Forced evictions and climate change

The damaging impact on risks and emissions

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Forced evictions of informal settlements not only violate human rights, but also hinder climate mitigation and adaptation efforts. In a context where the climate crisis is increasingly resulting in people's displacement and responses to climate change are also driving evictions, this paper offers evidence about how forced evictions exacerbate all dimensions of vulnerability and exposure to climate risks. It also reveals that in Nigeria, forced evictions of informal settlements during the past 25 years could have generated over 2.46 million metric tonnes of CO_2e, which would take a forest the size of Paris eleven years to absorb. By contrast, in-situ upgrading offers a low-carbon approach, cutting emissions by up to 66% compared to evictions followed by relocation. These findings have profound implications for urban development and emissions worldwide.

Contents

Abbreviations

CO_2e	CO_2 equivalent
COHRE	Centre on Housing Rights and Evictions
EC3 database	Embodied Carbon in Construction Calculator database
EPDs	Environmental product declarations
HIC-HLRN	Housing and Land Rights Network
IPCC	Intergovernmental Panel on Climate Change
JEI	Justice & Empowerment Initiatives
kg CO_2e	Kilograms of CO_2 equivalent
LASURA	Lagos State Urban Renewal Agency
LCA	Life cycle assessment
Mt	Million tonnes
NDC 3.0	Third Nationally Determined Contribution
NGOs	Nongovernmental organisations
OHCHR	Office of the United Nations High Commissioner for Human Rights
t	tonnes
UN	United Nations
UN-AGFE	UN Advisory Group on Forced Evictions
UN-Habitat	UN Human Settlements Programme

Summary

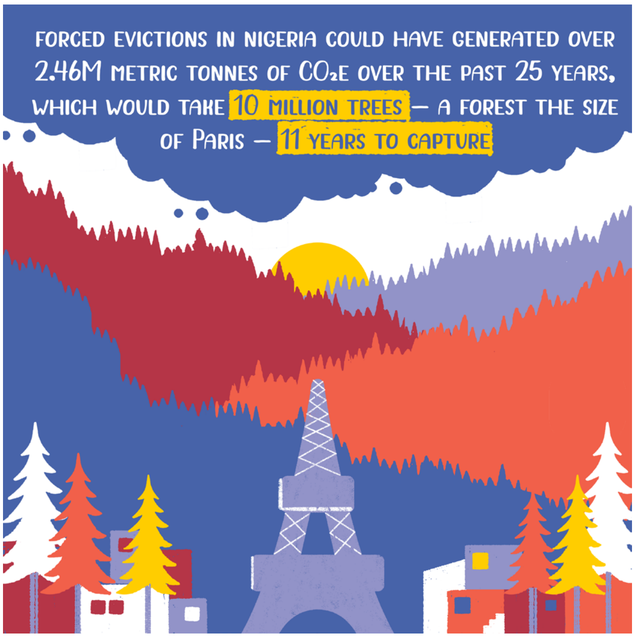
Forced evictions of informal settlements are not only a gross violation of human rights, but they also undermine efforts to foster adaptation and reduce carbon emissions in cities. In a context in which climate change and risk reduction arguments are often used to forcibly displace people from informal settlements, this paper advances a renewed call to link anti-eviction arguments and climate change.

This paper presents evidence about how forced evictions not only exacerbate dimensions of vulnerability and exposure to climate risk, but also generate higher CO_2 emissions than upgrading and retrofitting existing settlements — where possible. During the past 25 years, evictions of informal settlements in Nigeria alone could have generated over 2.46 million tonnes[i] (Mt) of CO_2e.[ii] This would take a forest the size of Paris more than a decade to absorb. This paper calls for a more sustainable, community-led approach to transforming informal settlements and cities.

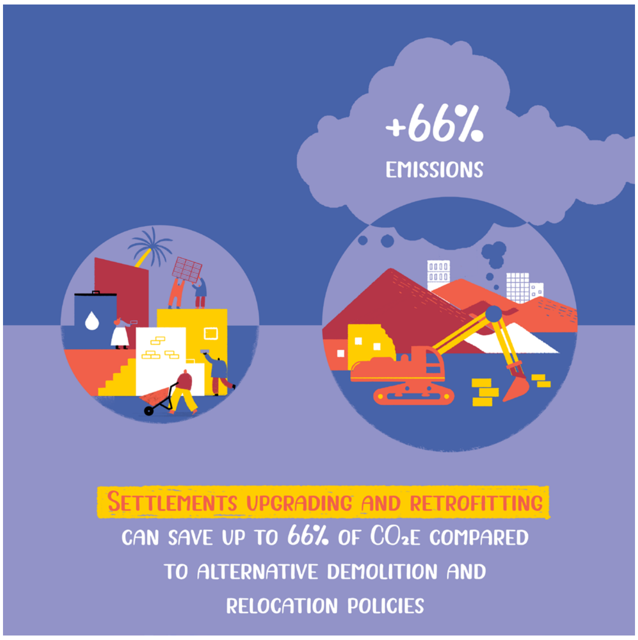
Forced evictions undermine carbon reduction targets

Forced evictions of informal settlements undermine efforts to achieve carbon reduction targets. Our new estimates show that in Nigeria, CO_2 emissions related to evictions over the past 25 years have generated more than 2.46Mt CO_2e, which would take ten million trees — a forest the size of Paris — eleven years to capture. Drawing on community data from a recently evicted settlement in the city of Lagos called Otumara, as well as estimates from Amnesty International, our research demonstrates that if evictions continue at the same pace, an additional five million people could be displaced by 2050, generating a further 2.46Mt CO_2e — a cumulative 4.92Mt CO_2e over 50 years.

However, different types of policy responses to informal settlements have very different emissions implications. Our calculations for Lagos found that upgrading and retrofitting is the most effective response, saving up to 66% of CO_2e compared to alternative demolition and relocation policies. Evictions followed by relocation and reconstruction could generate 2.37Mt CO_2e by 2035, undermining national and city emissions reduction targets.[1,2] By comparison, in-situ slum upgrading can promote both mitigation (by reducing emissions) and adaptation (by reducing determinants of risk) to climate change.



i This paper uses metric tonnes throughout.
ii CO_2e, or carbon dioxide equivalent, is a metric used to show the climate impact of various greenhouse gases as a single, comparable unit.



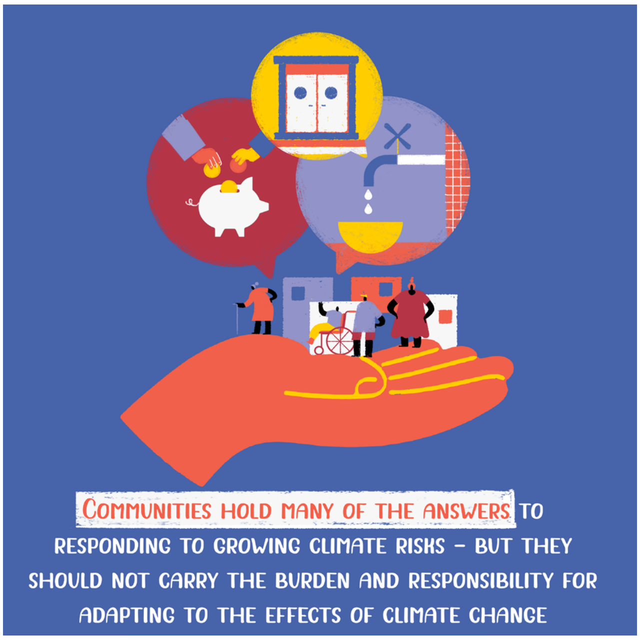
Forced evictions are a handbrake on urban resilience

Forced evictions of informal settlements are also a handbrake on cities becoming more resilient. They increase people's exposure to climate risks and hinder the capacity of communities to adapt by negatively impacting key dimensions of vulnerability and exposure: environmental and physical, education, health and wellbeing, governance and cultural, economic and intersectional.

Additionally, forced evictions generate cumulative effects for those individuals, families and communities that are exposed to recurrent threats and experiences of such evictions over time, increasing cycles of poverty and vulnerability. This impedes the capacity of cities and societies to adequately respond to the climate crisis.

Communities that live in the intersection of vulnerabilities, insecurity and violence hold many of the answers to responding to growing climate risks. Therefore, evicting them — even when done under the pretence of climate adaptation and risk reduction — often translates into undermining ongoing adaptation efforts, increasing communities' exposure to climate risks and hindering their response capacity.

Recognising that informal settlement dwellers should not carry the burden and responsibility for adapting to the effects of the climate emergency — a crisis for which they are scarcely responsible — demands increased investment in in-situ upgrading through resources, policies and technical support mechanisms that recognise local capacities and repair the long-term accumulation of historical violence and injustices.



Forced evictions fuel carbon-intensive usages and urban sprawl

Protecting and supporting low-carbon approaches to transforming settlements can also safeguard cities and inner-city areas against more carbon-intensive usages and unsustainable urban sprawl. Evidence from in-situ upgrading programmes demonstrates the potential of such approaches to promote low-carbon upgrading and housing provision for residents. By contrast, recent research shows that the land from which communities have been displaced is often being repurposed for private property development and other carbon-intensive usages, such as 'premium' or luxury residential properties. Likewise, evicting people from centrally located settlements, even with adequate compensation, often results in people being relocated to the outskirts of cities, contributing to urban expansion and increasing the use of carbon-intensive modes of transport and demand for the construction of new infrastructure. This highlights the need for zoning mechanisms that protect low-carbon emission communities and their role in promoting more sustainable urban development patterns.

This paper is divided into two main sections: a literature review describing the impacts of forced evictions on the determinants of risk, and a quantitative estimation of the environmental impacts of forced evictions based on the case of Lagos.

While this is an exploratory research and there remain knowledge gaps, the existing evidence together with our own findings demonstrate clear links between climate change and forced evictions. It also demonstrates the need for cities to review their methods of carbon accounting and carbon reduction target definitions, taking into account blind spots related to evictions as well as the importance of community-led data collection for addressing these oversights.

Introduction

With more than half of the world's population living in urban areas,[3] our future largely depends on how cities reduce carbon emissions and respond to climate-related shocks and hazards. The importance of this issue is underscored by the inclusion of a special report on climate change and cities in the seventh cycle of the Intergovernmental Panel on Climate Change (IPCC). A crucial challenge for cities is ensuring no one is left behind in climate responses, yet forced evictions make this more likely.

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It is well documented that the poorest and most vulnerable groups in society are disproportionately affected by climate change,[4] many of whom also live in inadequate housing conditions — notably in informal settlements. In addition to being the most exposed to the impacts of climate change, including heat, floods and other extreme weather events, residents of informal settlements often face high insecurity of tenure, being particularly susceptible to forced evictions. As the climate emergency intensifies, the dynamics that drive forced evictions both influence and are influenced by climate-related risks and the policies chosen to respond to them.

Experiencing a forced eviction is one of the most violent events that a community or individual can face. They constitute "a gross violation of human rights" and a fierce manifestation of housing injustices.[5] They are often accompanied by episodes of physical and psychological violence, with devastating implications in terms of loss of physical assets, social bonds and, occasionally, human lives. While the United Nations Human Settlements Programme (UN-Habitat) and the Office of the United Nations High Commissioner for Human Rights (OHCHR) acknowledge that it is difficult to systematically collect global data on forced evictions, they estimate that around two million people are forcibly evicted each year,[6] a number considered conservative by many organisations conducting independent monitoring.

1.1 Anti-eviction activism and efforts

Throughout the years, the forced evictions agenda has had varying degrees of centrality in housing debates. The formation of the Asian Coalition for Housing Rights in 1988, for example, was closely linked to the struggles against evictions in South Korea.[7] The Housing and Land Rights Network[iii] (HIC-HLRN), established in 1991, has contributed to the systematic collection of data through the 'Housing and Land Rights Violation Database', with ongoing efforts to document evictions and other housing violations.[8] Likewise, the publication of reports and studies from 1991 to 2014 by the Centre on Housing Rights and Evictions (COHRE)[9] represents another key effort to systematise knowledge around the scale and impact of forced evictions. As early as 1994, the journal *Environment & Urbanization* published a special issue entitled 'Evictions: Enough violence; we want justice'.[10] Within the United Nations (UN) system, the work of the UN Advisory Group on Forced Evictions (UN-AGFE) in the early 2000s was a key driver in recognising the importance of understanding, monitoring and stopping forced evictions.[11] Likewise, the publication in 2010 of the book 'How people face evictions' was a testament to the growing interest.[12]

Over the last decade, however, the emphasis of urban global debates has shifted, with forced evictions generally falling into the background. Among other dynamics, the processes that led to the establishment of agendas around the Sustainable Development Goals (2015) and the New Urban Agenda (2016) turned towards other consensus issues.

Groups working on monitoring, documenting and stopping evictions have mobilised legal and human rights arguments to struggle against evictions for decades. These efforts have been extremely significant at the local, national and international levels. There are nevertheless good reasons for building and mobilising a renewed advocacy and research agenda against forced evictions, and particularly about their impacts in informal settlements. Generating evidence that connects the climate change and evictions agendas more explicitly can be a powerful tool for the efforts to advance climate justice.

1.2 Current context of forced evictions

There are several ongoing trends that, although not new, continue to deepen the insecure nature of housing for millions of people. Overall, the financialisation of housing and land has created conditions for growing contestation around land and property. Higher migration flows have also put pressure on cities in ways that deepen tensions around urban land. This is exacerbated by the increase of people displaced by climate change, with as many as 216 million people potentially internally displaced by climate change by 2050.[13] Likewise, armed conflicts, occupations and wars keep fuelling and sustaining processes of forced evictions.[14] The increased precarity of livelihoods and rental housing, and weak or non-existent tenants' rights, add more challenges to these phenomena. All these tensions often translate into legal disputes around land and property, more acutely affecting people living in the intersection of multiple discriminations and particularly those who have insecure tenure status, such as people living in occupied buildings, backyards, slums and informal settlements.

