are not evenly distributed. The brunt of it is borne by people like Rumki Mullick and Deenbandhu Dubey, who live in dense and underserved informal settlementsⁱ in India’s expanding cities and are engaged in the informal workⁱⁱ that underpins urban economies.

i We’ve used the term “informal settlements” throughout this report to represent multiple kinds of housing found in urban India. The term encompasses slums (including ones that are notified under the applicable Slum Act; non-notified slums; identified slums, which are not recognised by state governments; and unidentified slums, which display slum-like characteristics but are neither notified or identified); unauthorised housing, which house roughly 12–20 million households across urban India ([FSG, 2016](#)); transitional housing; and the homeless, who typically live on the streets.

ii Informal work is defined by the International Monetary Fund as “activities that have market value and would add to tax revenue and GDP if they were recorded.” (Corinne Deléchat and Leandro Medina, “[Having fewer workers outside the formal economy can support sustainable development](#),” *Finance & Development Magazine*, International Monetary Fund, December 2020.)

Informality is intricately woven into India's urban landscape. As cities have swelled – because of rapid industrialisation and an influx of migrants moving from rural to urban areas for better opportunities – the demand for settlements and livelihoods have far outpaced the creation of formal housing, employment, and infrastructure. Today, roughly 40 percent of India's urban population resides in informal settlements⁸ while nearly 80 percent of the urban workforce is employed through informal arrangements.⁹

“Adaptation measures have long been underplayed in comparison to mitigation efforts. The logic has been, if you stop something from happening, why do you need adaptation? It's only now, when we've crossed the 1.5 degrees Celsius climate threshold, that people are waking up to the fact that adaptation is also equally important because we are living in the now, not 10 years from now.”

ASHWIN DESHMUKH, DIRECTOR, SAMYAK

This pervasive informality is the driving force behind climate vulnerabilityⁱⁱⁱ in urban spaces: those whose lives and livelihoods are already precarious because of poverty and marginalisation are most at risk when it comes to climate disasters. They are the worst hit when it comes to severe weather such as extreme heat or rain. On top of that, most

“We don't anticipate or calculate how many people living informally in big cities are needed to service the formal, so-called elite, city. And this number is only going to grow because we don't have a support system in small towns to absorb migrants. There's not enough infrastructure, livelihoods, or medical facilities to support these households and city planning doesn't ensure they are provided habitat and infrastructure support. Without these systems in place, migrants inevitably head to big cities, and as a result, [cities] continue to grow, both through the natural growth of informal populations and an influx of new migrants.”

SHEELA PATEL, FOUNDER AND DIRECTOR, SOCIETY FOR THE PROMOTION OF AREA RESOURCE CENTRES (SPARC)

informal work requires spending time outside for long hours. In the absence of formal employment that grants them paid leave, most have no option but to work, regardless of weather conditions.

Informality also limits the ability to adapt to climate change. For instance, many informal settlers have no legal documentation of residence and live in constant fear of eviction, which prevents them from investing in household modifications to weather extreme climate events.

India is expected to have over 400 million additional urban dwellers by 2050.¹⁰ Unless informal urban communities become more resilient to climate change, millions more lives will be put at risk over the next two and a half decades.

iii Vulnerability is described by the Intergovernmental Panel on Climate Change as encompassing “a variety of concepts and elements, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.” (Intergovernmental Panel on Climate Change, [Climate Change 2014: Impacts, Adaptations, and Vulnerability – Summary for Policymakers](#), IPCC's Fifth Assessment Report (WGII AR5), 5.)

Despite this imminent crisis, momentum for climate adaptation – that is, making people and places more resilient to the effects of climate change – has been slow to build in India as well as globally, especially for urban areas. While allocations for adaptation finance have increased over the past few years, they still account for only 5 percent of annual tracked climate finance globally.¹¹ An even smaller percentage goes to urban areas; efforts for vulnerable urban communities, who are most affected by climate change, are rarely referenced, if at all. This might be because urban adaptation efforts typically require highly localised solutions and considerable time and patience to show results, and because implementing them often needs public and private sector actors to come together.

In India, although there have been recent efforts to improve climate adaptation, investments are still largely concentrated in rural areas, whether from philanthropy or the public sector. Our research finds that, currently, there just isn't enough funding available to match the pace at which India's urban adaptation needs are growing.

India needs an estimated \$52 billion (roughly Rs 4.58 lakh crore) per year to effectively address its urban climate change adaptation needs, but current available funding is only \$8 billion (roughly Rs 0.71 lakh crore), including funds from government, domestic and global philanthropy, venture capital, and corporate social responsibility sources. **That's a staggering \$44 billion (roughly Rs 3.88 lakh crore) annual adaptation finance gap.** (See [Appendix B: Approach for Calculating Estimates](#).)

Bridging this finance gap requires not only public money but also private finance. But in our conversations with experts, we found that unlocking private capital for urban climate adaptation has not been easy. In a country like India, where the effects of climate change vary drastically by geography and socio-cultural context, climate adaptation for urban areas and vulnerable communities needs highly localised solutions. They also require considerable time and patience, and collaboration between private and public sector actors, to realise results. Even if funders are interested in supporting solutions, they might still be hesitant to do so because they are unsure of what the “right” investments are – both in terms of what is needed and what will have the most impact.

This is where this research comes in. Developed with support from HSBC India, and building on our work on [bold bets for rural adaptation](#), this report is designed to make it easier for philanthropic funders and impact investors to allocate capital for urban climate adaptation by answering two critical questions:

- **What do urban informal communities need the most when it comes to coping with climate change?**
- **How can funders strategically invest catalytic capital to meet these needs in a way that benefits the most people and attracts additional investments to the sector?**

Using insights from time spent in communities and interviews with experts (see [Research Methodology](#)), we have identified five innovative opportunities that are ripe for such investment. We call these opportunities “bold bets” because we believe, if fully realised, these investments can fast-track climate adaptation in urban informal communities. They are also designed to have a multiplier effect – that is, they can also unlock significant capital from both the government and private players (see [An Overview of Bold Bets](#)).

Why Catalytic Capital?

Catalytic capital is typically defined as investments that take on a disproportionate amount of risk or concessionary returns, compared to traditional investments, to drive positive change and enable more capital to flow. For the purposes of the report, we have used the term “catalytic capital” to represent private capital from philanthropy, corporate social responsibility (CSR), or impact investment funds.

Catalytic capital is especially important in urban climate adaptation because it can help spur critical innovations – key for localised solutions – and absorb risk in ways that attract follow-on investments. For instance, it can provide seed funding for early-stage pilots or bridge finance for organisations that seek to scale. It can also bypass challenges that typically slow urban adaptation efforts (say, the informal status of settlements making them ineligible for certain government schemes) by providing the initial investment needed to help communities get started on adaptation. In these ways, catalytic capital can create a disproportionate impact by smoothing the way for future conventional investments.

This is a decisive decade for climate action. Estimates suggest that India is likely to warm by another 0.5 degrees Celsius by 2030¹² – an increase that will have catastrophic consequences on everything from air pollution and rainfall to agricultural yields and migration. The nation cannot afford to wait another 10 years to ramp up adaptation efforts. And while the climate crisis can sometimes feel insurmountable, we hope our research shows that transformative change *is* possible. Now more than ever, there is real opportunity for funders to invest in climate action that can help better the lives of those most vulnerable, for generations to come.

Research Methodology

To arrive at the five bold bets, we conducted our research through:

- **Quantitative surveys, qualitative interviews, and field visits:** We surveyed approximately 1,000 respondents in eight cities – Bengaluru, Dehradun, Delhi, Guwahati, Hyderabad, Kolkata, Lucknow, and Mumbai – who live in informal settlements and engage in informal work. Most (75 percent) of our respondents work in professions in which they are exposed to outdoor working conditions, with roughly 26 percent in street vending, 16 percent in construction, and 11 percent in transport or delivery. Twenty-five percent of them engage in other professions like domestic work. Over half of our survey respondents (53 percent) are women and over 70 percent are members of Dalit, Bahujan, and Adivasi communities, which helped us understand the overlaps between climate, and caste and gender. We also spoke to people whose pre-existing medical conditions – respiratory ailments (24 percent), cardiovascular issues (roughly 30 percent), and mental health conditions (28 percent) – put them most at risk (see [Appendix A](#) for more details). The surveys were conducted in person through our research partner, [Catalyst Management Services](#), in local languages by people familiar with the locales. We also got approval from the [Institutional Ethics Committee of The Catalyst Foundation](#), to ensure ethical practice during the research (See [Appendix E](#) for approval certificate). We also visited eight informal settlements and conducted six in-depth interviews to understand local conditions and constraints.
- **Expert consultations:** We interviewed more than 40 experts, including funders, nonprofits, and government and ecosystem stakeholders specialising in urban climate adaptation. (See [Appendix D](#) for the full list of interviewees.)
- **Secondary research:** We conducted a comprehensive literature review to understand the current landscape of urban climate adaptation in India and to evaluate both the existing funding gap as well as the full impact potential of our proposed bold bets. (See [Appendices B](#) and [C](#) for more details.)

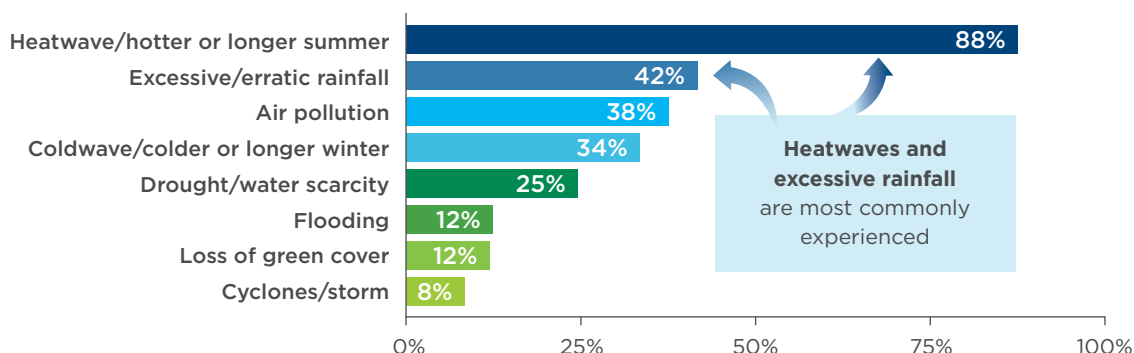
Lessons From the Field: What Are the Biggest Challenges Urban Informal Communities Face?

By including community members in decision-making processes, factoring in their lived experiences, and making them active participants, solutions are more likely to match the realities on the ground. Recognising this, and in line with our past work on [rural climate adaptation](#), we started our research by speaking to urban informal communities to understand their experience with climate change across key areas – housing; livelihoods; water, sanitation and hygiene (WASH); and health – and asked them what solutions they think would work best for them. We found that these communities were repositories of local climate knowledge and their responses, coupled with interviews with practitioners, helped us home in on three themes – and on bold bets to address them.

