Cities and Infrastructure

Research Findings and Emerging Impact

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Introduction

This report synthesises key findings emerging from the British Academy's research programme on *Cities and Infrastructure*. It highlights their relevance to policy and practice, and to the everyday lives of people across the Global South.

The *Cities and Infrastructure* programme ran from 2017 to 2019 and was supported by the UK Department for Business, Energy, and Industrial Strategy through the Global Challenges Research Fund (GCRF). GCRF is part of the UK's official development assistance and aims to promote cutting-edge research and innovation that address the challenges facing developing countries. The *Cities and Infrastructure* programme sought to foster and harness expertise across the disciplinary spectrum to maximise the practical impact of high-quality research, contributing to improving lives and opportunities in the Global South. It was inspired by a recognition that tackling the major development challenges facing societies today requires close collaboration across disciplines, borders, and communities of knowledge and practice.

With the majority of the world's population now living in urban environments and numbers growing daily, making cities inclusive, sustainable, resilient, and safe is critical to achieving the United Nation's 2030 Agenda for Sustainable Development. Issues related to urban living and infrastructure are core to virtually all of the 17 Sustainable Development Goals (SDGs).[2] It is estimated that 95 per cent of city expansion in the next decades will be in the Global South. Around 828 million people today already live in urban informal settlements and this figure is bound to rise. Rapid urbanisation is putting pressure on clean water supplies, sanitation, energy access, education, and public health. Common challenges, particularly in the Global South, include congestion and air pollution, a lack of funding for basic services and a shortage of adequate housing.

Infrastructure plays a key role in economic development and social well-being, especially in urban contexts. It serves to increase productivity, lower production costs, improve quality of life, alleviate

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[1] Professor Caroline Knowles (Goldsmiths, University of London) led the British Academy's research programme on Cities and Infrastructure between 2017 and 2019.
[2] SDG 11, in particular, sets out the aspiration to make cities inclusive, safe, resilient, and sustainable.

poverty, raise international competitiveness, and attract foreign investment. In developing countries, infrastructure is considered a pace setter of growth, and critical to economic expansion. It can improve urban sustainability and social cohesion, and help to address pressing challenges such as inequality, exclusion, and conflict. Infrastructure – physical, economic, and social – has the potential to create more liveable cities, where urban habitats play a unifying rather than divisive function, and where public services and policy promote greater human creativity, interaction, and wellbeing.

Development, urbanisation, and infrastructure are thus inextricably linked. The complex problems cities face cannot, however, be solved by any single discipline. Collaborative responses informed by deep understanding of human perceptions, activities, and of the economic and social impacts of the physical and biological processes on which welfare depends, are needed. Against this backdrop, the *Cities and Infrastructure* programme was developed and delivered. It aimed to fill gaps in existing knowledge on how to create and maintain sustainable and resilient cities in the Global South, while interweaving mitigation and adaptation. It sought to inform the elaboration of better policies and practices, with tangible impacts on the everyday lives of ordinary people in developing countries.

The *Cities and Infrastructure* programme comprised 17 projects led by researchers in 14 different UK institutions.[3] They drew on strong and equitable partnerships with universities, civil society organisations and policymakers in 20 countries across Africa, Asia, Latin America, and the Middle East. These international partnerships, and the local knowledge and on-the-ground networks they brought, underpinned the success of the programme. The researchers adopted predominantly bottom-up approaches, engaging directly with communities to identify and unfold good practice, and co-design much needed changes to the urban environment, empowering local people to take responsibility for improving their living conditions working with, around, and through existing systems of politics and authority.

This report highlights the main research findings of the programme and their practical relevance to policymakers and practitioners in the UK and overseas. It also details positive changes which the researchers' engagement with partners across multiple cities in the Global South are already stimulating on the ground.

Research Findings and Emerging Impact

The projects supported by the *Cities and Infrastructure* programme exposed, in granular detail, some of the most pressing circumstances confronting the everyday security and wellbeing of local communities in cities across the Global South. They explored the lived consequences of extreme heat in Ghana and of flooding in Vietnam; investigated the everyday challenges involved in rebuilding lives and livelihoods following destruction from earthquakes in Nepal and landslides in Colombia and Brazil; and furthered understanding of major stumbling blocks to developing sustainable lives. These include a lack of nutritious food supplies in Brazil, limited access to energy, clean water and adequate sanitation in India, South Africa and Mexico, inadequate provision for refugees in Kenya, Uganda and Lebanon, as well as large-scale displacement of low-income families by infrastructure developments in Pakistan and Nigeria.

(i)   The everyday challenges of climate change

The *Cities and Infrastructure* programme generated important new knowledge on the connections between climate change, livelihoods, and wellbeing. While cities in the Global South are rarely among the main culprits creating carbon emissions, the damaging effects of climate change

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[3] A full list of the research funded by the *Cities and Infrastructure* programme is available in Annex A.

disproportionately affect their populations. Data collected through the multiple contexts of the research supported by the programme considerably enhanced existing understanding of the fragilities in infrastructure on the ground that local communities in the Global South live with. Equipped with this new knowledge, the researchers were able to suggest to city authorities and other policymakers useful entry points for adaptation and mitigation.

A project team comprised of geographers, engineers, health and climate scientists, operating in Tamale and Accra (Ghana),[1] used a small device capable of providing highly accurate readings of temperature (rather than adopting the usual practice of being guided by temperature recordings at centralised locations such as airports) to develop a much better understanding of extreme heat in different rooms in people's homes and in various workplaces. The research led to the conclusion that local communities often live and work in conditions which actually exceed official temperature figures by a large margin. The researchers were also able to link different temperatures to different types of construction used, and suggest useful ways of reducing inside temperatures.