The COVID-19 pandemic brought to the forefront the issue of evictions, both by demonstrating the capacity of cities and countries to act by suspending evictions during the crisis, but also by bringing about a new wave of challenges.[15] HIC-HLRN referred to "a pandemic of violations" in their report about forced evictions and "other habitat-related human rights violations" during COVID-19, providing a vast range of examples of how these violations were taking place.[16] This was particularly evidenced in countries with no eviction moratoriums, such as Kenya, where approximately 20,000 families were evicted in the Kariobangi and Ruai areas of Nairobi

iii An initiative within the Habitat International Coalition.

and the city of Kisumu during the crisis, mainly affecting those living in informal settlements.[17] Even in countries with eviction moratoriums such as the United States, the UN special rapporteur on the right to adequate housing noted that at least 20% of the 110 million renters were particularly at risk of eviction in 2021, given an expected "cascading wave of foreclosures" following the pandemic.[18] Similarly, a survey by the Zero Evictions Campaign in Brazil, which was launched in the context of the COVID-19 crisis, estimated that more than 1.5 million Brazilians suffered forced evictions between October 2022 and July 2024.[19]

1.3 Forced evictions and climate change

Alongside these trends, the climate crisis is creating new challenges, with devastating consequences for those living under the threat of displacement. Even in 2011, UN-AGFE identified natural disasters and climate change as one of the five main causes of evictions, alongside urban development, large-scale development projects, mega-events and economic crises.[20] HIC-HLRN has documented cases of thousands of people affected by violations related to environmental and climate events. In its report, 'Housing and land rights violations in the context of environmental hazards and climate change', HIC-HLRN categories these cases with terms such as environmental racism, development-induced displacement, extractivism and industrial pollution.[21]

Although the interconnection between cities and climate change has been a critical issue in the academic literature for over two decades,[22] the last few years have witnessed a growing interest from scholars in linking climate change, cities and social justice through conceptual framings such as 'climate urbanism' and 'urban climate justice'.[23] The material effects of climate change are reshaping urban risk by increasing the likelihood and severity of weather events. This not only aggravates existing hazards like flooding but also enhances the use of 'risk' as part of the political rhetoric to justify government interventions. This "intensified 'climate moment' for cities"[24] is shaped by the fundamental role of cities in ensuring equitable transitions and inclusive adaptation, with implications for mitigation and adaptation governance.[25] The idea of a 'new climate urbanism' has emerged to recognise that this 'climate moment' requires multiple shifts, including the need for more diverse forms of knowledge and theory.[26]

Calls for a justice perspective reveal the importance of the conjunction between social and environmental aspirations and multi-sectoral action,[27] and the need to consider the links between climate risks and local economic transformation.[28] In other words, recognising that climate impacts are not evenly distributed and that the governance of adaptation and mitigation often reproduces this unevenness. Likewise, authors have proposed postcolonial perspectives on climate urbanism to engage with the varied impacts of climate change on urban development and their role in reproducing various kinds of dispossession and population displacement.[29] There has also been an increased recognition of the contradictions between different forms of 'climate friendliness' and displacement, acknowledging processes of 'eco-gentrification',[30] 'green gentrification',[31] 'eco-cleansing'[32] and what has been termed 'benevolent evictions'.[33] Academic literature has also highlighted how adaptation pathways may be entrenching cycles of dispossession and how the implementation of climate adaptation plans is affecting the vulnerability of the urban poor.[34]

Recent research and evidence from diverse geographies therefore shows that not only is climate change creating material impacts for low-income groups, but also the discourse around the prevention of environmental disasters has become a common narrative to justify new waves of evictions, with maladaptation to risks such as floods used as justification to displace communities. Those living in informal settlements in areas prone to disasters are the most affected by these climate-justified forced displacements.

While acknowledging these complexities, efforts to address the climate crisis can also open potential new entry points and arguments in the struggles against evictions. For example, promoting making existing housing more disaster-resilient rather than building new housing, as a way of saving embodied carbon.[35] Or presenting converting existing well-located vacant buildings into social housing as a climate mitigation strategy.[36]

However, forced evictions and their implications are still a critical blind spot in climate discussions. The technical summary of the forthcoming IPCC 'Special Report on Climate Change and Cities' mentions 'relocation' in relation to its chapter on 'Cities in a changing climate: trends, challenges and opportunities'[37] and its chapter on 'Actions and solutions to reduce urban risks and emissions'.[38] Yet these references to relocation don't seem to problematise the nature of such relocations and the implications that forced evictions could have. This may point to a lack of understanding regarding the impacts of forced evictions among urban climate scientists, and a gap in knowledge and documentation linking evictions to climate risks and carbon emissions.

1.4 This research

It is in this context that this paper provides evidence to advance the urgent need for a renewed action-research agenda around forced evictions in informal settlements

— particularly recognising the challenges and potential new narratives that emerge in the context of climate change. The paper shares the main findings emerging from an exploratory research project led by IIED into two key issues:

- The impacts of evictions on communities' determinants of risk, and
- The carbon emission impacts of forced evictions.

Together, these explorations aim to position forced evictions of informal settlements as a key challenge in the context of the climate emergency, as well as showcase the possibilities of undertaking low-carbon alternatives like slum upgrading to achieve climate targets. The findings are also supported by reflections about how climate change and the responses to it impact the mobilisation capacities of local anti-eviction efforts. These reflections were informed by a series of online exchanges with civil society groups (see Box 1). The paper concludes by summarising the key takeaways, gaps and potential future work needed to strengthen this agenda.

BOX 1. AN AUDIOVISUAL EXCHANGE ABOUT EVICTION STRUGGLES AND CLIMATE CHANGE

One aspect of this research was to explore the climate change and evictions agenda with civil society and grassroots groups struggling against forced evictions. We did this through an open dialogue in a series of online exchanges, aiming to co-develop a reflection about the effects of climate change on local anti-eviction efforts.

The online exchanges took place over two months and involved around 15 participants from five organisations discussing the question, 'How climate change – and the response to it – is impacting your mobilisation capacities against evictions?' The participants were representatives from: Slum Dwellers International (Kenya), Rujak Center for Urban Studies (Indonesia), Centro Gaspar Garcia de Direitos Humanos (Brazil), Justice & Empowerment Initiatives (JEI, Nigeria) and Red de Derechos Humanos y Desalojos (Chile).

Representing cities as varied as Jakarta, Lagos, Mombasa, Quilpué and São Paulo, some of the key messages emerging from the exchange included:

- Forced evictions hinder adaptation and mitigation capacities of cities and communities, particularly in settlements where there have been processes of long-term investment in infrastructure for adaptation
- Threats of evictions and housing dispossessions are embedded in larger ecological and social systems of violence and vulnerability, and both climate change and some of the responses to it can reinforce those systems
- Communities hold many of the answers to adapting and responding to growing risks, but they need adequate support to realise that potential without reinforcing unjust distributions of burdens and responsibilities, and
- Forced evictions and the effects of climate change deeply affect the cohesion and emotional connections within communities.

As part of these exchanges, each group produced a short video, which were used as a basis to collectively discuss common and divergent themes and lessons. IIED then produced a video summarising the key messages that emerged during the exchanges, feeding into this wider reflection on forced evictions and climate change. The outcome of these exchanges is available at: www.iied.org/forced-evictions-climate-change-risk-co2-emissions-anti-eviction-struggles

Evictions as handbrakes for risk reduction: impacts on vulnerability and exposure

Forced evictions impact informal settlement residents' wellbeing in a range of ways, deepening vulnerabilities and, in turn, weakening their adaptation capacity. In this section, we summarise the key findings of a comprehensive literature review conducted on the impacts of forced eviction on the determinants of risk, namely vulnerability and exposure.

2

"Community leaders, civil society groups, national and international NGOs and academic researchers alike have repeatedly warned that the impacts of forced evictions on the people affected are severe, debilitating and far-reaching. As a result of evictions people's property is damaged or destroyed; their productive assets are lost or rendered useless; their social networks are broken up; their livelihood strategies are compromised; their access to essential facilities and services is lost; and as violence often is used to force them to comply, they suffer severe and lasting psychological effects as a consequence thereof."

— UN-Habitat and UNHCR[39]

2.1 Understanding determinants of climate risks in informal settlements

We carried out a comprehensive review of what published research has identified as the main impacts of evictions on communities' capacities to adapt to climate change. Utilising academic publication databases and grey literature, we searched for studies that have investigated the impacts of forced evictions on communities in different ways. This search was conducted in English, Spanish and Portuguese using key terms such as 'forced evictions', 'displacement', 'demolition' and 'relocation', with a particular focus on literature about informal settlements.

The review of more than 120 resources, with evidence from around the world, was prioritised according to its relevance and then organised in relation to the different categories identified by the IPCC's 2012 special report, 'Managing the risks of extreme events and disasters to advance climate change adaptation'. Specifically, we have used the dimensions identified in its chapter, 'Determinants of risk: exposure and vulnerability', which states, with **high confidence**, that "the severity of the impacts of extreme and non-extreme weather and climate events depends strongly on the level of vulnerability and exposure to these events".[40] The report identifies the following dimensions and trends of vulnerability and exposure:

- Environmental dimensions
  - Physical dimensions
  - Geography, location, place
  - Settlement patterns and development trajectories
- Social dimensions
  - Demography
  - Education
  - Health and wellbeing
  - Cultural dimensions
  - Institutional and governance dimensions
- Economic dimensions
- Interactions, cross-cutting themes and integrations
  - Intersectionality and other dimensions
  - Timing, spatial and functional scales
  - Science and technology

Considering the relevance of these dimensions for forced evictions in informal settlements and the key themes identified in the literature review, we clustered the evidence around six key dimensions of vulnerability and exposure — namely the key determinants of risk:

- **Environmental and physical dimensions:** this refers to the physical aspects of the housing, urban and geographical conditions that affect exposure and capacity to respond to risks. These include the state of the housing structures, their implications in terms of physical exposure of residents to hazards and risks, as well as the multiple impacts that housing location, connectivity, accessibility and the availability of services have on households' exposure and vulnerability to risks.
- **Education dimensions:** this refers to a range of issues related to access to education, the vulnerability of educational building structures, and access to disaster risk reduction and climate adaptation information and knowledge. This extends beyond the ability of educational infrastructure to withstand extreme events; it also includes the capacity of households to afford and access education, as well as their access to information related to early warnings, response strategies, coping and adaptation mechanisms, and science and technology. Other important factors might include inequalities around digital connectivity and implications of education in terms of potential income.
- **Health and wellbeing dimensions:** this includes the different wellbeing aspects that determine the capacity of people and groups to respond to hazards, such as health infrastructure and the ability of institutions to provide health services, and the ability of households to access these services. It also refers to how different physical, physiological and mental health determinants shape disaster outcomes in different regions and among different social groups. Health vulnerability refers to the sum of factors that determine to what extent individuals or communities are able to respond to, and experience the adverse impacts from, climate change and extreme weather events.
- **Cultural and governance dimensions:** this refers to cultural and organisational aspects of risk, danger and vulnerability perception and

response, as well as the nature of institutional capacities and preventive actions to reduce risks. These dimensions include aspects such as social networks, safety nets, incentives, regulations and community organisation, as well as the cultural values and practices around prevention, adaptation and resilience. They also refer to the way in which policies and public action are designed and carried out — from top-down to bottom-up approaches — and the degree of collaboration with governmental and nongovernmental actors.

- **Economic dimensions:** this refers to the ways in which economic conditions shape the capacities of people and institutions to respond to, prepare for and cope with climate risks, as well as the impact of a climate phenomenon on the economic vulnerability of systems, communities and households. These include aspects such as the loss of income and assets, or increased financial burden from new or unexpected expenses. It can also refer to people's access to economic opportunity and sources of livelihoods, whether due to physical proximity, material and social conditions, or relationships.
- **Intersectionality dimensions:** these identify how different groups and individuals are affected by climate risks in uneven ways, given the differences in vulnerability **between** different groups as well as **within** groups, through the interaction of different identities such as race, nationality, age, gender and sexual orientation. Some factors might have a greater impact on people's lived experiences of an extreme event. This also connects with the cultural and governance dimensions, as who gets to speak, be listened to and shape collective decisions effects whose risk is accounted for and mitigated, or even what risk is produced through the development choices that are made.

The findings from the literature review aim to draw conclusions about the impacts of forced evictions in each of these dimensions and, in turn, the overall community's risk, drawing on what is known as the 'hazard-exposure-vulnerability framework of risk'.

For almost 50 years, there has been consensus that risks are the result of the combination of three factors: hazards, exposure and vulnerability.[41] According to the IPCC, a **hazard** is a "potential occurrence of a natural or human-induced physical event or trend" that can be harmful; **exposure** is understood as the presence of people, livelihoods, ecosystems, infrastructure or assets in places that could be affected by hazards; and **vulnerability** refers to the "propensity or predisposition to be adversely affected", encompassing elements such as sensitivity, susceptibility and lack of capacity to cope and adapt.[42]

Together, these three components are the determinants of risk. In our analysis, we have focused on understanding how the impacts of forced evictions on individuals and communities affect key dimensions and drivers of vulnerability, as identified by the IPCC.

By giving a detailed account of how forced evictions impact these dimensions, our findings offer significant evidence of how vulnerability increases — and the ability to adapt and respond to climate risks worsens — following forced evictions. In a context in which many forced displacements are sustained by climate arguments, with authorities justifying relocations as needed to reduce exposure, we demonstrate that, even when there is a well-planned relocation that reduces exposure, risks might still grow as a result of the drivers of vulnerability increasing. The evidence calls for assessing the effects of planned relocations on both exposure and vulnerability, as increases in vulnerability may outweigh reductions in exposure, leading to an overall increase in climate risks.

2.2 Impacts of forced evictions on the determinants of risk

Here we discuss what research says about each of the six dimensions of vulnerability and exposure, as well as the cumulative cycles of poverty and vulnerability related to evictions, and explore the implications of these factors in informal settlements in the wake of climate change.

2.2.1 Environmental and physical dimensions

Both the location and physical conditions in which residents live can significantly shape their vulnerability and determine their exposure, and forced evictions rarely result in an improvement of urban residents' living situations. Official narratives around demolitions and formal justifications for evictions tend to point to the goal of improving the urban fabric of a city, to enhance the material conditions of its residents. However, the transformation of the physical layout of a city hardly benefits the people who have been evicted. Instead, research shows that this pursuit of 'inclusive growth'[43] tends to result in processes of gentrification and real estate appreciation that reinforce patterns of spatial exclusion,[44] where low-income groups are forced away from city centres.[45] If, because of their displacement, these groups are forced into degraded or worse living conditions, they are more likely to face the harms of hazards and risks, such as flooding or heat, and with greater intensity.