A Snapshot of Our Survey Findings

Figure 1. Almost all informal-settlement dwellers and informal workers have experienced acute climate challenges

Survey question: Which of the following climate events have you experienced most in the last 10 years? Please choose up to 3 options.



Respondents have fragile finances, limited resources, and little external support to adapt to climate change



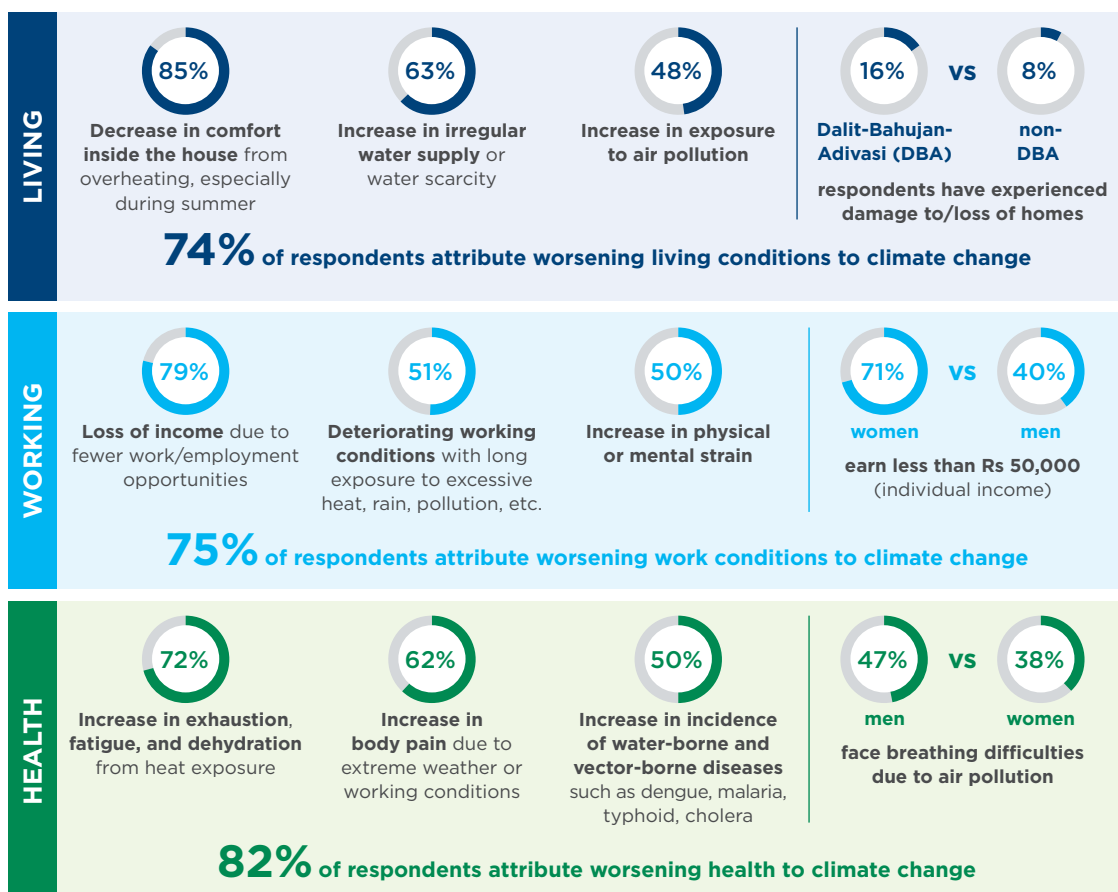
Note: N=1,091

Source: Bridgespan Group survey of informal workers and informal-settlement dwellers, 2024-2025.

The Bridgespan Group

Figure 2. Most informal-settlement dwellers and informal workers attribute worsening living, working, and health conditions to climate change

Survey question: We want to understand the changes you have experienced in your living/working/health conditions in the last few years. Which of these options are true for you?



Note: N=1,091

Source: Bridgespan Group survey of informal workers and informal-settlement dwellers, 2024-2025.

The Bridgespan Group

Informal housing is vulnerable to extreme weather, affecting residents' health and quality of life

For Manda Koltharkar, a stay-at-home mother who lives in a densely populated slum in Bandra East, Mumbai, the biggest challenge in summer is staying indoors. “The heat is unbearable inside the house,” she says. “We have a *patra* [iron sheet] over our house, so it gets incredibly hot during the day. We have a ceiling fan, and we use a table fan with it, but it’s still not enough. Plus, the humidity is suffocating – the fans don’t really help.”

Almost all respondents (99 percent) in our survey reported that their living conditions had worsened over the past decade, with 74 percent attributing it to climate change. This is unsurprising given that informal housing is typically located in “high-risk” areas – low-lying lands that are prone to flooding, for instance, or tucked alongside highways or train tracks – that are overlooked by or considered unsuitable for formal housing. These areas become even more precarious when climate disasters strike, worsening living conditions, damaging property, and posing significant health risks for residents.

To make matters worse, many informal-settlement dwellers live on plots of land that do not legally belong to them or for which they don’t have necessary documentation to prove ownership. In our survey, only 16 percent of respondents had all the necessary documentation for ownership of their land. This means many residents live in constant risk of eviction, making it impractical to invest in housing infrastructure. Some live in settlements made of materials like aluminium or plastic that do nothing to protect them from excessive heat or flooding.

“Where [informal settlers] live is a function of what they can afford. So, they [end up] living in the boondocks, in some really unsafe places, and their challenge is to find affordable housing, which is [also] legal in nature. And the more an area is gentrified, the more it drives up costs.”

SATHYANARAYANAN SHANKARAN, URBAN STRATEGY LEAD,
RAINMATTER FOUNDATION

The lack of legal status also means that the delivery of basic amenities like electricity, water, and waste collection is not guaranteed, and, if available, erratic at best. Emergency measures like early warning systems, evacuation plans, and disaster relief also routinely bypass informal settlements. Dalit, Bahujan, and Adivasi (DBA) communities are particularly vulnerable since informal settlements disproportionately house marginalised communities. In our survey, approximately 47 percent of those who lived in these areas belonged to DBA communities.

Of the most commonly experienced climate events, overheating was the most cited in our survey. An overwhelming 85 percent of respondents reported a decrease in comfort inside the house from overheating during summer. Most only had a fan for indoor cooling, and even then, reported an increase in power outages, likely brought on by increased demand in the summer months, making the heat even more challenging.

This is in line with existing research. For instance, an analysis by World Resources Institute found temperatures in one of Mumbai's slums averaged 6 degrees Celsius warmer than neighbouring areas, with factors like overcrowding and poor housing quality contributing to heat stress.¹³ These conditions can also intensify temperatures indoors, making the inside of homes even hotter than the outside, especially during heatwaves.¹⁴

Nearly half (48 percent) of our respondents also highlighted an increase in exposure to air pollution over the past decade. Vehicular emissions, construction work (performed mostly by informal workers), and the lack of open spaces and green cover in informal settlements all contribute to pollution levels, made worse by climate conditions like extreme heat.

Ventilation is also practically non-existent, with most residents living in single-room dwellings that double as both living and sleeping areas, and kitchens. Nearly 70 percent of the respondents in our survey said they have a kitchen indoors, where combustion and poor ventilation increases the already high levels of air pollution. This affects women more, since they are typically in charge of cooking. Lack of ventilation also makes the insides of houses more humid, which, combined with the heat, can lead to heatstroke or organ failure, even if the person is indoors. The people most at risk are those with pre-existing illnesses. Exposure to highly polluted air, for instance, is more likely to affect those suffering from respiratory issues or those with hypertension. This is not a small number: around 37 percent of the households we surveyed said they have a family member with chronic health issues.

“While we focus on building materials for energy efficiency and emissions, we also need to look at the design of homes holistically, including ventilation, layout, orientation, and construction techniques for thermal comfort. This is critical in informal settlements, where poorly built homes coupled with a lack of green cover cause heat stress and energy poverty. This heat stress disproportionately affects women, who stay at home longer.”

NITHYA RAMESH, DIRECTOR, PLANNING AND DESIGN,
JANA URBAN SPACE FOUNDATION

Informal workers are more exposed to extreme weather, resulting in income loss and health issues

Abdul Kalam came to Lucknow from his village nearly two decades ago to earn a living and currently works as a painting contractor for private houses. But with the rising heat, it's becoming increasingly difficult for him to earn enough for his household. "It's only February and it's already so hot now. I don't know what the weather will be like in March and April. It's like the winters have disappeared," he says. "When it's 50 degrees [Celsius], how can you work outside?" He's finished high school and would much rather run his own small business. "I'd like another way to earn a living, one where I don't have to spend so much time outside."

A staggering 80 percent of India's urban population rely on informal work to survive¹⁵ – from waste picking and street vending to construction work and transport for app-based delivery services. Almost all these professions require workers to spend long hours outdoors, increasing their exposure to climate threats: half of our respondents said they spend more than six hours outdoors for work every day. This prolonged exposure has lasting negative consequences on their income, productivity, and health. A study on informal workers in slums in Delhi found that every degree of increase in mean temperature was associated with a 16 percent decline in net earnings, with net earnings reducing by as much as 40 percent during extreme climate events like heatwaves.¹⁶ In fact, a *Lancet* report found that India lost 181 billion potential labour hours due to heat exposure in 2023.¹⁷

When caste and gender are considered, the risks are even higher. For example, heat-related loss of productivity affects women more, when factoring in unpaid labour like caregiving and housekeeping. Caste, too, is an important factor when it comes to outdoor exposure. Most construction workers are from marginalised communities: 31 percent of Adivasi respondents we spoke to were construction workers as opposed to only 14 percent of General (i.e. non-DBA) respondents.

Half of our respondents said that they had experienced significant deterioration in working conditions in the past decade, due to long exposure to heat, rain, pollution, and other climate conditions. Nearly 80 percent reported loss of income due to fewer employment opportunities. Over 70 percent said they faced health issues like exhaustion, fatigue, dehydration, and sleep disturbances from heat exposure, while over 40 percent experienced breathing or lung problems.

Waste pickers are also disproportionately from DBA communities: of the waste pickers we spoke to, 61 percent were Dalit or Adivasi, and 70 percent were women. They face increasing health risks because of rising temperatures. And rising temperatures accelerate organic waste decomposition, which leads to the production of dangerous gases such as methane and an increase in vector-borne diseases and landfill fires.

Lack of access to drinking water, shaded rest areas, and other basic amenities at worksites compound the situation. In our survey, we found that 26 percent of respondents didn't have access to toilets in the workplace and 30 percent had no access to shaded areas. Access to affordable commuting options is also limited. Only a handful have their own transportation, and most brave weather conditions in public transport or walk several hours to their workplace.