Evictions that result either in the destruction of critical infrastructure or in the displacement of residents away from basic services deepen people's vulnerability to climate shocks — for example by limiting their access to clean water. The demolishment of an informal settlement often entails the loss of physical infrastructure that, whether made by residents themselves or by other actors like nongovernmental organisations (NGOs) and humanitarian agencies, was playing a role in protecting residents from hazards and risks. A study of evictions in Somalia in 2022 calculated a loss of over US$4.6 million due to the destruction of over 6,807 latrines, 45 water points, two shallow wells, two water kiosks, 18 water tanks, 49 rainwater infrastructures, 18 schools and four health centres.[46] Sometimes, after a certain period, residents return to the same location of the demolition but without any of the infrastructure that had previously been in place.[47]

The new location that people move to is likely to leave families even more vulnerable than before if, as illustrated by the experience of evicted farm dwellers in South Africa, they have to settle illegally in private land near urban areas, without access to basic public services.[48] People may even be displaced towards flood-prone or low-lying coastal areas, where they are more exposed to hazards. Even in situations where formal resettlement is coordinated by authorities, there are cases where residents are sent to the city outskirts with little access to services and far away from economic opportunities, locking families into poverty.[49]

Furthermore, evidence shows that a household's material living conditions are likely to worsen after an eviction, which increases exposure to hazards and risks. This is particularly the case when families stay in the open, in makeshift structures, abandoned public buildings like schools[50] or even in canoes[51] in the direct aftermath of the eviction, but it extends to their longer-term living conditions. Usually, housing structures of people having faced eviction are more likely to be made up of temporary or semi-permanent materials, such as cane or re-used wood for the walls and rustic mats for roofs, compared to those of households who have not faced eviction and use more permanent materials like cement.[52] These temporary structures also tend to have less or no connection to piped water and toilets, increasing the environmental and health hazards for households.[53] A survey of households evicted from Maroko in Lagos, Nigeria, for example, shows that the number of households living with inadequate facilities increased from 37% to 69% following their eviction.[54] A survey among another evicted community in Lagos found that among those who had accommodation, 83% reported it was worse than their shelter prior to the demolition and 8% reported it was "much worse".[55] Declines in living conditions such as these can have dramatic, potentially life-threatening, consequences when it comes to exposure to hazards like flooding or heat, aggravating residents' vulnerability and their ability to cope with the impacts of the climate crisis.

Often, the process of relocating following an eviction increases the risk of further displacement. The stigma associated with being evicted can also limit people's access to a new home, if landlords are unwilling to rent to households that have been evicted in the past — this is even evident in formal housing markets in the likes of the US.[56]

2.2.2 Education dimensions

Forced evictions take a heavy toll on residents' educational prospects in various ways, particularly affecting children and young people. First, they result in the destruction of critical educational infrastructure.[57] For example, in Somalia, 36 educational facilities like learning centres and Qur'anic schools were destroyed in evictions in 2022, in addition to 116 community infrastructures.[58] These spaces represent considerable investment from communities themselves as well as educational institutions, NGOs, humanitarian agencies and governments.

Whether due to the destruction of such facilities or to the displacement of communities, evicted families struggle to send children to school. A survey of residents of Kwa Vonza in Kitui county, Kenya, found that 39% of households with school-aged children said they "had not found suitable schools for their children and some had been forced to repeat classes thus losing time of schooling".[59] Displaced informal settlement dwellers in Indore, India, found themselves on average three kilometres further away from a school — a 220% increase from before the eviction.[60]

Even when schools are available, children in evicted households are often too traumatised to return.[61] From Somalia[62] to Argentina,[63] there is widespread evidence of how development of negative coping mechanisms severely hinders children's ability to concentrate and learn. Cultural stigma might also expose them to bullying,[64] the loss of social contacts and even increased risk of sexual harassment, as demonstrated by a study in Pakistan,[65] further discouraging them from attending school. As a result of the longer distances they have to travel to school and their reduced access to education, children in families whose homes have been demolished — and particularly in cases of repeated evictions — end up seldom or never attending school and showing significantly lower educational achievements than children in families who have not been evicted.[66]

This can all have potentially negative impacts on children's exposure and vulnerability to climate risks in various ways. The greater distance children need to travel to attend school implies a higher exposure to daily hazards and risks, including flooding and heat. If the educational facilities are of lower quality, this also exposes those in them to increased hazards — similar to those living in worse housing conditions. Beyond the physical factors, schools are an important place for children to learn about responses and forms of adaptation to climate shocks, which is jeopardised when access is interrupted after an eviction.

These issues have both short- and long-term implications for an individual's vulnerability. In the short-term, those who do not attend school might not be provided with useful information on adaptation mechanisms shared as part of education curriculums or by local authorities via schools. The social capital built through relationships in schools and other educational facilities can also be lost, reducing families' networks of solidarity and mutual aid in moments of climate shocks. In the long-term, lower educational achievements might impact an individual's access to livelihoods, increasing their risk of poverty and vulnerability to both climate and economic shocks.

2.2.3 Health and wellbeing dimensions

Many studies point to the detrimental impacts of evictions on the health of informal settlement dwellers due to poorer living conditions, the loss of critical health infrastructure, and the loss of income and access to livelihoods, among other factors. It then follows that worsened health conditions will have a detrimental impact on the ability of individuals and communities to respond to and live through the adverse impacts from climate change and extreme weather events.

Health facilities in informal settlements, often built by the residents themselves, are an important source of resilience and adaptability for residents, as they provide life-saving treatment for diseases and vulnerabilities that are themselves made more frequent and/or graver by climate shocks. The loss of such infrastructures through evictions undermines the resilience and adaptation capacity of the communities that have invested in them.[67] Even if there are no health facilities destroyed, communities may find themselves further away from health services — in Indore, India, the distance for evicted dwellers to a public hospital increased by 325%.[68] Similarly to educational facilities, the need to travel longer distances can in itself increase a community's exposure, particularly in instances of extreme weather events like storms or flooding.

The health impact of evictions on the urban poor is well-studied. As demonstrated by research into forced evictions in Phnom Penh, Cambodia, "unhygienic environments are making their children ill, and medical expenses cut through their already depleted incomes. Such living conditions are obvious sources of diseases that affect urban poor settlements".[69] There is also a large body of evidence linking evictions to adverse birth outcomes, children's physical health and cognitive development, and children's healthcare utilisation.[70] The lower quality of life of informal settlement dwellers suggests an even starker impact for their families. When those evicted are forced to move to new locations with poorer living conditions, they can be exposed to various illnesses, such as malaria, dysentery, tuberculosis and pneumonia.[71] Studies in Argentina[72] and Zimbabwe[73] describe the impacts of a lack of waste management on the rise of water-borne diseases. Across the world, there is evidence of higher mortality and morbidity rates for women and children (especially girls) that have been involuntarily displaced. A study of women and children in Ambedkar Nagar, Mumbai, for example, found that two months after the eviction, the majority of children were stunted and two-thirds showed pallor, with other children showing symptoms of different forms of severe malnutrition, including kwashiorkor, rickets and hypovitaminosis. The same study also found evidence of widespread diarrhoea, and respiratory and skin infections.[74]

Importantly, the climate crisis is itself a multiplier of health risks,[75] increasing the gravity of illnesses and the exposure to health hazards. Thus, it is reasonable to expect that evicted communities face an accumulation of risk, firstly due to the exacerbated vulnerabilities and worsened health conditions that come with evictions, and secondly due to the greater intensity of these hazards and risks as a result of the climate crisis. When the medical conditions of residents worsen, this also reduces their ability to respond to, prepare for and cope with shocks — for example, from limited mobility or worse physical health — leading to a vicious cycle of vulnerability and lower adaptation capacity.

A similar vicious cycle is present when it comes to evictions, mental health and climate-related vulnerabilities. A key dimension of evictions is the psychological impact on communities, particularly as repeated evictions increase the feeling of loss and insecurity.[76] People who live through evictions even experience changes in their lifegoals, expressing a lower sense of achievement.[77] Organisations working against evictions warn that "the prospect of being forcibly evicted can be so terrifying that it is not uncommon for people to risk their lives in an attempt to resist; or, even more extreme, to take their own lives when it becomes apparent that the eviction cannot be prevented".[78] The stress, anxiety and trauma that results in communities[79] can also lead to the breakdown of social ties and even increases in domestic violence.[80] This is not just the case for informal settlement dwellers; studies in countries like the US link evictions with higher levels of stress, depression and suicide.[81]

This produces a concerning challenge in responding to the climate crisis. While the literature linking climate change and mental health often focuses on the impacts of the former on the latter,[82] experiences of stress and trauma can also negatively impact individuals' ability to respond to and cope with crises and shocks,[83] which could include climate-related disasters. In this sense, the mental health toll of evictions weakens communities' capacities to tackle climate shocks.

2.2.4 Cultural and governance dimensions

A strong sense of place, belonging and community solidarity are critical foundations for community-based climate action and constructive relationships between residents and government to address climate risks.[84] Forced evictions, however, represent an important threat to such foundations. Both formal and informal institutions are impacted through the process of forcefully evicting a community. The destruction of critical health, educational and cultural infrastructures in the community leaves many without work, but also breaks any connection between the people living in those informal settlements and the institutions (public or not) that were set up to serve them.[85] Following the forced eviction and demolition of informal settlements, the dwellers are often "completely excluded from planning for infrastructure development and resettlement processes, leading to a lack of understanding of their needs by the state and their subsequent impoverishment after resettlement".[86]

The social fabric that has been built by informal settlement dwellers over years — sometimes decades — is torn down when the community is evicted, as residents are often forced to separate from each other in search of a new home.[87] This includes systems of mutual aid that have supported families to overcome economic hardship but also to respond to shocks, including climate-related ones.[88] Practices of solidarity that might have a positive outcome on individuals' sense of belonging are therefore negatively impacted. In Abidjan, Côte d'Ivoire, for example, "evictions often impact the capacities of residents to imagine and work towards future opportunities and possibilities to cope with uncertainty and precarity".[89] Climate shocks themselves can have a multiplier effect on the breakdown of trust within communities, further limiting both individual and collective adaptation capacities.

The cultural stigma associated with being evicted represents an important obstacle for people to finding a sense of normality following an eviction. The discrimination they face might take the form of bullying of children in school[90] or likely being denied a place to rent by a landlord, as evidence has shown in the US.[91]

2.2.5 Economic dimensions

Responding to the climate crisis requires considerable economic investments. Yet resilience to climate shocks also requires economic resilience, such as stable sources of income, the protection of assets and the generation of livelihood opportunities. This is particularly important for those living in informal settlements, who are disproportionately affected by climate shocks but also the most susceptible to the economic losses brought about by forced evictions.

Arguably, the most documented result of forced evictions of informal settlements is the economic impact, which takes many forms. These include: the actual cost of dealing with the demolition and rebuilding housing; the unaffordability of alternatives and the resulting transportation costs; the loss of income and livelihoods; the loss of assets; and increased food insecurity. With the loss of assets and sources of income, households are less prepared to respond to new or unexpected expenses that might result from increased climate vulnerability or higher frequency of shocks, weakening their adaptation capacities.

A forced eviction is not cheap for anyone involved. In fact, some calculations suggest that, "when the costs of development projects related to forced evictions are disaggregated, financial and social costs and losses are often greater and more extensive than the profits generated in the name of public interest".[92] For example, it is estimated that the 2010 Sattola slum eviction in Dhaka, Bangladesh, of more than 5,000 slum dwellers and 2,000 houses cost 200–300 million Taka (US$2.6–3.9).[93] Another study of a demolition in Ghana in 2004 calculated that the lost investment totalled 12 billion Cedis (US$1.3 million), equivalent to 7% of the entire national budget for new housing units (175 billion Cedis).[94]

This loss of investment takes place at different levels. For those who are forcefully evicted, the demolition of their housing and the settlement's infrastructure represents both a great loss of assets and a great expense, as they relocate and rebuild their lives, usually without any form of support or compensation. When communities are forcefully evicted from informal settlements, they lose most of their assets — starting with the structures in which they have invested money and time to build. A family has likely saved for decades to construct a house.[95] Once the structures are demolished, households must find the financial resources to rebuild their housing — often repeatedly — exhausting any further savings they might have. In fact, it is not uncommon for houses to be demolished before the households have paid off the full loan they acquired to pay for them.[96]

Though they might transport some belongings (and pay high transportation costs for them),[97] families tend to lose many, if not all, their personal belongings as well as business stock during evictions.[98] Often the assets lost were their only safety net in instances of economic, health and — importantly in this case — environmental shocks, and without them they have no way of coping with unexpected events or large expenses such as illness, a death or loss of income.[99]

As they are expelled from the settlement, communities are forced to find shelter elsewhere. Faced with high unaffordability of housing in the city centre, they might have to relocate to the outskirts of the city and pay increased transportation costs to access livelihood opportunities, education and other services.[100] The combined cost of relocation therefore becomes high for households. In the case of Muthurwa Estate in Nairobi, Kenya, the total additional monthly transportation cost resulting from the relocation of 40 households was calculated at 834,540 Kenyan shillings (US$9,275), an average of 19,733 Kenyan shillings (US$229) per household.[101] For a surveyed evicted community in Indore, India, the cost of travel increased by 405% and the distance to their workplace increased by 214%, with half of the working residents having to use motorised or private transport due to the lack of public transport options.[102]

All these processes usually result in the loss of income and sources of livelihoods. For example, it is estimated that demolitions in Nairobi in the late 1980s caused the loss of 1,431 businesses and 4,293 jobs, affecting 34,000 people.[103] Similarly, the UN special envoy for human settlements issues in Zimbabwe reported in 2005 that the government's Operation Murambatsvina destroyed an estimated 32,538 informal business structures, leaving 97,614 individuals unemployed.[104] Across different contexts, owners of shops and businesses in informal settlements lose their ability to generate income,[105] while those who worked outside of settlements might lose their jobs because of increased transportation costs,[106] greater distances[107] or the loss of connections.[108] Those who work in the informal economy or in location-specific activities, such as farming or fishing, are particularly vulnerable to the loss of income.[109] Beyond the increased vulnerability from the loss of income, individuals might also seek alternative sources of livelihoods that can put them further at risk — for example, from floods, heat or extreme weather events.

Increased economic precarity resulting from forced evictions has also proven to increase levels of food insecurity, further increasing communities' vulnerability and exposure to risks. This is particularly the case for those who, like evicted farm dwellers in South Africa,[110] produced their own sources of subsistence. Evictees might lose access to land they cultivate as well as livestock and any infrastructure they have invested in to produce food. This is also the case for urban communities: a survey of an evicted waterfront community in Lagos, Nigeria, showed that 93% of households remained without a source of livelihood, largely due to the displacement from the waterfront where they used to fish to earn a living.[111] This can have ripple effects towards other members of the community as well. In the previous case of Lagos, for example, just over half of the children were engaged in child labour before the eviction, but 97% of households sent their children to street hawk after the eviction.[112]

It is worth noting that, while studies of the economic impact of evictions tend to focus on the informal settlement dwellers themselves, the indirect economic impact of evictions is much larger and affects many more people who engage in business with these communities.[113] Likewise, host communities' livelihoods might also be affected when mass evictions take place.[114] This suggests that forcibly evicting people strips not just the evicted, but all of society, of valuable economic investment that could be used to protect all residents from climate hazards and risks.

2.2.6 Intersectionality dimensions

The way an eviction impacts an individual and the degree to which their exposure to risks and vulnerabilities are affected are determined by the interaction of a range of factors, including race, gender, economic status, migration status, disability or age, among others.[115] For instance, a study of farmer evictions in Tanzania demonstrated that poorer farmers were more affected than those that were "previously better-off".[116] Even in countries where women have legal rights to land, their ability to resist or recover from an eviction and build up resilience to further shocks can be hampered by greater discrimination, for example by receiving less land.[117] Female-headed households are also particularly vulnerable to the loss of income and the need to take care of family members in the aftermath of an eviction.[118]

Eviction processes, therefore, do not impact all members of a household in the same way. Research in the US points to the ways in which Black women are particularly affected by forced evictions and that Black children are almost twice as likely to be evicted during their childhood compared to White children.[119] This differentiated vulnerability to evictions extends to other contexts. Women might face sexual violence during and following the evictions,[120] particularly when they become homeless as a result.[121] The psychosocial stress they experience can lead to miscarriages, undernutrition and other health issues.[122] Studies in Africa have also identified links between disability rights and forced evictions.[123] Children's exposure to stress from an eviction can also impact their wellbeing and, when evictions lead to family breakdown, children might be exposed to domestic violence and abuse.[124]

2.2.7 Cumulative cycles of poverty and vulnerability related to evictions

The review of the literature demonstrates that forced evictions have a profound and complex impact on all the dimensions and trends that underscore vulnerability and exposure. For all these dimensions in which forced evictions disrupt people's lives, economic prospects and wellbeing, it is evident that threats of forced evictions both arise from poverty and are a driving cause of poverty and human rights violations.[125] Evictions also exacerbate inequalities between and within groups, depending on race, gender, migration status and other characteristics. Climate change, being a multiplier of risk, means that the occurrence of forced evictions in the context of the climate emergency will disproportionately impact the vulnerability or exposure of some residents more heavily than others, further complicating climate responses that can effectively address the needs of marginalised groups.

Importantly, evictions are not just one-off occurrences, but are often recurrent processes of expulsion, either because the same settlement is evicted several times or because the same families are exposed to recurrent evictions in different locations. An example of the former is Ambedkar Nagar in Mumbai, India, where residents have faced eviction 45 times in ten years.[126] An example of the latter is the evictees from Otodo Gbame in Lagos, Nigeria, with Amnesty International revealing that five years after the eviction, many have been displaced again due to the demolition or threats of evictions in hosting communities and at least 12 evictees have died due to trauma and poor living conditions.[127] Likewise, the period of transition and homelessness that follows an eviction can last for years, feeding into cycles of poverty and marginalisation. Also in Lagos, a survey two and a half years after the demolition of Badia East reported that 29% of evictees had still not secured a house and were homeless.[128] In Bogotá, Colombia, a study showed that a group of 30 families evicted in 1992 and promised public housing stayed in an abandoned school for several months and, by 1997, were scattered throughout the city in whatever housing they could find.[129]

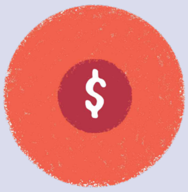
Recurrent exposure to evictions translates into repeatedly destroying households' assets[130] while offering no support to address the risks of poverty or further eviction. In other words, throughout the years, "government interventions consequently further exposes the informal dwellers of these settlements into extreme vulnerabilities".[131] Even when there is formal compensation, this doesn't mean the cycle of insecurity is broken. The same survey with Badia East evictees showed that when asked whether the compensation was enough to put them back to their pre-demolition situation, almost 95% of those compensated said no.[132] This leaves evicted families in a perpetual cycle of insecurity and risk, unable to fully recover and access adequate housing, systematically preventing societies from advancing.[133]

Considering these uneven intersectional and cumulative impacts, a forced eviction can be understood as a discriminatory housing practice, more explicitly affecting those who have been historically and systematically excluded from adequate housing opportunities. The cycles of evictions and the inability to secure a safe and decent home mean that these communities are likelier to be the hardest hit by climate shocks and the hardest to reach with climate action policies.

Table 1 provides a summary of the impacts of forced evictions on each of the six dimensions of vulnerability and exposure, and how these impacts, in turn, exacerbate the vulnerability and exposure of evicted communities, representing a handbrake for cities to becoming more resilient.

Table 1. Impacts of forced evictions in key dimensions of vulnerability and exposure

DIMENSIONS OF VULNERABILITY AND EXPOSURE	IMPACTS OF FORCED EVICTIONS	HOW IMPACTS INCREASE VULNERABILITY AND EXPOSURE
Environmental and physical dimensions	▪ Inadequacy of temporary housing ▪ Worse housing conditions (permanent or semi-permanent solutions) ▪ Loss of infrastructure like water, sanitation and hygiene ▪ Moving to more vulnerable locations ▪ Reduced access to public services and infrastructure	Degraded or worse physical conditions of the housing structure — including the lack of appropriate infrastructure — increases individuals' exposures to hazards and risks, such as flooding or heat. Lack of basic services and infrastructure also impact people's vulnerability by, for example, limiting access to clean water. Location also affects residents' exposure to these risks, for example by being displaced to flood-prone areas or low-lying coastal zones
Education dimensions	▪ Destruction of educational facilities ▪ Loss of educational materials ▪ Increased distance to schools ▪ Increased school desertion ▪ Lower capacity to concentrate and learn due to trauma ▪ Increased risk of stigma and harassment in school ▪ Education loss impacting future income potential	Factors that limit someone's ability to either attend school or learn impact their coping and adaptation mechanisms, from hindering them receiving information on response strategies and health and environmental hazards to accessing early warning systems. Individuals seeking to go to school face greater risks if they have to travel longer distances or use facilities that are of poorer quality. Also, education loss might impact a person's future income potential, further increasing their vulnerability. The collective resilience that can be built through shared educational infrastructures is jeopardised
Health and wellbeing dimensions	▪ Loss of health infrastructures ▪ Lack of sanitation and waste management increases water-borne diseases and infections ▪ Exposure to diseases like malaria, tuberculosis, pneumonia, cholera and dysentery ▪ Increased malnutrition, particularly among children ▪ Worse mental health, increased stress and anxiety as well as lower self-esteem and sense of belonging	Resilience is impacted by failures in health infrastructures and by the community's limited access to health services due to having to travel longer distances, particularly in the case of extreme events like storms and floods. As climate-related disasters increase, these can exacerbate the gravity of illnesses, increase exposure to diseases and limit access to treatment. If residents' medical conditions worsen, this reduces their ability to respond to, prepare for and cope with shocks, for example from limited mobility or enhanced vulnerability

DIMENSIONS OF VULNERABILITY AND EXPOSURE	IMPACTS OF FORCED EVICTIONS	HOW IMPACTS INCREASE VULNERABILITY AND EXPOSURE
Cultural and governance dimensions 	▪ Loss of ties to service-providing institutions (health, education and cultural) ▪ Breakdown of social fabric and feelings of belonging/solidarity ▪ Cultural stigma that prevents coping with stress and adapting to new realities	The destruction of community fabric, bonds and organisation directly affect people's capacity to respond to risks. Additionally, climate shocks have a multiplier effect on the breakdown of trust within communities, further limiting both individual and collective adaptation capacities
Economic dimensions 	▪ Loss of sources of income/ livelihoods due to businesses in settlements or proximity to jobs ▪ Inability to afford new housing as well as increased transportation costs ▪ Financial impact of moving assets and rebuilding housing ▪ Loss of assets to insulate from economic shocks ▪ Increased food insecurity	Displacement from eviction disproportionately affects those employed in location-specific work, such as farming or fishing. With the loss of sources of income and of assets, households are less prepared to respond to new or unexpected expenses that might result from increased climate vulnerability or more frequent shocks, reducing their coping capacity
Intersectionality dimensions 	▪ Greater vulnerability of poorer residents ▪ Heavier burden on female-headed households ▪ Higher exposure of women and girls to sexual violence ▪ Increased exposure of children to family breakdown and domestic abuse	Different groups experience the impacts mentioned above differently based on the interaction of their identities such as their race, gender and migration status, and evictions can exacerbate inequalities between and within groups. Some residents' vulnerability or exposure will be more heavily impacted than others. Repeat evictions of people with specific intersectional identities reinforces their marginalisation

Source: compiled by authors

2.3 Key takeaways

The findings from the literature review outlined in this paper illustrate that the experience of evictions cannot be separated from individual and collective struggles to respond and adapt to the climate crisis. Instead, when understanding the links between evictions and climate change, it is crucial to recognise the following:

- **Forced evictions of informal settlements are a handbrake on cities becoming more resilient, directly impacting all dimensions of vulnerability and exposure**
    - Forced evictions increase communities' exposure to climate risks and hinder their adaptation capacity by impacting all dimensions of vulnerability and exposure
    - There is a cumulative effect for those individuals, families and communities that are exposed to recurrent threats and experiences of forced evictions, increasing cycles of poverty and vulnerability
    - The negative impacts of forced evictions on the vulnerability and exposure of those living in informal settlements affect the capacity of cities and societies to effectively respond to the climate crisis
- **Communities that live in the intersection of vulnerabilities, insecurity and violence hold many of the answers to responding to growing risk exposure**
    - Evicting communities often translates into undermining ongoing adaptation efforts, increasing communities' exposure to climate risks and hindering their response capacity
    - There is a need to increase the financial and political support for in-situ upgrading and retrofitting, recognising the long-term accumulation of historical violence and injustices, as well as the role that low-carbon development settlements play in safeguarding cities and their inner-city areas against more carbon-intensive usages and unsustainable urban sprawl.

Evictions as handbrakes for mitigation efforts: environmental impacts of forced evictions

Forced evictions are not only socially and economically destructive; they also carry significant environmental impacts. This section presents the findings of a comparative analysis of embodied carbon emissions across three policy responses to informal settlements. Estimates were developed using the case study of, and community-led data from, Otumara in Lagos, Nigeria, where residents were forcibly evicted in March 2025.

3

3.1 Estimating the carbon emissions of evictions

The second component of the research focused on estimating the embodied carbon emissions associated with three policy responses to informal settlements:

- **Scenario 1:** eviction without government support or compensation (self-reconstruction)
- **Scenario 2:** eviction followed by relocation in government-supported social housing
- **Scenario 3:** in-situ upgrading and retrofitting

These scenarios represent divergent urban development pathways, each with distinct emission profiles depending on the degree of demolition, material use and reconstruction involved. Together, they provide a framework for evaluating the climate implications of forced evictions and state interventions in urban housing.

We grounded the calculations on the case study of Otumara in Lagos, Nigeria, an informal settlement that was forcefully evicted in March 2025 (see Box 2). While calculations for emissions of the construction and demolition of buildings require information that is highly limited in informal settlements, this exercise allowed us to illustrate a possible approach to estimating the emissions of forced evictions in an informal settlement and close this knowledge gap. A more technical explanation of the assumptions and methodology can be found in the Appendix.

BOX 2. THE FORCED EVICTION OF OTUMARA IN LAGOS, NIGERIA

On the morning of Friday 7 March 2025, with no warning, Lagos State Building Control Agency officials, police and individuals armed with machetes entered the two communities of Ilaje Otumara (Otumara) and Baba Ijora in mainland Lagos, Nigeria. Using excavators and beating residents, they quickly began to demolish both communities. The eviction continued on 8 and 9 March, destroying nearly the entirety of both communities and leaving thousands of displaced people sleeping outside.

This eviction didn't take place in a vacuum, but rather in a community that had produced its own habitat and organised over decades. As members of the Nigerian Slum/Informal Settlement Federation stated in a video produced in Otumara in 2024, "Ilaje Otumara is a community that began as a fishing settlement over a hundred years ago and has grown into a modern neighbourhood in the heart of Lagos mainland".[134]

Since mid-2021, residents of Otumara had engaged positively with the Lagos State Urban Renewal Agency (LASURA) around a planned partnership to carry out regeneration with the active involvement of residents. Later in 2021, the community set up a regeneration committee to engage with LASURA and potential developers. In 2022, the community conducted its own census, numbering 2,800 households. This was followed in 2023 with a community-led opinion survey to identify the upgrading priorities of residents, to feed into an expected participatory planning process. The estimates produced for this research are based on the data gathered during those community-led processes before the eviction.

Since March 2025, several organised residents of informal settlements, human rights activists and members of civil society have advocated to condemn the forced eviction and the resulting human rights violations, and demand proper compensation and justice for the community.

Source: JEI et al., 2025.[135]

Figure 1. Otumara before (left) and after (right) the eviction

Left: JEI, 2024; right: JEI via Flickr (CC BY 2.0)

Across the different scenarios, the following data sources were used in the calculations:

- **Community census data from Otumara:**[136] data about the composition of Otumara was collected by the community before the eviction in a 2022 census and was provided to the research team by the NGO JEI, which supports the work of the Nigerian Slum/Informal Settlement Federation.[137] The data included information about each housing typology and the main materials of walls, roofs and floors. The census included 2,800 residential and 912 business structures. The 765 non-residential communal buildings were excluded to allow the comparison with scenario 3, which focuses on the retrofitting of residential housing. To estimate average household size, this information was complemented by data from the 2021 Lagos Informal Settlement Household Energy Survey.[138]
- **Embodied Carbon in Construction Calculator (EC3) database:** emissions of specific materials were estimated based on the EC3 database,[139] a publicly available and peer-reviewed repository of environmental product declarations (EPDs) widely used in building lifecycle assessments. Emissions factors were selected based on material type and generic classification.
- **Life cycle assessment (LCA):** to estimate all emissions related to the different scenarios, we used four stages of the material LCA, which are: A1–A3 (raw material extraction to manufacturing), A4–A5 (transport and construction), B1–B5 (use and maintenance) and C1–C4 (demolition)[140] (see Figure 2). The elements of the LCA considered for each scenario is summarised in Table 2.
- **Nigeria's Third Nationally Determined Contribution (NDC 3.0):**[141] to estimate the magnitude of emissions in relation to national reduction targets, we used the reductions by sector estimated by Nigeria's most recent NDC.
- **Lagos Climate Action Plan:** to understand better the significance of emissions in relation to city targets, we relied on the plans for reducing emissions across different sectors in the city, as per the Lagos Climate Action Plan.[142]
- **Housing finance in Africa yearbook: 15th edition — 2024:** to define the typology of new housing units in Nigeria for scenario 2, we considered what the Centre for Affordable Housing Finance in Africa identifies as "the cheapest, newly built house by a formal developer or contractor in an urban area" in Nigeria in the last year, which was a 42m² unit from the Millard Fuller Foundation.[143]
- **Saving embodied carbon through strengthening existing housing:** this 2024 report by Build Change compiles retrofit emissions data from multiple countries and project contexts, expressed as average tonnes (t) of CO_2 per square metre of upgraded floor area, which we used for scenario 3.[144] As Nigeria is not included in the original case studies, a methodological extrapolation was required to adapt these findings to the Otumara settlement (see Appendix, Section A4).