Even after enduring these gruelling work conditions, most informal workers are not making enough to sustain themselves. More than half of the respondents we spoke to personally earned less than Rs 50,000 (roughly \$580) each annually, despite an average family size of five. With meagre earnings and little to no social protections to fall back on, even a few days of lost wages can mean a descent into debt. More than half of all our respondents had some form of debt – greater for those from DBA communities (roughly 60 percent versus 50 percent of non-DBA respondents), and over 60 percent had not accessed any support, such as relevant government schemes. Only 12 percent reported that they were able to save. When income isn't enough to cover living costs, especially with the income loss during climate events, most are forced to engage in negative coping strategies like reducing expenditure on food (40 percent) and health (36 percent), worsening the effects of climate change on their health, not to mention leaving no money aside for investing in adaptive solutions.

“Livelihoods are the most critical area of intervention. The livelihoods we currently have are fast becoming rudimentary if not redundant, especially for the informal sector. We need to reimagine livelihoods with green jobs while leveraging the rapid strides in AI and technology so that they are more relevant and sustainable.”

ROYSTON BRAGANZA, CEO, GRAMEEN CAPITAL INDIA

Informal settlements' water scarcity and improper wastewater management are worsened by erratic weather, increasing risk of disease

Fifty-three-year-old domestic worker **Rita Kheradkar**, who lives in a cramped 10-by-10 foot room in a chawl (tenement house) in Vakola, Mumbai, dreads the monsoons. With heavy rains and flash floods becoming increasingly common, her house is flooded for nearly three months every year. "Earlier the gutters outside would be flooded, but now the water from the community toilets seeps through the floors into our house. It's so bad that we have to wake up at 2 or 3 a.m. in the morning and use buckets, utensils – whatever we have – to throw the dirty water out of our house." It leaves her and her family stranded in their homes, their belongings damaged, and her grandchildren exposed to serious health risks. "But what can we do?" she adds, resigned. "It costs too much to elevate the floors of our house. So, we live with it."

Most residents of informal settlements continue to face challenges when it comes to drainage and wastewater management. Nearly half (46 percent) of our survey respondents said they had makeshift open drains in their areas, and 11 percent had no drains at all. And while most have access to toilets, either at home or a communal one, they rarely function as they should. When erratic climate conditions push these already-strained systems to capacity, drains overflow, toilets flood, settlements are waterlogged, and the groundwater is contaminated. Stagnant floodwater is a breeding ground for mosquitoes which spread vector-borne diseases, while contaminated drinking water increases the risk of diseases like diarrhoea, leading to loss of wages and expensive medical care, on top of the damage to property caused by the flooding.

Nearly half of the respondents we spoke to confirmed that there has been an increase in cases of dengue, malaria, typhoid, and cholera over the past decade.

survey noted that they have seen an increase in water scarcity or irregular supply over the past few years.

“We still do not have functional wastewater management systems in most of our cities. Black and grey water get mixed, there is solid waste blockage, and overflow due to limited capacity. All of this leads to flooding, and this water typically stagnates in low-lying areas, which house urban slums.”

ADITI PANDEY, HEAD, PARTNERSHIPS AND COMMUNICATION,
CDD INDIA

On the flip side of urban flooding is water scarcity. Access to a tap at home is often a luxury, with nearly 50 percent of our respondents saying they rely on community sources of drinking water. Water delivery is marked by chronic unreliability, contamination, and conflict, made worse by the increased demand brought on by conditions like heatwaves. In fact, 63 percent of respondents in our

...

Taken together, all these factors also severely affect the mental health of urban informal communities. Residents of informal settlements are already predisposed to psychological distress, anxiety, and suicidal ideation, because of poverty and unequal access to opportunities and services.¹⁸ This is made worse by the uncertainty brought about by climate change: 23 percent of our survey respondents said they experienced an increase in mental health conditions like stress and anxiety. With limited access to mental health support, this struggle plays out in ways that might not be obvious at first glance. For instance, experts we spoke to pointed out that domestic violence is often exacerbated by extreme heat.

Using this research as the starting point and drawing on solutions proposed by the community, the next section outlines the five bold bets that we believe can best address the most critical challenges faced by urban informal communities and help them adapt better to climate change.

An Overview of the Bold Bets

Using what we learned in communities and from experts, we identified five bold bets that funders and impact investors can invest in to accelerate climate adaptation for urban informal communities.

For each bold bet, we've estimated an investment of Rs 100 crore (roughly \$12 million) for a like-for-like comparison, although actual investments may be larger or smaller. We have also assumed that each bold bet will take five to seven years to achieve its full impact. In line with the "[pay-what-it-takes](#)" principle, the full cost of implementation, including administrative and partner costs, is factored in.

For the sake of simplicity, we have also assumed the same cost of implementation of bold bets across geographies and communities, although we recognise that during implementation, programmes will have to be tailored to different locales, ideally working with knowledgeable, trusted partners who already work in the target communities.

For each bold bet we propose in this section, we've outlined the following:

- **Impact potential:** The number of people who could benefit from one bold bet (of Rs 100 crore). To arrive at this, we drew on quantified evidence from proprietary data shared with us by organisations, then vetted these estimates with experts in the field.
- **Catalytic multiplier:** The amount of public and private capital that can be unlocked per rupee invested. This includes funds budgeted for government schemes and bank lending. To estimate government funding, we considered a portion of a scheme's allocated budget, depending on the level of alignment between the objectives of the scheme and the bold bet. (See [Appendix B](#) for more details.) To estimate capital from financial institutions, we apportioned a share of the total priority sector lending to housing, renewable energy, and other relevant areas.
- **Full leverage potential:** The number of bold bets (of Rs 100 crore each) that is needed to fully realise the government funds and commercial capital unlocked. To arrive at this, we analysed the scale of capital available and the catalytic multiplier.
- **Full impact potential:** The number of people who could benefit by using the commercial and government capital unlocked around this bold bet.
- **Expected impact:** The results that research, experts, and practitioners say could be achieved by each bold bet based on evidence from recent or ongoing activities.
- **Case study:** A specific example in India that illustrates how the bold bet is being implemented, albeit at a smaller scale, and how the proposed bold bet can be implemented by a nonprofit or an intermediary organisation.

Overview

Bold bet	Role of catalytic capital from funders and impact investors	Impact potential <i>Number of people impacted per “bet” of Rs 100 crore/ \$12 Mn</i>	Catalytic multiplier <i>Commercial/ government capital unlocked by every catalytic rupee</i>	Full leverage potential <i>Number of bold bets to fully leverage commercial/ government capital</i>	Full impact potential <i>Number of people impacted by fully leveraging commercial/ government capital</i>
Support climate-smart housing modifications for better heat protection	Support research and development (R&D) to develop localised, cost-effective solutions; fund pilots to generate evidence and show commercial viability	9.2 K	5.7x	815	7.5 Mn
Invest in climate-indexed wage insurance to supplement income during climate crises	De-risk initial investment for private players; support the creation of localised climate datasets for more accurate payouts; create easy-to-use payment solutions	79 K	3.6x	16	1.2 Mn
Build sustainable urban drainage systems to improve water supply and reduce urban flooding	Help generate localised hydrogeological data; fund proof-of-concept pilots; offset set-up costs	2.7 Mn	8.6x	6	16.8 Mn
Create distributed renewable energy systems to reduce reliance on conventional energy sources	Support early adopters to spur demand; drive R&D to develop more affordable solutions; train local service providers	4.1 K	2.7x	231	950 K
Promote climate-resilient micro-entrepreneurship to reduce outdoor exposure and create green jobs	Support business incubation for green entrepreneurship solutions; invest in technology for skill building	13.5 K	5.9x	504	7 Mn

Bold Bet ①: Support Climate-Smart Housing Modifications for Better Heat Protection

IMPACT POTENTIAL

9,200
people

benefit from
each bold bet

CATALYTIC MULTIPLIER

5.7x
multiplier

per catalytic
rupee invested

FULL LEVERAGE POTENTIAL

815
bold bets

can be mobilised to reach
a full impact potential of
7.5 million people

The Problem

Informal settlements typically experience temperatures 2 to 3 degrees Celsius warmer than the city average,¹⁹ due to densely packed construction, overcrowding, and building materials like tin, asbestos, and concrete that absorb and retain heat, made worse with the rising frequency of climate events like heatwaves. Houses become like furnaces, severely affecting residents' health, productivity, and livelihoods – in fact, over 85 percent of our survey respondents identified overheating as their biggest climate-related challenge. Most informal settlement dwellers don't legally own their houses, and have little to no savings, both of which limit their willingness or ability to make significant design or structural modifications to their houses that can help cope with the rising heat.



of respondents
chose house
modifications
using **heat-reducing**
materials as the **top**
infrastructure solution for
adapting to climate change.²⁰

Solutions, therefore, that are simple enough to be implemented at low cost, regardless of ownership status, are the most promising.

The Opportunity

There are several emerging solutions in the market to combat extreme heat. These include **cool roofs** (applying reflective coatings to metal, concrete, or asbestos rooftops to reduce heat absorption), **green roofs** (covering rooftops with vegetation over a waterproof layer to provide natural insulation), and **thermal insulation panels** (made from lightweight materials like waste straw or coconut coir that are added to walls and roofs to keep insides cooler). Design enhancements like roof vents, solar-powered exhaust fans, or strategically placed openings to improve ventilation can also help reduce heat.

In India, and globally, conversations around housing modifications to help reduce heat have been underway for quite some time. In fact, in 2023, the Indian state of Telangana became the first to launch a Cool Roof Policy to encourage widespread adoption of cool roofs across the state.²¹ India is also a part of a global trial to test how cool roofs can positively affect the health and economic conditions of lower-income communities.²² But uptake for these solutions is still low because of limited

awareness and slow large-scale implementation. Catalytic capital can address some of this by:

- **Driving research and development (R&D) towards new solutions for extreme heat:** Funders can work with public and private research institutes or incubate climate start-ups to drive R&D on solutions best suited for different urban areas, explore ways to make these solutions more affordable, and identify the most efficient ways to implement climate-smart housing modifications.
- **Generating evidence:** Thermal modification solutions require continuous monitoring to assess how they are affected by long-term exposure to weather or to assess how they affect energy consumption or health in communities over time. This evidence is crucial to advocate for large-scale adoption. To support this, funders can back pilot projects to generate evidence on the feasibility, cost-effectiveness, and impact of these modifications across different Indian topographies.
- **Training local workers for implementing these modifications:** Investing in training people from the community to implement and maintain these modifications will also help generate green jobs and build ownership around these solutions, helping with more widespread adoption.

Pathways to Scale

While some private companies currently offer cool roofing solutions or heat-reflective paints in India, the untapped market is substantial. Stimulating demand would incentivise more private consumer-goods companies to offer these products at affordable prices.

The Pradhan Mantri Awas Yojana – a flagship programme of the Ministry of Housing & Urban Affairs – will invest an additional Rs 10 lakh crore (roughly \$120 billion) to build one crore houses by 2029.²³ This presents an opportunity to integrate climate-smart modifications into the design and construction of these houses, with the cost of materials, installation, and other direct expenses funded through this and other government programmes. This is in line with government recommendations. The National Mission on Sustainable Habitat 2021–2030, for instance, encourages integrating roof-cooling techniques for newly constructed urban and peri-urban housing.²⁴

Several nonprofits already work with urban local bodies (ULBs) to roll out government housing programmes. Funders can also support these efforts to expand the scope and reach of these programmes. Eventually, ULBs can establish building codes to mandate the integration of thermal modifications, as was done in Ahmedabad under its Heat Action Plan for low-income housing.²⁵

Expected Impact

- **Lower temperatures and energy consumption:** Studies show that modifications like cool roofs can reduce indoor temperature by 2 degrees Celsius and surface temperature up to 15 degrees Celsius compared to asbestos concrete roofs.²⁶ By lowering internal temperature, solutions can reduce energy consumption indoors.

- **Less strain on urban power supply:** Reducing internal temperatures in informal settlements can reduce overall energy demand in summers, safeguarding against grid failures, and reducing emissions. When implemented on a large scale, solutions like cool roofs can also reduce the urban heat island effect.²⁷
- **Fewer heat-related health issues, especially for vulnerable groups:** Extreme heat puts people at risk of fatigue, exhaustion, and fatal dehydration and can increase the risk of developing cardiovascular illnesses and respiratory issues.²⁸ Climate-smart housing can help reduce instances of heat-related illness, especially in those who are more vulnerable, like the elderly, or those with pre-existing illnesses, like asthma.
- **Reduced income stress:** Lower energy consumption and fewer cases of falling sick mean lower out-of-pocket expenditures for informal workers, who often live on a meagre income and have little to no savings to fall back on, as our survey revealed. Over the long term, this means less debt, more financial security, and more disposable income for these communities.

Case study: Roof Over Our Heads



Started in 2022, [Roof Over Our Heads](#) (ROOH) is a global campaign that aims to move informal settlements from “survival homes” to “resilient homes” through climate-resilient housing upgrades. Since most informal settlements are designed, constructed, and financed by residents, ROOH works to co-develop solutions with communities, particularly women’s collectives, in India, Indonesia, Kenya, Latin America, and the Philippines. It then identifies where external support – such as professional expertise or state backing – can complement these efforts.

Upgrades focus on reducing heat, improving light and ventilation, and addressing flooding. This process is supported through hands-on training of local construction workers and recommending the use of local and affordable alternative materials such as terracotta ceramic tiles, fly-ash bricks built using the rat-trap bond technique, Vedic plaster, oriented strand board panels, and polyurethane foam sandwich roofing sheets to ensure better performance against climate vulnerabilities while preserving traditional building practices. Incremental upgrading is key to ROOH’s approach – improving existing structures rather than full reconstruction – making these modifications more affordable and accessible for low-income families. At each location, contractors, material providers, and financiers work with the community to first test solutions and then scale them based on what they learned.

With support from ROOH, over 60 settlements in 11 Indian cities have undergone assessments to help develop locally tailored solutions. The [Society for the Promotion of Area Resource Centers \(SPARC\)](#), a nonprofit based out of Mumbai, plays a crucial role in ROOH's work in India. SPARC builds partnerships with women's collectives, supports data-driven interventions, and helps put community voices at the forefront of policy discussions, while the SPARC Samudhaya Nirman Sahayak manages the execution of affordable housing solutions.

To share learnings across different geographical and social contexts, ROOH has also established "learning labs," which it aims to expand across 20 countries over the next five years. ROOH also advocates for more urban climate adaptation support. The ROOH secretariat, based in India, fosters a global network of practitioners working in climate resilience, and develops universal data and assessment tools, which can then be adapted to different communities.

Bold Bet ②: Invest in Climate-Indexed Wage Insurance to Supplement Income During Climate Crises

IMPACT POTENTIAL

79,000
people

benefit from
each bold bet

CATALYTIC MULTIPLIER

3.6x
multiplier

per catalytic
rupee invested

FULL LEVERAGE POTENTIAL

16

bold bets

can be mobilised to reach
a full impact potential of
1.2 million people

The Problem

Informal workers make up approximately 80 percent of the urban workforce.²⁹ Since most of them work outdoors, they are disproportionately affected by extreme weather. Half of the respondents in our survey reported that their working conditions have deteriorated because of long exposure to excessive heat, rain, and pollution.

A staggering 80 percent also said they experienced loss of wages and employment opportunities. With little

to no social

protection, loss of income due to climate events can mean a spiral into debt and poverty. In fact, nearly 90 percent of our respondents said they have no savings to fall back on after spending on household

expenses, and in times of crisis, they have to cut back on essentials like food or medicine.



of respondents
chose **insurance**
as a **climate**
adaptation
solution that

**would be most useful for
their livelihoods.**

The Opportunity

Climate-indexed wage insurance is designed to provide financial compensation to workers whose income is disrupted by climate events like extreme heat, flooding, or air pollution. Climate-indexed insurance relies on pre-defined climate triggers: temperatures rising above a specific threshold, rainfall exceeding a certain level, or air quality indices reaching hazardous levels. When these thresholds are breached, payouts are automatically triggered, so that affected workers receive timely compensation without going into lengthy claims processes.

But for climate-indexed wage insurance to work, several factors need to be in place. Insurance schemes need a viable cost structure that keeps premiums affordable; accurate payout triggers depend on localised and reliable weather monitoring and climate data, which need to be streamlined; and a common interface or platform would aid premium collection and payout disbursement because informal workers are often not linked to formal financial systems. Workers would need to adapt their

behaviours, as well, because they may have a limited understanding of risk transfer. Absent these factors, private players will avoid the sector.

This is where catalytic capital can step in, specifically through:

- **Helping de-risk the opportunity for private players to step up:** Funders could provide first-loss guarantees, subsidise premiums, or develop blended finance models to encourage insurers to enter the space. Funders can also support pilots that test different models to prove viability.
- **Supporting the collection of high-quality, localised climate data:** Funding research institutions, data collection projects, and partnering with meteorological agencies to build robust, granular climate datasets will lead to fairer, more responsive insurance products that are tailored for local conditions.
- **Building mobile- and digital-first payment solutions:** A dedicated payment platform – think a mobile phone app, for example – can help ensure that workers can easily access a climate-indexed insurance solution. Funders can also partner with community organisations or collectives to act as local intermediaries to collect premiums and ensure timely payouts.
- **Educating communities on financial literacy:** Raising a community's understanding of financial concepts can raise comfort with climate insurance amongst communities who need it the most.

Pathways to Scale

Increased demand and proven viability would encourage more private players to enter the market. Insurance companies can partner with impact investors, banks, and microfinance institutions to subsidise premiums, offer wage insurance as a part of their financial products, or bundle it with other microinsurance products (health, accident, or life insurance) to reduce costs and increase reach. Microfinance institutions can act as the interface for collecting premiums and disbursing payouts, as they have done in the past for life insurance.

Once feasibility is established, state governments can integrate climate-indexed wage insurance into existing social protection and employment schemes. For example, introducing climate-indexed wage insurance in the National Urban Livelihoods Mission, which aims to reduce poverty in vulnerable urban households, can provide an added layer of financial security for informal workers. By subsidising premiums or acting as re-insurers, governments can eventually make these schemes more affordable and sustainable and help assure communities that insurance premiums are not set at predatory levels.

Expected Impact

- **Increased financial stability and ability to recover from climate shocks:** Climate-indexed wage insurance helps prevent wage loss, reduces dependence on high-interest loans, and maintains the already precarious financial stability of informal workers. Similar programmes in agriculture, such as rainfall-indexed crop insurance, have proven that timely payouts not only reduce the likelihood

of workers falling into debt or selling productive assets during times of crisis but also helps them recover faster from climate shocks.³⁰

- **Reduced health risks:** Informal workers are often forced to work through unsafe climate conditions to earn their daily wages. This, in turn, leads to more climate-related health issues, which most cannot afford to treat. Having insurance to supplement income helps ease the difficult choice between loss of health and loss of income and reduces risk of exposure.
- **More support for vulnerable communities:** Migrant workers and members of DBA communities are disproportionately employed in professions that have the highest exposure to outdoor conditions like waste picking, street vending, or construction. Climate-indexed wage insurance helps these already disadvantaged groups sustain their incomes during climate-related work disruptions.
- **Increased financial inclusion:** An indirect benefit of a climate-indexed wage insurance could be to bring more informal workers within formal financial institutions, by creating bank accounts or onboarding them on digital payment platforms. It helps them build a credit history over time, providing them with future access to other financial products.

Case study: Mahila Housing Trust



MAHILA HOUSING TRUST
Towards Responsible Urban Development

The [Mahila Housing Trust](#) (MHT) operates a climate-indexed wage insurance program for women in informal employment, such as domestic workers and street vendors, who are exposed to long hours in extreme heat. In 2024, the Climate Risk Insurance programme was piloted in Ahmedabad, Surat, and Vadodara and currently covers 26,000 families at an annual premium of Rs 354 (roughly \$4). Families receive a payout of Rs 2,000 (roughly \$23) if maximum temperatures breach the threshold for two consecutive days.

MHT designed the insurance product in partnership with insurance providers, using heatwave thresholds defined by local meteorological data to trigger payouts. When women cannot go outside for work during extreme heat days, they receive compensation for lost income. To ensure wide adoption, MHT conducted awareness campaigns to educate workers about climate risks and the benefits of investing in climate-risk insurance, even when there is no immediate payout – not a small ask in communities where money is scarce.

Payouts through the programme were triggered in the first year in some communities, with families receiving payments worth Rs 15 lakhs (roughly \$17,500). A survey conducted by MHT to evaluate the effectiveness of the insurance revealed that 97 percent of the insured felt increased financial autonomy and 89 percent would recommend the insurance scheme to others.

Bold Bet ③: Build Sustainable Urban Drainage Systems to Improve Water Supply and Reduce Urban Flooding

IMPACT POTENTIAL

2.7 million
people

benefit from
each bold bet

CATALYTIC MULTIPLIER

8.6x
multiplier
per catalytic
rupee invested

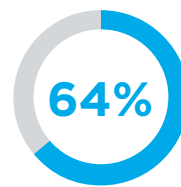
FULL LEVERAGE POTENTIAL

6
bold bets
can be mobilised to reach
a full impact potential of
16.8 million people^{iv}

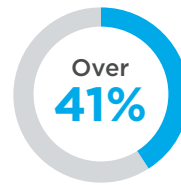
The Problem

Informal settlements in India face the dual, seemingly paradoxical, challenges of urban flooding and water scarcity driven by lack of service delivery and poor drainage infrastructure, which only worsens during the extreme weather events that are more frequent with climate change. For example, 63 percent of our survey respondents reported an increase in water scarcity, especially during summer. Nearly half of them rely on makeshift open drains for

Amongst WASH solutions,



of respondents
chose **regular
access to tap
water** as their
top priority.



of respondents
chose **access
to better
drainage
systems** to
**reduce waterlogging and
wastewater accumulation.**

wastewater disposal, and even where services exist, they're inadequate in both quality and capacity. During extreme weather, like heavy rainfall or cloudbursts, these systems are overwhelmed, leading to waterlogged settlements, and stormwater mixing with wastewater, which damages property and increases risk of disease. Half of the respondents we spoke to reported an increase in diseases like dengue, malaria, typhoid, and cholera during these events.