Figure 2. The life cycle assessment

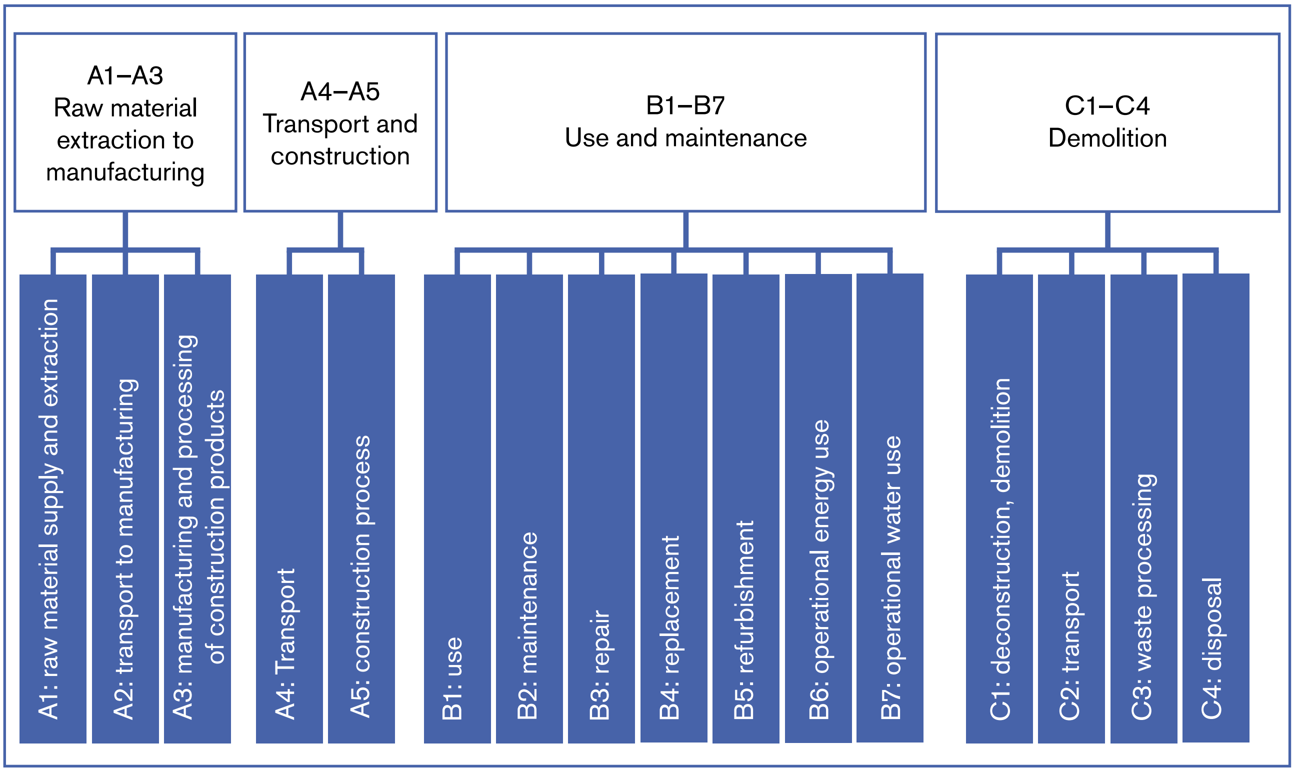


Table 2. Elements considered in the estimates of emissions of each scenario

SCENARIO 1: Eviction without government support or compensation (self-reconstruction)	SCENARIO 2: Eviction followed by relocation in government-supported social housing	SCENARIO 3: In-situ upgrading and retrofitting
Emissions from raw material extraction, manufacturing, transport and installation (A1–A5) of settlement equivalent to Otumara + Emissions from Otumara's demolition (C1–C4)	Emissions from newly built housing units for Otumara residents (A1–A5) + Emissions from Otumara's demolition (C1–C4)	Emissions from retrofitting housing units for Otumara residents (range based on Build Change benchmarks)

Source: compiled by authors

By modelling all three scenarios with consistent assumptions and internationally recognised LCA conventions, the analysis enables comparison of the carbon implications of forced eviction pathways versus in-situ alternatives. Although the existing information has gaps and some of the estimates might be imperfect, we see this exercise as part of wider efforts to generate quantitative data and estimates that inform the climate discussion in ways that capture realities in cities and settlements that are not fully reflected by official statistics (see Box 3). This methodology builds the case for integrating forced eviction emissions into urban carbon accounting and supports a shift toward socially just, low-carbon housing policies.

3.2 Environmental impacts of forced evictions: assessing different policy scenarios

In this section we will look at the results of the three scenarios modelled (summarised in Table 3 and Figure 3) and explore what the findings mean in relation to the different responses and their environmental implications.

BOX 3. ONGOING EFFORTS TO ESTIMATE EMISSIONS FROM PROCESSES IN INFORMAL SETTLEMENTS AND GLOBAL SOUTH CITIES

As part of efforts to link housing justice and climate action, there is growing interest in understanding the climate impact of different housing policies. Some research and advocacy organisations have used various methodologies to calculate the emissions of processes related to retrofitting housing and prioritising housing residents in well-located areas instead of promoting new construction and urban sprawl. These efforts shed light on possible avenues to undertake housing policies and practices that benefit residents and tackle spatial inequalities, while also offering less carbon-intensive modes of housing production.

Build Change works to protect people and their livelihoods by preventing housing loss caused by disasters and climate-induced events, transforming the systems for regulating, financing, building and improving houses around the world. Through their methodology of calculating and comparing the embodied carbon of different housing retrofitting and construction processes, Build Change demonstrates the great potential for emissions savings from strengthening and upgrading existing housing. Its findings show that on average, improving existing housing saves two-thirds of embodied carbon compared to new housing construction, meaning that three houses can be improved for every new housing unit built. Each improved house thus saves 18t CO_2. In improving housing, according to Build Change, "there's an opportunity to save 4.8 gigatons of CO_2 emissions while addressing the more than 268 million inadequate houses globally".[145]

Instituto Pólis is a Brazil-based research and civil society organisation that promotes more democratic, sustainable and just cities. In a recent study, they have explored the potential carbon savings of using existing housing, by focusing on vacant housing in São Paulo city centre. Instituto Pólis identified 87,000 empty housing units in central São Paulo. If idle and vacant properties in the city centre were used to house lower-income households, it would cut 4.4Mt CO_2e emissions, equivalent to 1% of all of Brazil's emissions in 2022. By living closer to the centre, families would save 1.25 million kilometres of car travel and 557,000 kilometres of motorbike travel, equivalent to 31 and 14 trips around the world, respectively.[146]

3.2.1 Eviction without government support or compensation: the unsustainable current pathway

When considering the current scenario, in which residents of informal settlements are evicted without government compensation or support, the estimation suggests that the eviction of Otumara produced emissions of 7.3 million kilograms of CO_2 equivalent (kg CO_2e) (on average), with a conservative estimate of a lower bound of 6.5 million kg CO_2e and an upper bound of 8.1 million kg CO_2e. These are the emissions estimated from the extraction and processing of raw materials, the manufacturing and transportation of building materials, and the installation of a settlement equivalent to Otumara, as well as its demolition.

These values are not marginal. According to Amnesty International, two million people were forcefully evicted from informal settlements over a period of ten years, between 2000 and 2009.[147] Based on the detailed carbon accounting from the Otumara case, it is possible to estimate the cumulative climate impact of these practices. Assuming a consistent pace of evictions,[iv] around five million residents have been displaced in Nigeria in a period of 25 years. This equates to roughly 305 Otumara-scale events.[v]Extrapolating from the emissions of the current scenario of forced evictions (in which people are forced to relocate themselves), past evictions in Nigeria may have generated up to 2.46Mt CO_2e — with a lower estimate of 1.99Mt CO_2e.

If forced evictions of informal settlements continue at the same pace across Nigerian cities (around 200,000 residents a year), roughly two million additional people will have been displaced by 2035, equating to 122 Otumara-scale events. This implies up to 984 million kg CO_2e, which added to the 2.46Mt CO_2e already generated by past evictions, raises the **cumulative footprint in 2035 to 3.44Mt CO_2e**. Furthermore, keeping the same trajectory through 2050 would raise total new displacements to five million people (around 305 Otumara-style events). This would inject another 2.46Mt CO_2e to current emissions and push the cumulative eviction footprint to 4.92Mt CO_2e by the middle of the century.[148]

3.2.2 Eviction followed by relocation in government-supported social housing: the high environmental costs

We know, however, that evictions with no compensation or provision of alternative adequate housing are a human rights violation, which doesn't respect international commitments and agreements, and should not even be conceived as a potential approach. In this second scenario, we therefore assess the emissions implications of providing adequate housing to each household evicted from Otumara, using existing affordable housing in Nigeria as a benchmark. When modelling eviction followed by state-supported relocation and construction of formal social housing, this generates by far the highest emissions scenario, averaging 18.1 million kg CO_2e, with a lower bound of 16.7 million kg CO_2e and an upper bound of 19.4 million kg CO_2e. These estimates are significantly higher than those in the first scenario, due to the relatively high-emission materials most likely used for reconstruction.

Extrapolating from this benchmark and Amnesty International's estimates of actual evictions puts into perspective the significance of these emissions in the future. By 2035, an extra two million people being evicted and relocated could add up to 2.36Mt CO_2e, while **the additional emissions caused by the eviction of another five million people by 2050 would equate to up to 5.9Mt CO_2e**.

These emissions take on heightened significance when considered within the national emissions reduction targets. Nigeria's NDC 3.0 states that emissions are expected to reduce by 29% by 2030 and 32% by 2035.[149] If evictions continue at today's pace, eviction-linked embodied emissions would amount to 0.221Mt CO_2e annually. Against the economy-wide mitigation requirement under NDC 3.0 (168.2Mt by 2030 and 184.9Mt by 2035), these emissions could equal 1.19% of the 2035 target. That is equivalent to 3–4% of Nigeria's cement and mineral-industry process emissions (based on recent inventory values).[150] While modest in some comparisons, the share in this sub-sector is materially large and worth policy attention.

Beyond these national figures, in Lagos alone, Amnesty International documented that over a period of four years between 2013 and 2017, approximately 50,000 people were evicted in the city.[vi] If forced evictions in Lagos proceed at that same pace of roughly 12,500 residents per year, about 62,500 additional people would be displaced by 2030 and 125,000 by 2035, equivalent to roughly 3.8 and 7.6 Otumara-scale events, respectively. Demolitions and relocations linked to these forced displacements could therefore generate 0.069Mt and 0.138Mt of embodied CO_2e by 2030 and 2035, respectively, which is equal to roughly 20% of a single year of Lagos' waste-methane reduction potential (around 0.70Mt CO_2e per year).[151] Over a decade, embodied emissions from evictions are therefore a small

iv After 2010, there is scattered evidence about the magnitude of forced evictions, which has not been published in a systematic way. For these calculations, we are assuming the same pace of forced evictions as for the pre-2010 period.

v This is based on an estimated population of around 16,380 people in Otumara, calculated by taking the 2,800 structures identified during the 2022 Otumara community census (unpublished) and multiplying it by the average household size identified in the Lagos Informal Settlement Household Energy Survey (see note 138).

vi This figure considers the following incidents: Badia East (February 2013); Badia East and West (September 2015); and Otodo Gbame and Ilubirin (November 2016–April 2017). For more information, see: Amnesty International (2017) The human cost of a megacity: forced evictions of the urban poor in Lagos, Nigeria. London.

Table 3. Estimates of total embodied carbon (kg CO_2) emissions for evictions under different policy scenarios, based on Otumara

SCENARIOS	LOWER ESTIMATE (kg CO_2)	AVERAGE ESTIMATE (kg CO_2)	UPPER ESTIMATE (kg CO_2)
Scenario 1: eviction without government support or compensation (self-reconstruction)	6,530,273.93	7,295,092.70	8,059,911.48
Scenario 2: eviction followed by relocation in government-supported social housing	16,748,023.08	18,062,306.87	19,376,590.65
Scenario 3: in-situ upgrading and retrofitting	3,942,632.98	6,020,466.67	8,098,300.35

Source: estimations by authors

but non-negligible share of the total climate benefit potential from methane mitigation in Lagos.