The Opportunity

Sustainable urban drainage systems (SUDS) are a potential solution both to combat urban flooding and to reduce water scarcity in informal settlements.^v Unlike traditional drainage systems, SUDS mimics natural hydrological processes like infiltration and

^{iv} The cost calculations for this bold bet pertain only to artificial recharge tube-wells. Additionally, simplifying assumptions have been made for impact numbers, with one artificial recharge tube-well per informal settlement, as impact determinants and thresholds vary for different contexts.

^v It's important to note, however, that a single solution cannot fix an issue as vast and complex as urban drainage. We have proposed SUDS as one of many potential solutions; several solutions need to come together to comprehensively address this issue.

retention to better manage stormwater and reduce urban flooding while also recharging groundwater and improving water quality.

SUDS can be implemented in several forms like permeable pavements, which allow rainwater to infiltrate directly into the soil; rain gardens planted with deep-rooted vegetation that collect and filter water runoff; constructed wetlands, engineered systems that mimic natural wetlands; or artificial recharge tube-wells, carefully constructed vertical structures that allow rainwater from rooftops, pavements, or open spaces to penetrate directly into groundwater aquifers. Recharge tube-wells have filtration layers that remove pollutants and prevent contamination, and can help increase groundwater storage, reduce flooding, and maintain water table levels. This also ensures water is available during dry periods, especially in water-stressed informal settlements.

A SUDS implementation is built with considerations for holistic local climate and soil conditions, as well as physical constraints such as limited open space in informal settlements. Typically, multiple complementary SUDS solutions are considered for each community's needs. But uptake has been slow due to the need for coordinated efforts across multiple government agencies to adopt and maintain SUDS solutions.

Catalytic capital can play an important role in overcoming some of these challenges and encourage early-stage adoption, specifically by:

- **Generating localised data for SUDS:** Funders can partner with research institutes and nonprofit partners to generate the localised hydrogeological data that is essential for designing and implementing contextually appropriate SUDS solutions.
- **Piloting proofs-of-concept:** Funding early-stage demonstration projects by nonprofits and implementing organisations can help build evidence that, in turn, can persuade both public and private players on the efficacy of SUDS interventions.
- **Training stakeholders across the value chain:** Implementing SUDS requires large-scale training of city planners, engineers, government organisations, and the community on their benefits and working mechanisms. Funders can partner with nonprofits, technical experts, or intermediaries to carry this out.

Pathways to Scale

There are several existing government schemes that focus on drainage and wastewater management (like the Atal Mission for Rejuvenation and Urban Transformation Scheme³¹) and on water conservation and recharging groundwater (like the Jal Shakti Abhiyan³² launched by the Ministry of Jal Shakti). The government also plans to allocate roughly Rs 2500 crore (roughly \$300 million) to expand water bodies and construct drains in major cities like Mumbai, Chennai, and Bengaluru, to tackle urban flooding.³³ As a climate adaptation solution, SUDS is in line with all of these government priorities. This is especially important since regulatory support from government agencies (for instance, making sure that SUDS interventions are

up to national sanitation and wastewater management standards) is critical for the widespread implementation of this solution.

These schemes could expand the coverage of SUDS solutions, with the government covering the initial capital costs (such as for land acquisition, construction, and installation), while philanthropy and nonprofits provide implementation and technical support, or explore public-private partnership models.

Expected Impact

- **Protection against extreme climate events:** SUDS reduces urban flooding by improving stormwater absorption and reduces the mixing of stormwater and wastewater, especially during heavy or erratic rainfall. They also recharge groundwater, which builds water security for times of extreme heat.
- **Fewer diseases and improved community health:** By ensuring safe wastewater management and reduced waterlogging, SUDS can reduce cases of water-borne illnesses like diarrhoea, and vector-borne diseases like dengue and malaria. This, in turn, lowers out-of-pocket expenses, leading to more financial security for informal communities.
- **Better environmental footprint:** Since many SUDS solutions use nature-based solutions to recharge groundwater, they help reduce water wastage, promote local ecosystems, and support environmental sustainability.
- **Reduced urban expenditure:** SUDS are more cost-effective in the long run, since SUDS solutions reduce costs associated with flood damage, infrastructure maintenance, and water management. For example, the city of Portland, Oregon, in the United States, expects to save roughly \$224 million (approximately Rs 1,882 crore) in combined sewer overflow management costs over 20 years by implementing SUDS solutions in conjunction with its major investment in sewer pipe infrastructure.³⁴
- **More support for women:** When it comes to poor drainage and sanitation, women in informal settlements tend to be worse hit since they are more likely to be home-based workers. When flooding occurs, the responsibility of household repairs and removing stagnant water falls primarily on women, as well as caring for family members who might fall sick. SUDS can help address some of these challenges.

Case study: Center for Water and Sanitation



Initiated in 2009, the [Center for Water and Sanitation \(CWAS\)](#) at [CEPT University](#) works to promote equitable water and sanitation services in India. It does this through a mix of action research, implementation support, and capacity building. CWAS has played a pivotal role in promoting SUDS across Indian cities, working closely with city and state governments to develop and implement localised, context-specific initiatives. These primarily focus on water conservation practices, including rainwater harvesting and groundwater recharge systems.

Since 2022, CWAS has supported the municipalities of Anjar and Gandhidham in Gujarat's drought-prone Kachchh region to develop water security and climate resilience action plans. Both cities faced intermittent water supply, relying only on distant water sources and depleting groundwater – conditions that were worsened by erratic rainfall and urban flooding. CWAS conducted geo-hydrological studies in both cities to identify strategic recharge zones for rainwater harvesting and for the revival of dry borewells through groundwater recharge initiatives. It then implemented demonstration projects across institutional buildings and flood-prone urban areas.

These projects supplied over 40,000 litres of drinking water to more than 3,500 people. They also helped recharge over 56 million litres of groundwater, equivalent to the annual drinking water needs of over 10,000 households. Water quality in areas affected by salinity ingress (that is, saltwater moving into freshwater areas) was also improved. CWAS complemented these efforts with trainings for over 100 professionals in SUDS-based solutions. These demonstration projects led city authorities to formally recognise SUDS as a scalable and cost-effective solution; other cities also have plans to implement SUDS.

This is just one example. To date, CWAS has supported the monitoring of water and sanitation services in over 1,000 Indian cities, supporting city government bodies to take targeted action to improve service delivery. These efforts have benefited millions of urban residents and helped establish SUDS as a key approach to building climate-resilient and water-secure cities.

Bold Bet ④: Create Distributed Renewable Energy Systems to Reduce Reliance on Conventional Energy Sources

IMPACT POTENTIAL

4,100
people

benefit from
each bold bet

CATALYTIC MULTIPLIER

2.7x
multiplier

per catalytic
rupee invested

FULL LEVERAGE POTENTIAL

231
bold bets

can be mobilised to reach
a full impact potential of
950,000 households

The Problem

While most informal settlements have some form of electricity, supply is erratic, especially in peak summers or other periods of high demand. One in three respondents from our survey – especially women and members of DBA communities – said they saw an increase in the frequency of outages in their areas. Even when power is available, the cost of electricity is often too high: 40 percent of survey respondents reported an increase in living costs over the past few years, in part due to higher electricity bills. Unreliable supply and high costs force residents to rely only on fans, which, studies have found,³⁵ are insufficient, even counter-productive, during intense heat. Others take on debt



of respondents
chose using
**renewable
energy devices
at home to
reduce electricity bills** as
their preferred infrastructure
solution to combat
climate change.

to buy coolers and air conditioners, reinforcing heat poverty.³⁶

The Opportunity

A distributed renewable energy (DRE) system uses solar panels or other renewable energy generating equipment, on a building's roof or in common community areas. The electricity generated is first used for local consumption by houses connected to the system, and the excess is fed into the public grid. This also helps reduce electricity bills through "net metering": a billing mechanism that lets consumers sell excess energy they produce back to the grid.

These DRE systems can also be connected to energy storage systems like batteries to store power in a microgrid. When primary grids are overwhelmed due to climate surges, or when natural forces (like sunlight or wind) are not strong enough, DRE-powered microgrids can act as backup systems to the main grid. They are especially useful in mid-size to small cities where power cuts are fairly common, particularly during periods of high demand. DRE microgrids can be owned and managed by local cooperatives or resident collectives to ensure fair pricing, maintenance, and community-led governance.

Despite significant evidence, in India and globally,³⁷ of DRE systems improving quality of life in informal settlements, widescale adoption has been slow. Sustaining the operation and maintenance of these systems can also be challenging. This is where catalytic capital can come in, specifically by:

- **Supporting R&D to make DRE systems more affordable:** Funders can support research organisations, climate start-ups, and manufacturers to find innovative solutions to make systems like solar panels more affordable and, therefore, more attractive to low-income households and cooperatives.
- **Driving early demand:** Funders can help drive adoption by supporting household-level installations for early adopters and community leaders, to showcase its benefits to the community and generate demand. Funders can also support civil society organisations, with their significant community-level networks, to build community awareness and participation, paving the way for large-scale adoption.
- **Training service providers in the community:** Funders can also help train community members to effectively operate and maintain DRE systems or support the creation of community-led models to ensure fair pricing, sustainability, and collective ownership of these systems.

Pathways to Scale

Once enough demand is generated, affordable financing models can help communities invest in their own energy generation and storage systems. Financial institutions and regulatory authorities could also consider including energy systems under Priority Sector Lending regulations,³⁸ which can significantly increase the amount of capital flowing to DRE systems.

The government's Pradhan Mantri Surya Ghar Muft Bijli Yojana already provides a subsidy of 40 percent to 60 percent for the installation of rooftop solar units.³⁹ Distribution companies are also required to ease rooftop solar set-up by, for example, making net metering readily available, inspecting and commissioning installations in a timely manner, and expediting vendor registration. The inclusion of solar and renewable energy installations in other flagship programmes, such as the Pradhan Mantri Awas Yojana (Urban) 2.0,⁴⁰ could also mobilise large-scale market-linked funding and help communities transition to DRE systems. Eventually, urban local bodies can invest in strategic microgrid systems in zones most prone to spikes in energy demand.