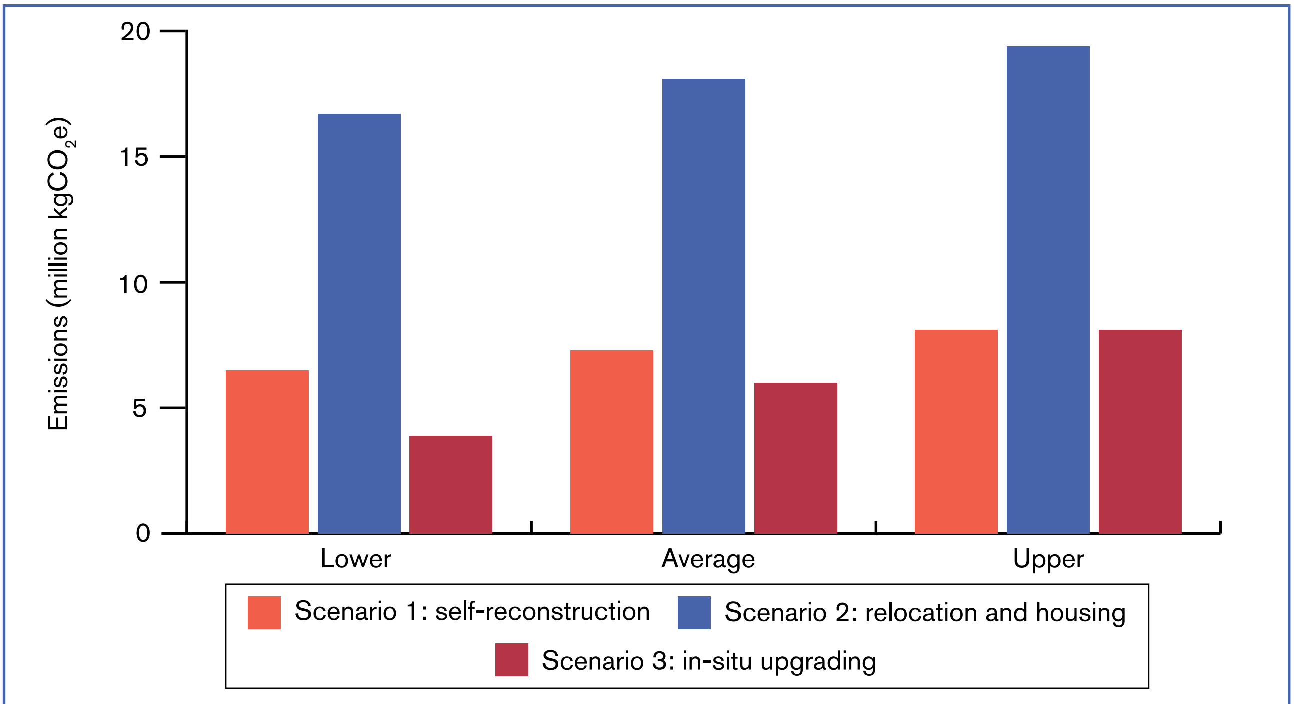
In other words, **displacements not only incur a significant carbon debt but also directly offset the equivalent of years' worth of investment in the waste and wastewater, transport and energy sectors, which are already under pressure to decarbonise.** By embedding such high-emission eviction practices into urban development strategies, Lagos risks undermining the very mitigation actions it has prioritised.[152]

3.2.3 In-situ upgrading and retrofitting: an alternative to evictions and emissions

From the three estimated scenarios, the less polluting is the one that estimates the emissions of in-situ upgrading and retrofitting housing. For the case of Otumara, upgrading yields an average emission of 6 million kg CO_2e, with a lower bound of 3.9 million kg CO_2e and an upper bound of 8.1 million kg CO_2e.

In-situ upgrading and retrofitting is therefore the most climate-efficient housing intervention, with its 6 million kg CO_2e of average emissions lower than

Figure 3. Emissions per bound cluster (lower, average, upper) across housing intervention scenarios



Source: estimations by authors

the 7.3 million kg CO_2e for eviction without support (scenario 1) and the striking 18.1 million kg CO_2e for displacement with social housing construction (scenario 2). This means that upgrading generates the equivalent of 82.5% of the emissions of evictions without compensation and just 33.3% of the emissions produced by relocating to new housing. In other words, **upgrading and retrofitting can save up to 66% of CO_2e compared to relocation policies**.

Even at the lower end of the range, emissions from upgrading (3.9 million kg CO_2e) remain well below those of scenario 1 (6.5 million kg CO_2e), representing just 60% of the emissions of informal reconstruction by those evicted without support. When compared to scenario 2 (16.7 million kg CO_2e), upgrading produces only 23.4% of the emissions of new social housing construction. At the upper bound, upgrading reaches 8.1 million kg CO_2e — only 0.04 million kg CO_2e higher than scenario 1 (see Table 3) — but still represents only 41.8% of the emissions generated by scenario 2 (19.4 million kg CO_2e).

By contrast with the relocation scenario, **in-situ upgrading and retrofitting aligns more closely with the low-carbon objectives of Nigeria's NDC 3.0 and the Lagos Climate Action Plan targets**, while also responding to human rights obligations, offering a clear pathway to both social justice and emissions avoidance.

We understand that the calls for in-situ upgrading need to recognise the limits of adaptation. In other words, in-situ upgrading is not always possible and some informal settlements are located in areas where redevelopment is not viable. Indeed, there is a growing debate about how some informal settlements might be experiencing some forms of 'loss and damage'; namely, settlements in which the risks posed by climate change are beyond any adaptation or mitigation efforts.[153] That said, there is a vast number of settlements (or parts of them) in which adaptation and upgrading are possible. The risks and limits of adaptation are both ecological and socially constructed;[154] this implies that what is tolerable or acceptable varies across different territories and social groups. Who determines what is beyond or within the limits of adaptation is also shaped by unequal power structures. As one of Slum Dwellers International's slogans rightly says, the directive should be "upgrade where possible and relocate where necessary."

The evidence is clear: upgrading informal settlements in place is not only a socially just solution that can support the adaptation capacity of communities, but it is also the most emissions responsible answer. "Slum upgrading is climate action",[155] as it enables cities to strengthen climate resilience and improve housing conditions without incurring the enormous carbon costs of demolition and reconstruction. It has been shown, as well, that improving housing in informal settlements has significant impacts across all human development dimensions.[156] The differences identified between the three scenarios confirm the findings of Build Change's research,[157] whose benchmarks show that retrofitting existing homes can reduce embodied emissions by up to two-thirds compared to new construction — effectively allowing three homes to be upgraded for the carbon cost of one new build.

3.2.4 Hidden emissions: other environmental impacts and urban development patterns

In these estimations, there are several aspects that were not considered and that would make the gap between demolishing with or without support for relocation, on the one hand, and in-situ upgrading, on the other, significantly larger.

First, processes of relocation and displacement have implications in terms of increased transport and fuel dependency, which in turn translates into higher sustained emissions in the long term. In this regard, several pieces of research have demonstrated that housing relocation tends to have worse sustainability outcomes and more transport-dependency than in-situ improvement programmes.[158]

A second source of emissions that is not considered in our calculations is the need for building infrastructure, accessibility and basic services in any new development in the outskirts of the city, which is likely to be more polluting than renewing or expanding infrastructure in already consolidated urban areas.

A third critical aspect is the question about what replaces informal settlements. A recent study assessing informal settlement displacements between 2003 and 2022 in 60 sample cities found that "41 percent of land was subsequently repurposed for private property development [...] and 35 percent remained unused".[159] Either of these post-demolition land uses has critical environmental implications. Private urban developments in well-located areas tend to offer 'luxurious' ways of living that have high rates of energy and resource consumption. Luxury homes tend to replicate consumption patterns that lock-in high carbon development pathways. In fact, in Lagos there are clear examples of this pattern in the site of Otodo Gbame, where 30,000 people were evicted in 2016–2017 and where currently "premium, luxury residential properties" are advertised for sale in what is presented as the "best addresses in Lagos".[160] Alternatively, when land is left with no use or as wasteland (which is the main outcome in the sample of cities in Africa), this is likely to translate into degradation of inner-city areas that in turn promotes urban expansion. All in all, these post-demolition uses demonstrate the need for zoning mechanisms that recognise the role that low-carbon development settlements play in safeguarding cities and their inner-city areas against more carbon-intensive usages and unsustainable urban sprawl.

Recognising that our estimates are conservative and could be much higher when considering these different hidden costs and additional emissions, it is critical to acknowledge the role of forced evictions in mitigation efforts. **Their exclusion from current carbon accounting frameworks and policy discussions is not just a technical omission, but a political one.** Without addressing the emissions embedded in housing displacement and redevelopment, Lagos and other cities risk locking in a high-carbon, exclusionary form of urban development. Integrating eviction-related emissions into climate action planning — and redirecting investment toward in-situ upgrading — is a necessary condition for aligning the city's housing practices with its climate justice ambitions.

3.3 Key takeaways

This exploratory research exercise provides an important lens through which to understand the ways in which evictions are not just harmful to the communities that are evicted, but hinder collective efforts to build more sustainable societies. Using the data from Otumara in Lagos allowed us to model a calculation of the environmental impact of an eviction, demonstrating the following key takeaways.

Forced evictions of informal settlements undermine efforts to achieve carbon reduction targets:

- Our new estimates show that for Nigeria alone, emissions related to evictions from urban informal settlements over **the past 25 years might have generated more than 2.46Mt CO_2e**
- It would take **11 years for ten million trees** — a forest the size of Paris — **to capture these emissions**
- If evictions continue at the same pace through 2050, **an additional five million people could be displaced, generating another 2.46Mt CO_2e**.

Different types of policy responses have implications in terms of emissions:

- Upgrading and retrofitting can **save up to 66% of CO_2e compared to alternative policies**.
- By contrast, evictions followed by relocation and reconstruction **could generate 2.36Mt CO_2e between 2025 and 2035**, undermining both national and city emissions reduction targets.
- **In-situ slum upgrading is an alternative to forced eviction that can promote both mitigation** (by reducing emissions) **and adaptation** (by reducing determinants of risk).

Looking forward

4

This exploratory research has demonstrated that, although there are still knowledge gaps regarding the complex links between climate change and forced evictions, the existing evidence provides sufficient grounds to estimate significant impacts and interconnections.

The results call for a need to keep advancing a research agenda that provides a more in-depth understanding of current blind spots in relation to the negative environmental consequences of forced evictions, and to do so by highlighting and supporting the use of community-led data. They also call for reviewing methods of carbon accounting and carbon reduction target definitions, considering the hidden impacts that events such as continuous threats and experiences of forced evictions might have on communities. While recognising that quantification efforts are challenging, a similar approach to quantify the loss of adaptation capacity due to evictions could be promoted. This could provide a benchmark to assess against the potential reduction of exposure that is generally used to support evictions.

Our findings that forced evictions constitute a handbrake for cities to achieving their carbon reduction targets and adapt to climate change, and that in-situ slum upgrading and retrofitting is the only policy pathway that advances low-carbon city-wide objectives and supports community-led adaptation efforts — while also responding to human rights obligations — are critical for informing the ongoing discussions around policy responses to the climate crisis. These include: the IPCC's special report on climate change and cities, by problematising 'relocation' as part of its technical summary; the development of housing policy recommendations led by UN-Habitat's Open Ended Intergovernmental Expert Working Group on Adequate Housing for All, by recognising upgrading and securing tenure as critical means of addressing the housing crisis; and for city-led efforts of decarbonisation, adaptation and just urban transitions led by organisations such as the C40 and Local Governments for Sustainability (ICLEI), by addressing forced evictions as a critical aspect of these challenges.

The evidence presented in this paper builds on the decades-long anti-evictions efforts led by human rights networks and advocates, and provides additional tools to promote transformative and anti-discriminatory adaptation. We hope it contributes to processes in which climate change is not used as an argument against those living in informal settlements, but rather as another reason to prioritise inhabitants' security and wellbeing.

Lagos, Nigeria, 2017. Credit: Alexander Macfarlane (used with permission)

Appendix

Detailed methodology for estimating embodied carbon emissions across housing intervention scenarios

A1. Methodology approach

This methodological section outlines the approach used to estimate the carbon emissions associated with three prevalent policy responses to informal settlements: eviction without government support or compensation (self-reconstruction); eviction followed by relocation in government-supported social housing; and in-situ upgrading and retrofitting. These scenarios represent divergent urban development pathways that result in markedly different levels of carbon emissions, depending on the extent of demolition, reconstruction and material use involved. Together, they offer a structured framework to assess the climate implications of state intervention — or the lack thereof — in the event of forced evictions.

For the embodied carbon calculations, we drew from the methodology developed by Build Change.[161] The analysis is based predominantly on guidance from the UK Institution of Structural Engineers.[162]

The Build Change methodology only considers emissions due to materials and construction (A1–A5). The reasons for this include:

- Embodied carbon emissions from stages A1–A5 account for the majority of a building's emissions over its life cycle. The proportion of total emissions from stages A1–A5 is even higher in the countries where Build Change operates than in countries like the UK because operational energy use and refurbishment levels are much lower.
- Houses in Build Change programmes — similar to informal settlements studied here — have very low in-use consumption due to limited electrical appliances, so operational emissions will account for a very low percentage of total life emissions.

For stages A1–A3 (raw material supply, transport and manufacturing), the embodied carbon of each material was calculated as follows:

Embodied carbon A1–A3 (kg CO_2e) = material quantity (kg) embodied carbon factor A1–A3 ▪ (kg CO_2e/kg)

Since carbon accounting and EPDs are mostly not available in the countries where Build Change operates, two other databases were used as data sources:

- Inventory of Carbon and Energy database V3 (ICE3)[163]
- Embodied Carbon in Construction Calculator (EC3) database.[164]

Both databases are among the most well regarded and complete of all EPD and embodied carbon factor databases currently available internationally. The majority of the material emissions factors in these databases are obtained from global or regional meta databases and are therefore not specific to exact materials and suppliers.

A2. Methodology scenario 1: eviction without government support or compensation (self-reconstruction)

In this scenario, residents are forcibly evicted without compensation, relocation planning or government support. Households are left to secure shelter independently, typically reconstructing housing of a similar quality in other precarious locations. Emissions are calculated based on the demolition of the original structures and the informal reconstruction process for the new structures.

Structural scope

The analysis focuses on 2,800 residential and 912 business structures identified in the Otumara community census.[165] A total of 765 structures — comprising 42 religious buildings and 723 communal or other non-residential facilities — were excluded from the emissions calculation, as the focus is on dwellings most likely to be reconstructed post-eviction. Business structures were weighted as 0.5 residential units, to reflect their smaller average size and lower material intensity. The calculation includes only those materials that significantly contribute to embodied carbon and for which reliable emissions factors were available.

Material inclusion criteria

The selection of materials was based on two criteria:

1. Prevalence across the profiled structures in Otumara, and
2. Availability of reliable embodied carbon factors in the EC3 database.

The model includes:

- Roofs: zinc, aluminium, slate, wood
- Walls: concrete block, wood (timber), cement render, iron, zinc, aluminium, and
- Floors: cement, tile, wood.

Materials such as tarpaulin, earth and unknown categories were excluded due to their negligible contribution or lack of standard emissions data.

Housing typology and design basis

The total area and number of rooms were based on the average household's size and characteristics identified by the 2021 Lagos Informal Settlement Household Energy Survey, which identified an average household size of 5.85, occupying 1.93 rooms, with an average living space of 32ft²/3m² per capita.[166]

Typical wall, roof and floor surface areas were established per unit, based on settlement-specific housing dimensions. These were standardised using data from Otumara and reflect typical unit layouts. Each structure was assumed to have a floor area of 17.5m², with wall heights of 2.5m and an external perimeter of 17m. Roof areas were calculated assuming a sloped profile with an added height of 0.5m, consistent with observed informal roof designs. Openings were accounted for by subtracting a standard door area of 5.6m² (two doors at 2.8m² each) and a window area of 0.6m² from the total wall surface.

Construction and material quantification assumptions

Material quantities were derived by multiplying component areas by assumed thicknesses and converting volumes into mass using known material densities. Only dominant configurations and materials with available technical parameters were included.