Expected Impact

- **More reliable access to energy:** By reducing dependence on erratic power grids, microgrids can ensure a more uninterrupted power supply even during peak summer outages. For example, a study in Rajasthan found that solar microgrids improved energy reliability for over 77 percent of households and enabled night-time activities such as studying and home-based work.⁴¹
- **Lower electricity costs:** With DRE systems, informal households can save on electricity bills as locally generated power reduces dependence on expensive grid electricity. A study on a hybrid multi-source model that includes solar generation,

a biogas generator and energy storage found that it can reduce electricity costs for consumers by 30 percent.⁴²

- **Reduced heat stress:** Access to reliable power can help residents use energy-efficient fans, coolers, and passive cooling solutions, reducing indoor temperatures and heat stress. The case study in Rajasthan, mentioned above, found that 65 percent of households were able to install electric fans once they switched to solar microgrids, because of lower costs and a steadier supply of electricity.⁴³
- **Lower carbon footprint:** Distributed renewable energy has an important impact on climate mitigation – reducing planet-warming emissions – as well as other benefits for climate adaptation. Studies have found that microgrids that are renewable-energy based can reduce emissions of greenhouse gases by 15 percent to 50 percent.⁴⁴
- **More stable livelihoods:** Access to reliable energy means microenterprises and small businesses run from home can flourish, reducing lost workdays due to power outages. For instance, case studies in urban Kenya and Nigeria found that using renewable microgrid systems helped increase household incomes significantly (up to four times in some cases) through a mix of reduced electricity costs, longer working hours, and better productivity. It also contributed to gender equity, with women and girls having more time to give to education and business.⁴⁵

Case study: SELCO India



Since 1995, [SELCO India](#), a solar energy social enterprise headquartered in Bangalore, has pioneered decentralised solar energy solutions for low-income households. A part of this effort has included the design and deployment of programmes for urban informal settlements, where access to reliable electricity remains a challenge. SELCO's solutions are designed to address household energy needs to improve quality of life as well as provide opportunities for vulnerable urban communities to supplement their income.

Some of its solutions include solar inverters (battery backups) that reduce electricity bills and offer backup power, especially during climate surges; solar water heaters that offer an affordable, sustainable alternative for communities with limited access to hot water; and solar-powered butter churners and sewing machines that allow small entrepreneurs like dairy workers and home-based tailors to increase their earnings without having to rely on traditional energy sources. SELCO develops energy-efficient models based on community needs; works with financial institutions to provide affordable financing solutions; and trains stakeholders on the benefits of sustainable energy.

For instance, in an urban slum near Manipal, Karnataka, SELCO identified 400 migrant families who struggled with unreliable electricity supply, which hampered their productivity and, consequently, their income. Since traditional banks were unwilling to lend to them, SELCO collaborated with a

local cooperative bank to create a loan structure that matched these families' household incomes and cash flows, helping more than 75 households adopt solar home lighting systems. This, in turn, improved their productivity and overall quality of life, increased safety, and helped children study at night.

With the success of this and similar interventions across multiple cities in India, SELCO has helped those most vulnerable to climate risks transition to sustainable energy, paving the way for improved energy equity.

Bold Bet ⑤: Promote Climate-Resilient Micro-Entrepreneurship to Reduce Outdoor Exposure and Create Green Jobs

IMPACT POTENTIAL

13,500
people

benefit from
each bold bet

CATALYTIC MULTIPLIER

5.9x
multiplier

per catalytic
rupee invested

FULL LEVERAGE POTENTIAL

504

bold bets

can be mobilised to reach
a full impact potential of
nearly **7 million people**

The Problem

Millions of informal workers in India – street vendors, construction workers, waste pickers, delivery personnel – rely on occupations that require being outdoors, exposing them to extreme weather conditions like heatwaves and severe rainfall, and air pollution, all of which are worsening with climate change. Not only does this cause disruption in work – with nearly 80 percent of our respondents reporting loss of income – it also has serious consequences on health. In our survey, nearly 70 percent experienced issues like pain, fatigue, and dehydration due to difficult working conditions. Without alternative employment



of respondents
chose **creating
alternative
employment
opportunities**

as their **preferred
livelihood solution.**

models that reduce outdoor exposure, climate change

will continue to erode their livelihoods and health. And with the gradual phasing out of conventional energy sources like fossil fuels over the next few decades as part of global climate mitigation efforts, many informal jobs are at risk, and the workforce needs to be trained or upskilled to help them transition to the green economy.

The Opportunity

Encouraging the establishment of small-scale, climate-resilient businesses that can be operated indoors would not only reduce outdoor exposure but also help transition informal workers into the green economy. Most informal settlements in India already have several home-based micro- and nano-enterprises, which can form the foundation for creating additional indoor-based livelihoods. (A microenterprise is typically defined as a business that operates with fewer than 10 people. A nano enterprise is even smaller, with a team made up of one to two family members or hired labour.) Promotions could focus on home-based climate-resilient livelihoods across sectors such as food processing, handicrafts, or tailoring. And special incentives could support businesses catering to emerging sectors in the green economy (sustainable packaging solutions, consumer goods made with recycled materials, bio-enzyme cleaning products, to name a few).

At the same time, programmes could train informal workers on emerging green occupations such as the installation and repair of solar panels, energy-efficient construction, e-waste management, or the repair and maintenance of electronic vehicles. Once trained, programmes could help them set up climate-resilient microenterprises with these skills.

Catalytic capital can play a pivotal role in creating an ecosystem around transitioning to alternative, climate-friendly livelihoods, specifically by:

- **Funding research and development (R&D) on locally specific green entrepreneurship solutions:** Many prominent philanthropic organisations already work on entrepreneurship and livelihoods. They can draw on their vast experience to support R&D on green entrepreneurship opportunities in the communities they work with, helping identify locally relevant solutions based on population group, demand, and expertise in the community.
- **Providing business incubation support:** Funders, especially impact investors, can support new micro-entrepreneurs across the entrepreneurial life cycle through an incubation programme – from providing seed capital to helping them access markets and networks, and mentoring them to develop market-ready products. Funders can also partner with nonprofits to implement these programmes.
- **Investing in technology for training and upskilling:** Investing in easy-to-use digital educational materials delivered through mobile-first platforms can go a long way in helping upskill informal workers on new green opportunities. Funders can partner with nonprofits to increase adoption of these trainings.
- **Building climate-friendly infrastructure:** Establishing climate-controlled, shared workspaces in low-income areas can encourage more residents to become micro-entrepreneurs and provide a more comfortable alternative to home-based ventures.

Pathways to Scale

Today there's a push for sustainability both from consumers and companies, manifesting in a demand for more diverse and local supply chains, or climate-friendly alternatives (packaging, for instance) for consumer goods. With trained workers available to meet these trends, small- to medium-size companies can contract home-based enterprises operating at a micro- or even nano-scale.

The Open Network for Digital Commerce initiative by the Ministry of Commerce, Government of India, that provides a platform for businesses of all sizes to sell goods and services online, provides an opportunity for these micro-enterprises to sell goods and services directly to consumers as well as to other businesses. Upskilled informal workers can also utilise this platform to sell services as they transition to the green economy.

Several other government programmes and initiatives, like Atal Incubation Centres, the Pradhan Mantri Mudra Yojana, the Startup India Initiative, and the Stand-up India Programme, already promote entrepreneurship in the country and can be adapted to include climate-resilient alternatives. There's also the Skill Council for Green Jobs, under the Ministry of Skill Development & Entrepreneurship, an independent,

industry-led organisation mandated to identify skilling gaps in green-job sectors. The Council designs and implements a wide range of skilling programmes to address these gaps. With an increase in funding, these programmes could evolve to include accreditation and certification for training informal workers on climate-resilient livelihoods, leading to better uptake and expanded reach.

Expected Impact

- **Increased income stability:** Transitioning to climate-resilient micro-entrepreneurship means informal workers have lesser dependence on erratic outdoor working conditions, which means lower chances of lost wages and more stable incomes. It also means increased job security as the economy transitions towards sustainability.
- **Reduced health risks:** Indoor-based livelihoods significantly cut down on both the short- and long-term health risks associated with long exposure to outdoor working conditions. In turn, this means lower out-of-pocket spending on medicines and hospitalisations, and more financial security.
- **Increase in community productivity and agency:** Creating indoor-based employment opportunities can help communities regain productivity lost due to exposure to extreme weather conditions outdoors. It also helps in creating agency, financial independence, and dignity, especially for women, or members of DBA communities, who disproportionately work in socially shunned jobs like waste picking.
- **Transitioning workers to the formal economy:** Promoting micro-entrepreneurship and upskilling informal workers through accredited institutions and providing certifications also brings them within the folds of the formal economy, making it easier for them to build a credit history, access loans, and receive government subsidies and benefits.

Case study: Rang De India



Launched in 2008, [Rang De](#) is a peer-to-peer lending platform where individuals can invest directly to support entrepreneurs who do not have access to formal credit, by offering them low-cost, customised loans for their small businesses.

Rang De works with impact partners to identify and support entrepreneurs and mentor first-time borrowers on effective credit use and repayment, while helping them build sustainable livelihoods. It also vets these entrepreneurs and designs loan products tailored to the specific economic needs of communities with whom they work.

Although its work is primarily focused on rural entrepreneurship, in recent years Rang De has diversified its portfolio to help low-income urban communities across Indian cities access affordable, collateral-free credit to fund their ambitions. For instance, in Mumbai, Rang De works with low-income students

who are attending night school for entrepreneurship but have no credit history, which limits their access to working capital once they complete their education. To address this, Rang De designed a flexible loan product that offers a three-month moratorium period, allowing borrowers crucial time to establish their businesses and stabilise operations before loan repayments begin, which helps reduce financial stress and increases the business's chances of survival. To date, Rang De has disbursed over Rs 61 lakhs (roughly \$70,000) to more than 60 entrepreneurs. Similarly, it has worked with waste segregators in Karnataka to help them access loans to cover operation costs as they expand their businesses, and with domestic workers and first-generation women entrepreneurs in Delhi and Mumbai to secure low interest livelihood loans for them to invest in their businesses and gradually build formal credit histories.

Today, Rang De is a financial institution regulated by the Reserve Bank of India, and has disbursed over 26,000 loans, amounting to over Rs 96 crore (roughly \$11.6 million) and has connected around 11,100 social investors to over 11,300 micro-entrepreneurs.

Building the Climate Adaptation Ecosystem

While the bold bets outlined in this report promise to deliver significant positive change for informal communities struggling with climate change, we recognise that they cannot function in silos. Beyond supporting individual bold bets, funders can also play a vital role in [field building](#) that lays the groundwork for the bold bets to achieve their full potential. In our conversations with experts, we've identified four factors that can give the bold bets a better chance at success.

Data and Technology

Open-source data systems that collect, analyse, and disaggregate data on climate vulnerabilities can be game-changing when it comes to designing targeted climate adaptation solutions. For example, climate-indexed wage insurance needs accurate hyper-local data and reliable urban sensors. Once in place, they can be used to mark climate risk thresholds and trigger payouts. To build this, philanthropists and impact investors can invest in developing robust locally relevant datasets that use emerging technology, including artificial intelligence, geographic information systems and mapping tools, sensors, and drones – to precisely map the complexities of climate change across geographies and socio-economic disparities.

“Something that is coming up more and more in risk and adaptation conversations is: can we create ‘data highways’ where you develop the infrastructure for people to come in and plug in their tools? So, for example, if I’m conducting a climate vulnerability index [CVI], I will have data around monsoons and heat. Someone else can come with, say, income data and do an analysis of income versus CVI.”

VISHWAS CHITALE, FELLOW, COUNCIL ON ENERGY, ENVIRONMENT AND WATER

Legal and Regulatory Frameworks

The lack of legal status of informal settlements can be debilitating when it comes to urban planning. Experts we spoke to underscore the need to separate legal status from service

“Public-private partnerships [can be a good model] in certain areas where maybe the government has limited reach in terms of getting into those areas. [Public and private players] can come together and enhance each other’s strengths to help leverage some of these interventions.”

SURUCHI BHADWAL, SENIOR FELLOW AND DIRECTOR, CLIMATE CHANGE AND AIR QUALITY, THE ENERGY AND RESOURCES INSTITUTE

delivery, especially when it comes to integrating climate solutions in existing local and state urban development plans. Many of the bold bets also need favourable regulatory frameworks to be implemented to their full potential. Making policies and regulations around land tenure, zoning, and procurement of construction material more responsive to climate risks can help with bold bets like SUDS or climate-smart housing modifications becoming more widely accessible. Philanthropists, especially, can play a critical role in advocating for these changes, in collaboration with civil society.

Impact Assessment

Assessing impact is important for every programme, but when it comes to implementing big ideas like those outlined in our bold bets, it becomes imperative to understand what is working and what isn't, especially since climate adaptation is a relatively new sector. Funders can help build a strong impact-assessment ecosystem by investing in creating a shared language around measurement, evaluation, and learning (MEL) for the sector, by working with MEL organisations for insight and guidance on the subject, or simply by funding evaluation studies for climate adaptation pilots, which can help generate evidence and best practices.

Community Participation

While our survey found that there is a broad understanding of climate impact amongst informal settlement dwellers and informal workers, climate change is showing up in increasingly complex and nuanced ways in urban lives. A deeper awareness of how climate change can impact lives and livelihoods can help informal communities gain more agency around decision making for climate adaptation solutions. In turn, they themselves can advocate for the changes they need, both from the government and the private sector. Funders can partner with community-driven organisations to help build [power and assets](#) of informal communities, to improve awareness of and demand for climate solutions.

“Community awareness plays a key role in getting the government to do things. Creating this capacity in a community takes effort but it is an extremely powerful tool to hold the government accountable.”

VANESSA D'SOUZA, CEO, SOCIETY FOR NUTRITION, EDUCATION AND HEALTH ACTION

Towards a Collaborative Future for Urban Climate Adaptation

Climate is a complex and cross-cutting issue, and it can sometimes feel like “too big” of a problem to solve. The five bold bets outlined in this report offer a few tangible starting points for individuals and organisations to accelerate adaptation efforts in the country; but the greater opportunity will be for actors across the economy – government, private players, financial institutions, philanthropists, and, of course, communities – to come together. Funders, especially, can benefit from tapping into philanthropic collaboratives – typically made up of three or more independent actors, including at least one philanthropy, with a shared vision and strategy for achieving impact on a multifaceted issue like climate adaptation. Our [research](#) has found that both in India and globally, these collaborative approaches can unlock greater giving and scale than when players act alone.

Collaboratives, and other kinds of intermediaries, can help coordinate strategy around climate adaptation efforts, allow funds from multiple donors to be pooled, and enable different players to share their expertise about what works in specific community and climate contexts. These approaches also make it easier for newer donors to join in, potentially increasing the impact of these bold bets.⁴⁶ And although building consensus amongst multiple stakeholders might seem daunting initially, the benefits – the large-scale changes that collaborative action can drive for those who are the most vulnerable – far outweigh the risks. The bold bets outlined in this report can not only disrupt the status quo around urban climate adaptation, and help close the funding gap, but also help bring all ecosystem actors together for a common goal: helping shape a more resilient and equitable future for India’s cities.

Anant Bhagwati is a partner in The Bridgespan Group’s India office, where **Rishabh Tomar** is a principal, **Rohan Agarwalla** is a manager, and **Kanika Tomar** is a consultant. **Sohini Pal** is an editorial director also located in the India office.

Appendices

Appendix A: Survey Details

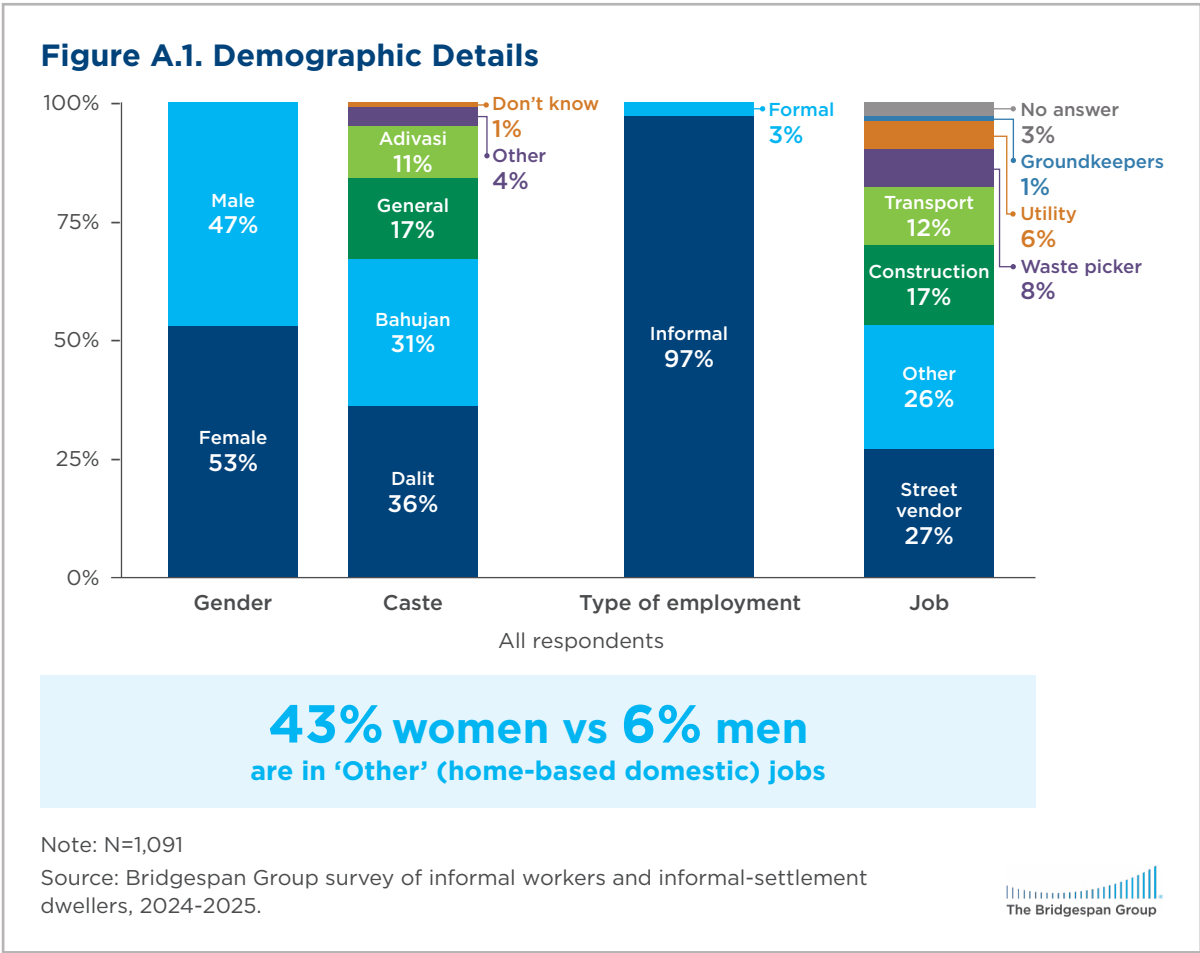
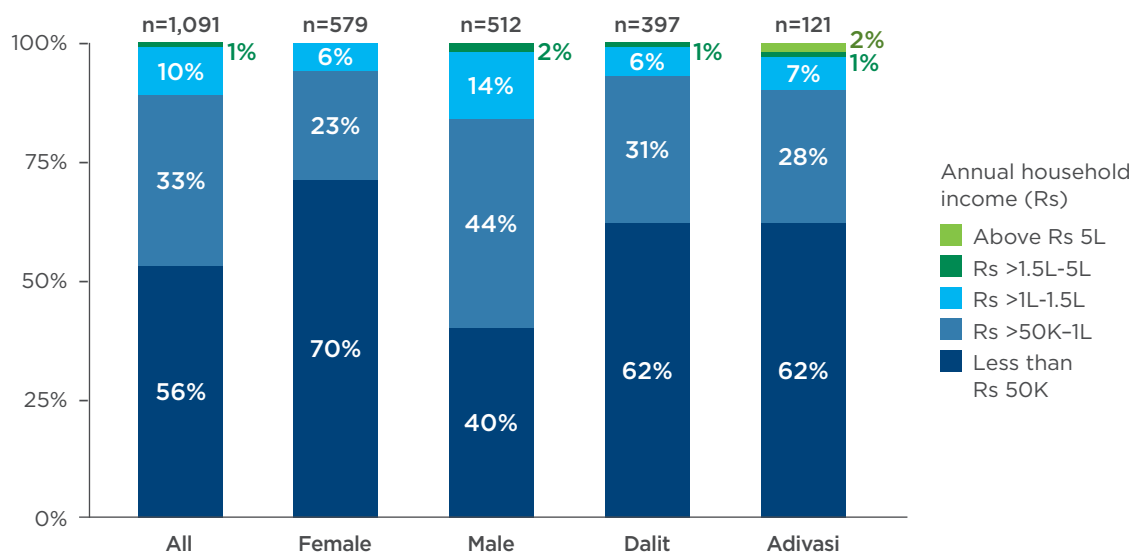


Figure A.2. Income



88%
of respondents do not find their income
sufficient to meet expenses and save

52%
of respondents
have debt

Source: Bridgespan Group survey of informal workers and informal-settlement dwellers, 2024-2025.

The Bridgespan Group

Limitations of the Survey

- Sample size:** The sample size of 1,091 respondents, across eight cities, is not statistically significant and hence the results may not be applicable to a wider population. Nonetheless, the team took efforts to ensure that the sample size was as representative as possible, across different geographic regions, city tiers, and climate vulnerabilities. The respondents were all informal settlement inhabitants and had diverse representation across gender, caste, job type, and health conditions.
- Coverage:** The study may not adequately reflect the experiences of emerging urban areas as the cities we covered did not include Tier 3 (cities with a population between 20,000 to 50,000) or Tier 4 (with a population between 10,000 to 20,000) cities. However, the solutions are intended to be broadly applicable as consultations with experts were used to calibrate for relevance for a wider urban populace.
- Recency bias:** The survey was conducted during the months of December 2024 and January 2025. As such, responses may reflect recency bias in questions pertaining to experiences of climate change and events. However, questions were carefully framed to capture changes experienced over longer periods of time.