- **Walls:** walls constructed from non-masonry materials (wood, zinc, iron, aluminium) were modelled as cladding fixed to a timber structural frame. The frame consisted of vertical members spaced at 1.2m, with cross-sectional dimensions of 0.038m × 0.089m. Cladding mass was calculated based on the total wall surface area (47.9m²), minus allowances for two doors (5.6m²) and one window (0.6m²), and adjusted for the density of each material. Masonry walls — concrete block and cement-rendered — were treated as solid assemblies. Block mass was estimated from the number of units (based on 0.1m² block face area and 19kg per block), while cement-rendered walls were modelled volumetrically using a density of 2,400kg/m³.
- **Roofs:** roofs were treated as composite systems, combining a timber joist structure and a cladding layer. The total roof area was set at 17.7m², derived from a 5m × 3.5m base and an additional 0.5m height due to slope. Joist spacing and section size matched that of the walls. Cladding mass was calculated either from volumetric density (for example, 7,140kg/m³ for zinc, 2,700kg/m³ for aluminium) or surface density (for example, 37.8kg/m² for slate tiles), depending on the material type.
- **Floors:** floors were modelled as single-layer slabs with a standard area of 17.5m². Thickness assumptions were 0.15m for cement, 0.025m for wood and 0.009m for ceramic tile. Material mass was calculated from volume and material density — 2,400kg/m³ for cement, 650kg/m³ for wood and 19.5kg/m² for tile. Compacted earth and other non-durable floor materials were recorded but excluded from the structural mass calculations due to their variability and lack of standardisation.

Each unit was assigned one material per component type and all estimates were based on simplified but representative housing typologies and construction logic observed in Otumara.

Embodied carbon estimation

Each material mass was multiplied by a corresponding emissions factor, expressed in kilograms of CO_2 equivalent per kilogram of material (kg CO_2e/kg). These emissions factors were sourced exclusively from the EC3 database,[167] a publicly available and peer-reviewed repository of EPDs widely used in building lifecycle assessments. Emissions factors were selected based on material type and generic classification (for example, cast-in-place concrete, galvanised steel sheet, kiln-dried softwood), ensuring consistency and comparability across components. Where ranges were provided in the database, median or conservative average values were used to avoid over- or under-estimation. Each structural component — walls, roof and floor — was calculated separately to allow for disaggregated comparison and all calculations were conducted at the unit level before being aggregated to the settlement scale.

Settlement aggregation

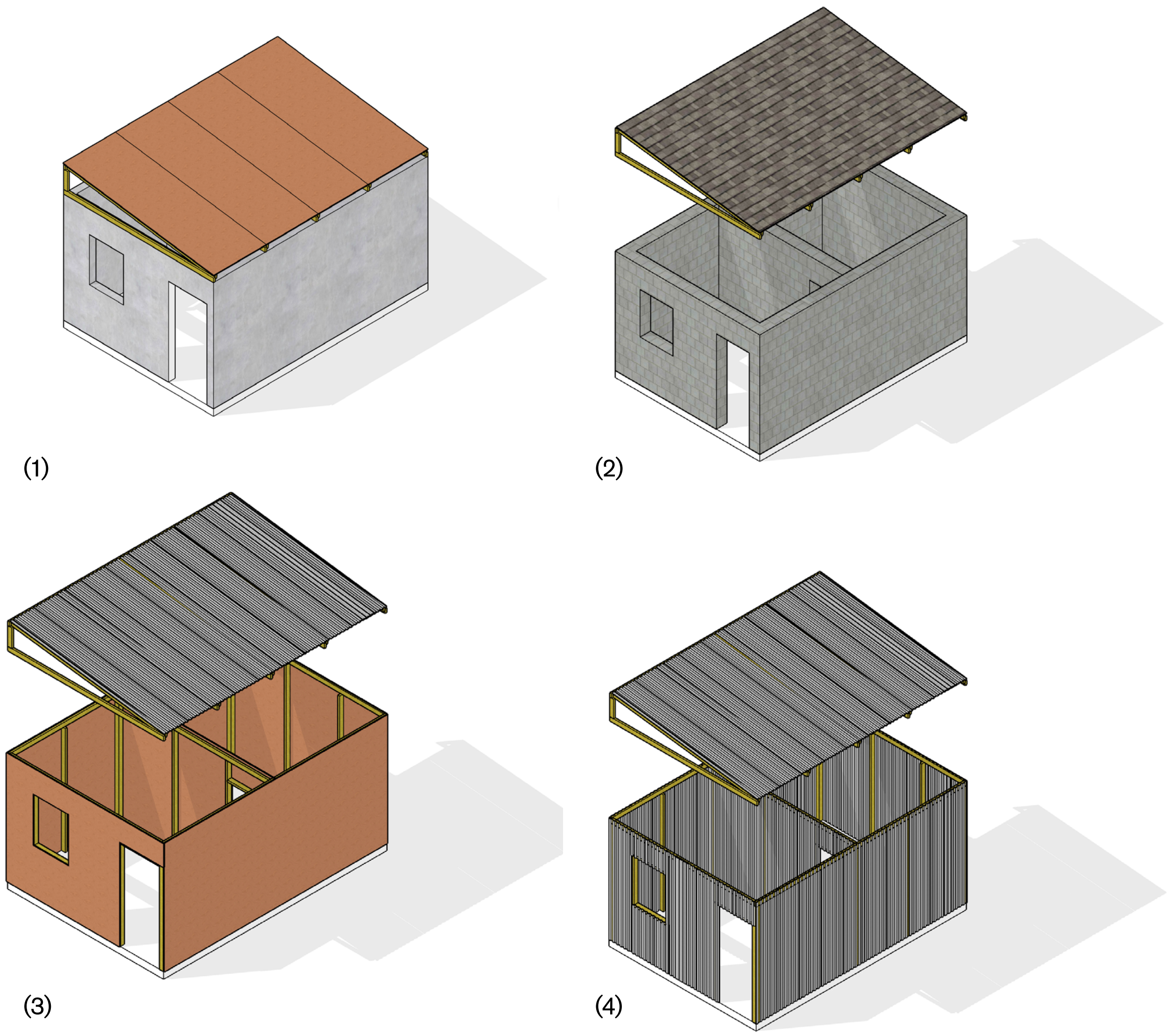
Material-specific emissions were first calculated on a per-unit basis and then scaled across the full sample of residential and business structures. Aggregation used the actual distribution of material types — across walls, roofs and floors — identified through the Otumara dataset. Business structures were adjusted using a conversion factor (0.5) to account for reduced size and material load. This aggregation enabled a comprehensive estimate of total emissions for the entire settlement scenario under informal reconstruction conditions.

Lifecycle adjustment

To estimate the total embodied carbon associated with the building components, this analysis followed established LCA conventions as defined by standards such as EN 15978 on the sustainability of construction works. The A1–A3 lifecycle stages, which include raw material supply and extraction (A1), transport to manufacturing (A2) and manufacturing and processing of construction products (A3), were the focus of the material quantification and emissions calculations presented in the previous sections. These stages capture the emissions associated with the production of construction materials and are widely recognised as comprising the majority of a structure's embodied carbon.

To approximate the complete embodied carbon cycle and enable comparability across policy scenarios, the model draws on A1–A3 values, extrapolating them by using standardised multipliers. Drawing on benchmarks from the Rocky Mountain Institute's (RMI's) Embodied Carbon 101 framework,[168] which indicates that A1–A3 typically account for 65–85% of total lifecycle embodied emissions, the model calculated a range for each material and component. The upper-bound estimate assumes that A1–A3 represent 65% of the total, thereby yielding a higher extrapolated value, while the lower-bound estimate assumes A1–A3 accounts for 85%, producing a more conservative figure. This method provides a transparent and standardised basis for estimating

Figure A1. Examples of housing typologies based on component materials and average household size



Component materials: (1) cement walls, cement floor, wooden roof; (2) concrete block walls, cement floor, slate roof; (3) wooden walls, wooden floor, zinc roof; (4) zinc walls, cement floor, zinc roof.

Source: authors

full-cycle embodied emissions while remaining grounded in the detailed material-level calculations already conducted. It enables the comparison of different policy responses by focusing specifically on lifecycle stages most directly affected by forced evictions, displacement and reconstruction activities.

A3. Methodology scenario 2: eviction followed by relocation in government-supported social housing

This scenario models the carbon emissions associated with a policy response in which informal settlement residents are forcibly evicted and resettled in newly constructed formal housing developed by government-supported programmes. The analysis accounts for both the embodied carbon of the newly built social housing units and the emissions arising from the demolition of the original informal structures. By including the carbon costs of both destruction and replacement, the scenario captures the full emissions implications of this intervention pathway.

Housing typology and design basis

To define the typology of the new housing units in Nigeria, we considered what the Centre for Affordable Housing Finance in Africa identifies as "the cheapest, newly built house by a formal developer or contractor in an urban area" in Nigeria in 2023, which was a 42m² unit from the Millard Fuller Foundation.[169] As it is aligned with Federal Housing Authority standards in Nigeria, this typology served as the design reference.

The unit has a rectangular footprint of 6m × 7m and consists of two rooms with one en-suite toilet. It is constructed with a solid concrete floor slab, load-bearing concrete block walls 2.2m high and two internal partition walls measuring 6.0m and 3.5m in length. The roof is a pitched zinc-clad system supported by a timber frame, featuring a 1m rise at the central apex and two symmetrical sloped surfaces extending to either side. Openings include two doors of 1.4m² each and three windows of 0.6m² each. These openings were subtracted from the total wall surface area in all material quantifications, while the internal partitions were added.

This housing design was used as a standardised basis for all emission calculations in scenario 2.

Construction and material quantification assumptions

Material quantities were derived by multiplying component areas by assumed thicknesses and converting volumes into mass using known material densities. The approach consistently applied one material per component type and excluded substructures (for example, foundations), ceiling layers and internal finishes to ensure comparability with scenario 1.

- **Walls:** walls were modelled as solid masonry using load-bearing concrete blocks. The total wall area included external walls and internal partitions, adjusted for two doors and three windows. Block mass was estimated based on a unit block face area of 0.1m² and a block weight of 19kg. Cement render, plaster and other finishes were excluded from the model.
- **Roofs:** roofs were treated as composite systems, combining a timber joist support structure and a zinc cladding layer. The total roof area was calculated, accounting for two sloped surfaces extending from a 1m central rise. Timber joists were spaced at 1.2m and sized at a 0.038m × 0.089m cross-section, consistent with scenario 1 framing assumptions. Zinc cladding mass was calculated using a volumetric density of 7,140kg/m³ and joist volume was converted using a timber density of 650kg/m³. As in the previous scenario, no insulation or ceiling materials were included.
- **Floors:** floor construction was modelled as a cast-in-place concrete slab covering a footprint of 42m². A uniform thickness of 0.15m was applied to all floor slabs. Volumetric mass was calculated by multiplying floor volume by a standard concrete density of 2,400kg/m³. Compacted earth and other informal floor types were not considered, in line with the exclusion of low-durability materials.

Embodied carbon estimation

Material mass values were multiplied by emissions factors (kg CO_2e/kg material), all sourced from the EC3 database.[170] Median or conservative average emissions values were used per material type (for example, concrete block, zinc sheet, kiln-dried softwood). Emissions were first calculated per unit and per component, and then used as the base for lifecycle extrapolation.

Settlement aggregation

Scenario 2 assumes a one-to-one replacement of all structures demolished under scenario 1, with newly constructed formal housing units. This includes the full number of residential and business structures previously modelled, with no size-based adjustments or scaling factors applied. Business premises, like residential ones, are assumed to be replaced by standardised housing units, reflecting a uniform typology adopted for post-eviction resettlement. Mixed-use or non-residential building types were not separately modelled and all emissions were scaled according to the total number of replacement units required for complete resettlement.

Lifecycle adjustment

Building on the A1–A3 emissions calculations detailed in previous sections — covering raw material extraction and manufacturing — the model extends the analysis to estimate the full embodied carbon impact of scenario 2. Using benchmarks from the RMI's Embodied Carbon 101 framework,[171] which indicates that A1–A3 account for 65–85% of total embodied emissions, total life cycle values were extrapolated accordingly.

From these totals, the contribution of A4–A5 phases — transport to site and construction/installation — was estimated as 6% (best case) and 10% (worst case) of the full life cycle emissions. These were then added to the A1–A3 baseline to reflect the total emissions from the construction-related phases. To avoid artificially widening the emissions range, high and low estimates were paired inversely: the lower A1–A3 bound (65%) was matched with the higher A4–A5 addition (10%), and the upper A1–A3 bound (85%) with the lower A4–A5 addition (6%).

In addition to new construction emissions, the model incorporates end-of-life impacts (C1–C4) from the demolition and disposal of informal structures. These emissions — covering deconstruction, demolition, waste transport, processing and final disposal — were estimated as 3% (best case) and 15% (worst case) of the total embodied emissions calculated for scenario 1. Here too, high and low values were paired inversely to maintain internal consistency across the range.

By combining the extrapolated emissions from new housing (A1–A5) with the demolition-related emissions from displaced informal dwellings (C1–C4), the analysis provides a comprehensive and methodologically aligned estimate of the carbon implications of a government-led resettlement approach.

Calculation of emissions from past and projected evictions

To estimate the embodied carbon associated with forced evictions, we applied the following consistent parameters:

- **Baseline rate of displacement:** drawing on Amnesty International's evidence, Nigeria has seen an average of around 200,000 forced evictees per year in the period 2000–2009.[172] We use this as a constant to calculate retrospective projections to 2025 and forward projections to 2030, 2035 and 2050.
- **Deriving per-capita emission factors:** the embodied carbon of evictions is calculated by taking the total life cycle emissions associated with different eviction scenarios, including high and low estimates, and dividing these figures by the number of residents in Otumara (16,380[vii]). This produces a per-person emissions factor.
- **Calculation procedure:** multiply the number of people evicted in a given period (for example, 1 million in 5 years, 2 million in 10 years, 5 million in 25 years) by the per-person emissions factor for each scenario. This yields the cumulative kg CO_2e for the time horizon (2025, 2030, 2035 and 2050).

A4. Methodology scenario 3: in-situ upgrading and retrofitting

This scenario estimates the carbon emissions associated with in-situ upgrading of existing informal housing, avoiding displacement and full demolition. Rather than modelling the embodied emissions of newly constructed or reconstructed dwellings, this scenario draws on international benchmarks for retrofit interventions that improve the safety and habitability of existing structures while retaining much of their original material fabric.

Data source and applicability

The analysis uses embodied carbon estimates from the 2023 Build Change report 'Saving embodied carbon through strengthening existing housing'.[173]
The report compiles retrofit emissions data from multiple countries and project contexts, expressed as average tonnes of CO_2 per square metre of upgraded floor area (see Figure A2). As Nigeria is not included in the original case studies, a methodological extrapolation was required to adapt these findings to the Otumara settlement.

Outlier removal and range construction

To ensure the robustness and transferability of the retrofit emissions data, values from the original case studies were first screened for statistical outliers. Any emissions estimates falling more than two standard deviations above or below the mean were excluded from the analysis. From the remaining dataset, a filtered average and standard deviation were calculated. These were then used to define a plausible emissions range for in-situ retrofitting, constructed by adding and subtracting one standard deviation from the filtered mean. This range was used to represent the variability in retrofit outcomes and to model lower- and upper-bound estimates of embodied carbon associated with upgrading interventions.

Scaling and structure aggregation

The per-square-metre emissions values were scaled up to the full Otumara settlement using a uniform floor

vii For details on how this was estimated, see footnote v.

area of 17.5m² per unit, consistent with the assumptions applied in scenario 1. The total number of structures — including 2,800 residential and 912 business units — was used to calculate aggregate emissions for the entire scenario.

This approach provides a conservative, evidence-based estimate of the carbon implications of in-situ upgrading, allowing for direct comparison with the higher-impact pathways represented in scenarios 1 and 2. While international in origin, the retrofit benchmarks reflect low-carbon strengthening interventions with minimal material input relative to new construction, and are appropriate for modelling alternatives to eviction-based redevelopment.

A5. Forest equivalence comparison

To make the scale of embodied emissions from forced evictions more tangible, we provide an equivalence with carbon sequestration from forests.

Step 1. Establishing the cumulative emissions from forced evictions

Using the life cycle methodology described earlier, cumulative embodied emissions are estimated for different time horizons (for example, 25 years). These values reflect the total tonnes of CO_2e released when informal settlements are demolished and rebuilt, under different scenarios of reconstruction. This 'stock' represents the climate cost of rebuilding homes from scratch rather than upgrading them in place.

Step 2. Defining the sequestration capacity of an average tree

Scientific assessments by the European Environment Agency (EEA) indicate that a mature tree in Europe absorbs approximately 22 kilograms of CO_2 per year.[174] This figure is used as the baseline assumption for tree-level sequestration.

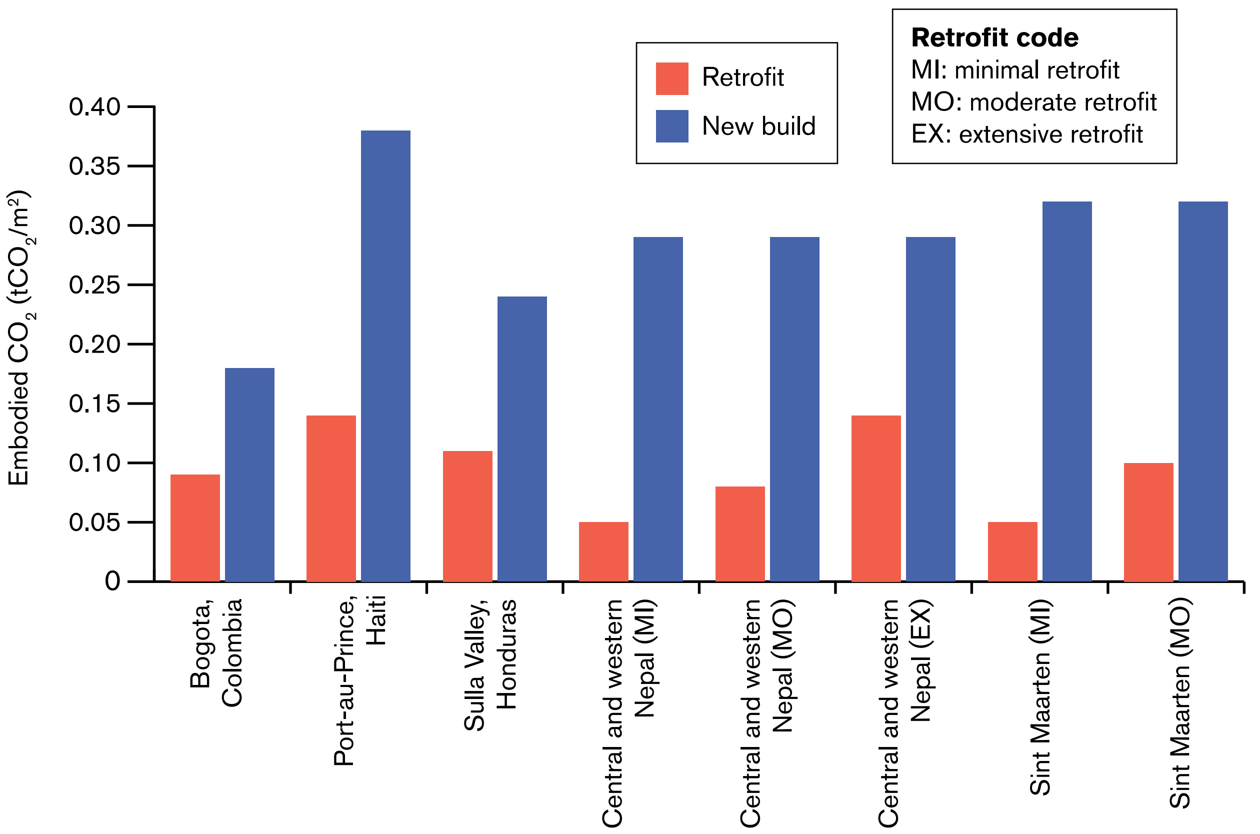
Formula: tree sequestration rate = 22kg CO_2/year

Step 3. Scaling up to a forest

To translate tree-level absorption into forest-level absorption, we assume:

- 10 million trees in the forest
- A density of 1,000 trees per hectare, which means 10 million trees occupy 10,000 hectares or 100km², and
- For comparison, the surface area of Paris is about 105km²,[175] making this forest roughly 'the size of Paris'.

Figure A2. Embodied carbon emissions for retrofit versus new construction for different countries and retrofit types



Source: Build Change (2023) Saving embodied carbon through strengthening existing housing.

Formula: annual sequestration = 10,000,000 × 22kg ÷ 1,000 = 220,000t CO_2/year

Step 4. Comparing forest uptake with eviction emissions

The cumulative eviction emissions from Step 1 are then divided by the forest's annual sequestration capacity from Step 3.

Formula: years required = cumulative emissions from evictions ÷ 220,000t CO_2/year

A6. Relative emissions in relation to national and Lagos benchmarks

This section sets out the calculation steps and assumptions used to situate eviction-related embodied emissions within broader climate policy frameworks.

National benchmark: Nigeria's NDC 3.0

Anchor values (NDC 3.0): Nigeria's latest Nationally Determined Contribution[176] commits to absolute economy-wide reductions of **168.2Mt CO_2e by 2030** and **184.9Mt CO_2e by 2035**, relative to a 2018 baseline.

Eviction baseline rate: Amnesty International reported that **"more than two million people"** were forcibly evicted across Nigeria between 2000 and 2009.[177]

Dividing this by ten years yields an average of approximately **200,000 people per year.** This observed national rate is used as the baseline displacement figure for forward projections to 2030, 2035 and 2050.

Per-person emission factors: the Otumara LCA provides total embodied emissions for a full settlement eviction under three scenarios. Dividing each settlement-level total by the Otumara resident population (16,380[viii]) produces scenario-specific per capita emission intensities

Calculation procedure: for each time horizon (2030, 2035 and 2050), the following steps are applied:

Emissions estimation

$\text{Emissions}_{(t,\text{scenario})}$ = population $\text{displaced}_{(t)}$ × per-person $\text{factor}_{(t,\text{scenario})}$

where:

Population $\text{displaced}_{(t)}$ = 200,000 × years

(for example, 1 million for 5 years, 2 million for 10 years)

The per-person factor for each scenario is derived from the LCA.

Relative share of NDC 3.0 commitments

To express eviction-related emissions as a share of Nigeria's mitigation targets:

$\text{Share}_{(t,\text{scenario})}$ = ($\text{emissions}_{(t,\text{scenario})}$ / NDC target $\text{reduction}_{(t)}$) × 100

This produces a percentage value representing the proportion of Nigeria's required mitigation that could be offset by embodied emissions resulting from continued forced evictions.

Lagos benchmark: methane mitigation

Anchor values (Lagos methane target): the Climate and Clean Air Coalition (CCAC) LOW-Methane Portfolio (2024) reports that Lagos has committed to a **30% reduction in waste-sector methane by 2030**, equivalent to **24,900t CH_4 per year.**[178] Using the IPCC AR6 global warming potential (GWP100 = 28), this equals **0.70Mt CO_2e per year.**[179]

For cumulative reductions, we assume a linear ramp-up from zero in 2025 to 0.70Mt CO_2e per year in 2030, then a constant 0.70Mt CO_2e per year through 2035. This produces a triangular plus rectangular area under the curve:

Cumulative methane reduction (2025–2030) = 0.50 × 0.70 × 5 = 1.75Mt CO_2e

Cumulative methane reduction (2030–2035) = 0.70 × 5 = 3.50Mt CO_2e

Total (2025–2035) = 1.75 + 3.50 = 5.25Mt CO_2e

Eviction baseline rate (Lagos): Amnesty International's 'Human cost of a megacity' (2017) report documents that at least **50,000 people were evicted in a period of four years between 2013 and 2017** in Lagos (from Badia East and West, Otodo Gbame and Ilubirin).[180] This implies a rate of around **12,500 people per year.**

Per-person emission factors: the same Otumara LCA factors described above are applied, dividing total settlement emissions by 16,380 residents to obtain per capita intensities.

Calculation procedure: for each horizon:

$\text{Emissions}_{(t,\text{scenario})}$ = population $\text{displaced}_{(t)}$ × per-person $\text{factor}_{(\text{scenario})}$

where:

Population $\text{displaced}_{(t)}$ = 12,500 × years

(for example, 62,500 for 5 years, 125,000 for 10 years)

The per-person factor is derived from the LCA and the resulting cumulative eviction emissions are then expressed as a share of methane mitigation:

$\text{Share}_{(t,\text{scenario})}$ = ($\text{emissions}_{(t,\text{scenario})}$ ÷ cumulative methane $\text{reduction}_{(t)}$) × 100

This allows direct comparison of eviction-linked emissions with the cumulative climate-benefit potential of Lagos's waste-methane strategy.

viii For details on how this was estimated, see footnote v.

A7. Calculation formulas, assumptions and variable definitions

This section provides the core equations, assumptions and variable definitions used in the embodied carbon estimation across all three scenarios.

Variable definitions

VARIABLE	DEFINITION
A	Surface area (m^2)
V	Volume (m^3)
M	Mass (kg)
ρ	Material density (kg/m^3)
EF	Emissions factor (kg CO_2e/kg)
tj, hj	Joist thickness and height (m)
Nj	Number of joists
tclad	Cladding thickness (m)
Spacing	Distance between framing members (m)
H	Wall or roof height (m)
W, L	Width and length of roof/floor (m)
EC	Embodied carbon (kg CO_2e)

General calculation formula, for each material and component

MATERIAL/ COMPONENT	FORMULA
Material volume (V)	For panels or slabs: V = area × thickness For timber framing: V = number of elements × cross-section × height/ length
Mass (M)	M = V × ρ Where ρ = material density (kg/m^3)
Embodied carbon (EC)	EC = M × EF Where EF = emissions factor (kg CO_2e/kg)

Lifecycle stage adjustment (to extrapolate full lifecycle embodied emissions)

TOTAL EMBODIED CARBON	FORMULA
Best case	Total EC = A1–A3 EC ÷ 0.85 + 6% (A4–A5) + 3% (C1–C4)
Worst case	Total EC = A1–A3 EC ÷ 0.65 + 10% (A4–A5) + 15% (C1–C4)

Component-specific formulas and assumptions

COMPONENT	FORMULAS/ASSUMPTIONS
Walls	Concrete block walls ▪ Wall area: A = perimeter × H ▪ Number of blocks: N = A ÷ block face area ▪ Mass: M = N × 19kg ▪ EF: 0.085kg CO_2/kg Timber-framed cladded walls ▪ Joist (j) volume: Vj = Nj × tj × hj × H ▪ Cladding volume: Vc = A × tclad ▪ Mass: (Vj + Vc) × ρρ (timber): 650kg/m^3 ▪ EF: 0.493kg CO_2/kg Cement-rendered walls ▪ Volume: V = A × 0.015m • ρ: 2,100kg/m^3 ▪ EF: 0.81kg CO_2/kg Metal-cladded walls (zinc, iron, aluminium) ▪ Volume: V = A × 0.007m • ρ: Zinc = 7,140kg/m^3, Iron = 7,850kg/m^3, Aluminium = 2,700kg/m^3 ▪ EF: Zinc = 3.09kg CO_2/kg, Iron = 2.03kg CO_2/kg, Aluminium = 13.1kg CO_2/kg
Roofs	Timber and cladding roof ▪ Sloped width: Wslope = $\sqrt{(W^2 + H^2)}$ ▪ Joist count: Nj = floor (L ÷ spacing) + 1 ▪ Joist (j) volume: Vj = Nj × tj × hj × Wslope ▪ Cladding volume: Vc = L × Wslope × tclad • ρ (timber): 650kg/m^3, ρ (zinc): 7,140kg/m^3, ρ (aluminium): 2,700kg/m^3 ▪ EF: Zinc = 3.09kg CO_2/kg, Aluminium = 13.1kg CO_2/kg, Slate = 0.035kg CO_2/kg ▪ Slate: 20 slates/m^2, weight per slate: 1.889–2.76kg
Floors	Cement slab ▪ Thickness: 0.15m • ρ: 2,400kg/m^3 ▪ EF: 0.138kg CO_2/kg Wood floor ▪ Thickness: 0.025m • ρ: 650kg/m^3 ▪ EF: 0.493kg CO_2/kg Ceramic tiles ▪ Weight: 19.5kg/m^2 ▪ EF: 0.48kg CO_2/kg

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Forced evictions of informal settlements not only violate human rights but also hinder climate mitigation and adaptation efforts. In a context where the climate crisis is increasingly resulting in people's displacement and responses to climate change are also driving evictions, this paper offers evidence about how forced evictions exacerbate all dimensions of vulnerability and exposure to climate risks. It also reveals that in Nigeria, forced evictions of informal settlements during the past 25 years could have generated over 2.46 million metric tonnes of CO_2e, which would take a forest the size of Paris eleven years to absorb. By contrast, in-situ upgrading offers a low-carbon approach, cutting emissions by up to 66% compared to evictions followed by relocation. These findings have profound implications for urban development and emissions worldwide.

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