Appendix B: Approach for Calculating Estimates

Funding Gap

To arrive at the capital needed, we referred to the Initial Adaptation Communication of India, a statement of purpose submitted by the Government of India to the United Nations detailing total adaptation capital stock needed in India by 2030 and adjusted it for the urban population in India. For the capital available, we studied relevant government programmes and commitments, analysed past commitments by multilateral development banks and philanthropy (both domestic and foreign) and considered projections on equity funding going into more established climate adaptation solutions (such as start-ups related to cooling) as an indicator for potential investments in the sector.

Bold Bets

To assess the transformative potential of each bold bet on climate change adaptation in urban India, we developed a structured approach to quantify impact, leverage capital, and gauge scalability. Each bold bet is conceptualised around a standardised philanthropic investment of Rs 100 crore. The following metrics were used to estimate potential.

- 1. Impact Potential:** The number of individuals directly reached or supported through one bold bet.

- Calculation approach: We conducted a detailed bottom-up costing exercise to derive the total unit costs for each intervention (e.g. per household, per ward, etc.) with one individual. On dividing the Rs 100 crore investment by this total unit cost, we determined the total number of people each bold bet could reach:

$$\text{Impact Potential} = \text{Rs 100 crore} \div \text{Total Unit Cost per Person}$$

- 2. Catalytic Multiplier:** The amount of commercial or government capital that can be unlocked per rupee of philanthropic investment.

- Calculation approach: For each bold bet, we identified portions of the Rs 100 crore investment that could be subsidised or supported by existing government schemes or by priority sector lending mechanisms. The ratio of this mobilisable capital to the philanthropic contribution gives the catalytic multiplier:

$$\text{Catalytic Multiplier} = \frac{\text{Capital Attributable to Government/Commercial Sources per Bold Bet}}{\text{Philanthropic Capital per Bold Bet}}$$

- 3. Full Leverage Potential:** The number of bold bets that can be implemented to fully leverage the available pool of government or commercial capital aligned with each intervention.

- Calculation approach: We estimated the total capital pool accessible through relevant schemes (e.g. Atal Mission for Rejuvenation and Urban Transformation, Smart Cities, priority sector lending targets, etc.). This was divided by the government/commercial contribution leveraged per bold bet (i.e. catalytic multiplier × Rs 100 crore):

$$\text{Full Leverage Potential} = \frac{\text{Total Available Government/Commercial Capital}}{(\text{Catalytic multiplier} \times \text{Rs 100 crore})}$$

4. Full Impact Potential: The total number of people who could be reached across urban India by fully deploying available commercial and government capital.

- Calculation approach: This is derived by multiplying the Impact Potential of one bold bet by the Full Leverage Potential, thus reflecting the full scale of replication and reach if the approach is adopted nationwide:

$$\text{Full Impact Potential} = \text{Impact Potential (of one bold bet)} \times \text{Full Leverage Potential}$$

Our calculations are based on approximations, simplifying assumptions, and trends, making them indicative rather than precise. In some cases, we have considered potential over current allocations for sources of capital. Some data points used might be dated. We have validated assumptions made on this data using secondary sources and expert interviews.

Appendix C: Government and Commercial Sources of Capital

Government Schemes

We examined the Union Budget to identify central government schemes, particularly focusing on centrally sponsored and central-sector schemes. We considered schemes based on their alignment with the core areas relevant to our bold bets, for example, Pradhan Mantri (PM) Awas Yojana was considered for the bold bet on housing modification. We also considered central government schemes (outlined below) across multiple ministries. This list is not exhaustive, however, and each scheme has multiple and overlapping mandates. We estimated the capital unlocked from these schemes by evaluating the overlap of the bold bet with specific scheme components, analysing past expenditure trends, and applying simplified assumptions, as necessary, for practical feasibility. Only central government outlays were accounted for in the calculations, excluding state expenditure.

The key government schemes considered include, but are not limited to:

- **Pradhan Mantri (PM) Awas Yojana:** Housing scheme to provide affordable housing to urban low-income households.
- **Atal Mission for Rejuvenation and Urban Transformation:** Urban renewal scheme focusing on water supply, sewerage, stormwater drainage, urban transport, and green spaces.
- **PM Surya Ghar Muft Bijli Yojana:** Initiative focused on providing free solar energy solutions and electricity connections to rural and underserved urban areas.
- **PM Mudra Yojana:** Financial support scheme providing loans to micro and small enterprises to foster entrepreneurship and employment.
- **Deendayal Antyodaya Yojana – National Urban Livelihoods Mission:** Supports urban poverty alleviation through skill training, employment opportunities, and livelihood support.
- **PM Street Vendors' Atmanirbhar Nidhi:** Provides working capital loans to street vendors to facilitate their economic empowerment.
- **Aatmanirbhar Bharat Rojgar Yojana:** Employment scheme incentivising employers to create new employment opportunities post-pandemic.
- **New Employment Generation Scheme:** Initiative aimed at creating new job opportunities through financial assistance and support for entrepreneurship.

Multilateral Development Bank Capital

We analysed capital from major multilateral development banks – such as the Asian Development Bank, World Bank, and Asian Infrastructure Investment Bank – by reviewing historical funding allocations over the past eight years. We used the average allocation for projects pertaining to sectors or issue areas relevant to our identified bold bets and estimated the potential capital available.

Priority Sector Lending

We specifically considered Priority Sector Lending (PSL) through banks and non-banking financial institutions for bold bets aligning with sectors covered by PSL guidelines, such as housing and renewable energy. We based calculations for potential PSL capital on historical shares allocated to these sectors and estimated future funding availability using past growth rates.

Appendix D: List of Interviewees

Name	Designation	Organisation
Yasmin Mulla	Director, Citizenship and Advocacy	Apnalaya
Dinesh Arora	Principal Health Specialist	Asian Development Bank
Kanupriya Kaikeyi	Senior Manager, Engagement and Communications for South and West Asia	C40
Shruti Narayan	Managing Director, Regions and Mayoral Engagement	C40
Urmila Sudhindra	Regional Officer for the South and West Asia	C40
Aasim Mansuri	Principal Researcher and Center Head of Strategy	Center for Water and Sanitation (CWAS), CEPT University
Dhruv Bhavsar	Senior Program Lead	CWAS, CEPT University
Meera Mehta	Professor Emeritus and Head	CWAS, CEPT University
Ranjini Mukherjee	Director, Research, Knowledge Management and Capacity Development	Coalition for Disaster Resilient Infrastructure
Aditi Pandey	Head, Partnerships and Communication	Consortium for DEWATS Dissemination India (CDD India)
Sandhya Haribal	Senior Project Manager	CDD India
Vishwas Chitale	Fellow	Council on Energy, Environment and Water
Kirti Jain	Manager	Dasra
Rukmini Banerjee	Team Lead, ClimateRISE	Dasra
Royston Braganza	CEO	Grameen Capital India
Shraman Jha	CEO	HUL Foundation

Name	Designation	Organisation
Jaigopal Rao	Co-founder and Managing Director	Inspiration Collective
Latha Raman Jaigopal	Co-founder and Director	Inspiration Collective
Prarthana Ramesh	Head, Environment-City Systems	Janaagraha
Srikanth Viswanathan	CEO	Janaagraha
Nithya Ramesh	Director, Planning and Design	Jana Urban Space Foundation
Ashif Shaikh	CEO	Jan Sahas
Manas Rath	Founder and CEO	LEAP Cities
Bijal Brahmbhatt	Executive Director	Mahila Housing Trust
Anand Jagtap	Ex-Officer on Special Duty	Municipal Corporation of Greater Mumbai
Sathyanarayanan Shankaran	Urban Strategy Lead	Rainmatter Foundation
Smita Ram	Co-founder and CEO	Rang De
Ashwin Deshmukh	Director	Samyak
Paresh Parasnis	Founder	Samyak
Harish Hande	Founder and CEO	SELCO
Huda Jaffer	Director	SELCO
Pratima Joshi	Founder and Executive Director	Shelter Associates
Sushmita Das	Director, Monitoring, Evaluation, and Research	Society for Nutrition, Education and Health Action (SNEHA)
Vanessa D'souza	CEO	SNEHA
Sheela Patel	Director	Society for the Promotion of Area Resource Centres (SPARC)
Smruti Jukur	Programs Manager	SPARC
Brian Burwell	Partner, San Francisco	The Bridgespan Group
Pritha Venkatachalam	Partner and Co-head, Asia and Africa	The Bridgespan Group
Sonali Patel	Partner, New York	The Bridgespan Group
Suruchi Bhadwal	Senior Fellow and Director, Climate Change and Air Quality	The Energy and Resources Institute
Charu Chadha	Advisor	The Rockefeller Foundation
Roshni Nuggehalli	Executive Director	Youth for Unity and Voluntary Action
Jaya Dhindaw	Executive Program Director, Sustainable Cities, and Director, WRI India Ross Center	World Resources Institute

Appendix E: Approval Letter from Institutional Ethics Committee

catalyst foundation | Institutional Ethics Committee

APPROVAL LETTER

DATE: 8 December 2024

TO:

Rishabh Tomar,
Principal Investigator,
Bridgespan India Private Limited,
9th Floor, Platina, G Block, Plot C-59, Bandra Kurla Complex, Mumbai, Maharashtra - 400 051

PROJECT TITLE: Climate and Equity Report

Thank you for submitting the protocol for the captioned project:- "*Climate and Equity Report*" for review by the Institutional Ethics Committee of the Catalyst Foundation.

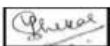
I am pleased to inform you that the study mentioned above has been approved by the members of the IEC. Accordingly, please note that the project should be conducted per the protocols submitted to and approved by the IEC. It is your responsibility to ensure the following approval requirements:

- I. Changes, amendments, and addenda to the study, its protocol, informed consent, tools or other study materials must be submitted to the Catalyst Foundation IEC for re-review and approval before implementation.
- II. Any unanticipated problems, adverse events, protocol violations, social harm, or any new information becoming available which could change the risk/benefit ratio of the study must be reported to the Catalyst Foundation IEC.

The following members of the Catalyst Foundation - IEC have reviewed this application:-

1. Ashwini Bhat (NGO Representative)
2. Dr. Devanshi Somaiya (Basic Medical Science)
3. Dr. Parul Naib (Data & Ethics specialist)
4. Dr. R.K. Prasad (Clinician)
5. Dr. Sudhashree Chandrashekar (Chair)
6. Hareesh B.S. (Social Scientist)
7. Joseph Julian Loy (Theologist)
8. Samheeta Rao (Legal specialist)
9. Siddhi Mankad (Gender specialist)
10. Vishwanath H.S. (Lay person)

The IEC concluded that the Principal Investigator had taken sufficient safeguards to carry out the study. Therefore, the IEC approves this proposal for conducting this study only. This is valid for one (1) year from the approval date, mentioned geographical location and presented sample. *After completing the study, please submit the study report to the Catalyst Foundation-IEC. Any changes to the study or duration of the study are to be intimated to the IEC by email to the IEC Manager, Ms. Aparna Suresh (aparna@catalysts.org).*

Signature: 

Dr. Sudhashree Chandrashekar
Chair - Institutional Ethics Committee,
Catalyst Foundation

Endnotes

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