Using interview data collected by local community champions, the research team discovered that extreme heat negatively affected people's capacity to work and buy food. People's ability to grow food was also reduced. Diminished incomes and food supplies in turn impacted adversely on nutrition and wellbeing. This was the first research of its kind to combine temperature data at the household level with qualitative interview data on how people in the Global South live in conditions of excessive heat. It brought new evidence on wellbeing to debates on climate change, showing that living with extreme heat not only increases vulnerability but also serves to further disadvantage low-income communities by making them susceptible to poor nutrition, which has significant impacts on their health. The granular understanding of connections between heat, health, and wellbeing, provided by this research, made it possible to suggest suitable adaptations to building methods and practices to lower inside temperatures and improve health and wellbeing. These include raised second roofs on buildings and strategic tree planting – measures which are low-cost and easy to implement. These suggestions have been enthusiastically taken up by local people as ways of effectively reducing heat in their living and working environments.

The researchers also probed another dimension of climate change in periodic flooding. Their data revealed the scale of disruptions experienced in local hospitals and other medical centres. The disruptions included loss of power supply and water contamination, giving rise to significant health risks for patients, and periodically reducing doctors to performing surgery by the light from mobile phones. Hospital administrators in Ghana are already using data from the research to add authority to their petitions to city officials for flood mitigation measures, such as tiling mud floors in medical facilities that easily become waterlogged, adding drainage, testing water quality for contamination, and installing and protecting generators to keep power supplies going. Local communities too are using the research data to lend urgency and expertise to their requests to city authorities for resources and adaptations that will improve their wellbeing. And perhaps most importantly, they are taking up the findings and recommendations of the research project directly in their own efforts to make immediate, tangible differences to their everyday lives.

Over the course of the same project, the team discovered that traditional knowledge, long engrained in the oral practices and understanding of low-income communities, is highly significant in how these communities understand and adapt to weather patterns brought by climate change. The researchers found that people often ignored radio meteorological forecasts in favour of vernacular knowledge. Through interviews with local communities, they pieced together the indicators which people used in understanding and forecasting heat and flooding, and the measures they deployed in mitigation to protect their crops and other assets on which they relied for survival. The researchers uncovered a range of fascinating patterns of bird, insect and animal behaviour through which local people would seek to understand and manage the effects of extreme weather patterns. This led the project team to recommend to city authorities that they incorporate

traditional knowledge into official, science-based, early warnings and contingency planning in order to make them more credible to local communities.

Another project supported by the *Cities and Infrastructure* programme also focused on the effects of climate change related flooding in the context of Vietnam.[2] Pluvial flooding poses a significant hazard in the everyday life of Hanoi. City budgets are tight and subject to competing priorities, so the research team comprised of geophysicists, applied mathematicians and social scientists set out to uncover which flooded infrastructures were most disruptive to the lives of low-income communities. The data collected indicated that it was road flooding, rather than the flooding of people's homes, that had particularly adverse impacts. It negatively affected incomes and made already disadvantaged communities more vulnerable to poverty and hunger. Road flooding made it difficult for them to bring food grown on their farms to city markets and therefore had a disproportionate effect on them. Having significantly fewer reserves in food and money than others, they must earn a living on a day-to-day basis.

The research team's investigation of Hanoi's flood mitigation measures revealed where they were ineffective in preventing flooding. As a result, the researchers developed an app called a Decision Support System. This is a modelling tool that city authorities can use to optimise their flood prevention investments, such as enhanced drainage ditches and reservoirs to store excess water. Using data from the research, the tool combined long-term weather patterns, qualitative data on the impact of flooding on people's livelihoods, the money available from Hanoi's budget for flood mitigation, and the available options for rerouting and capturing excess water. By feeding this data into the app, city authorities can now see how they can reduce flooding, as the app indicates which ditches and reservoirs need to be strengthened to avoid disruptions to particular infrastructures or parts of the city. The involvement of city planners and other stakeholders in the research project ensured that they would appreciate the value of the app as a planning tool and would know how to use it most effectively. The researchers have also written a user manual which describes how to adapt the app's data inputs for use in other cities (and countries) vulnerable to flooding. Ho Chi Minh city authorities have already applied for a loan from the World Bank to enable them to use the manual to adapt the app for use in the Mekong Delta, Vietnam's main food growing region, which is under imminent threat from rising sea levels.

(ii) The challenges of rebuilding after disaster

In Southeast Asia, as elsewhere, earthquakes often have catastrophic consequences, resulting in loss of life and large-scale destruction. In other parts of the world, earth shifts from other causes have been known to be equally disastrous. Landslides on city peripheries across Latin America, for example, are frequently triggered by the makeshift housing people build for lack of other viable land.

The 2015 earthquake in Nepal claimed more than 9,000 lives and changed Kathmandu's iconic skyline in seconds, with 403 monuments damaged across the UNESCO World Heritage Site. Humanitarian agencies intervened quickly but the relief effort relied largely on short-term strategies. Governments faltered under the logistical and financial strains, and the urgency of the situation allowed very little time to understand how people managed to live through the earthquake, or how they set about recovering and rebuilding their lives. Seeking to address the existing gap in knowledge, a project funded by the *Cities and Infrastructure* programme brought together a team of experts in anthropology, archaeology, international development, architecture and engineering[3] to gather information about resilience and recovery from Kathmandu's most disadvantaged communities. The research established that for low-income urban dwellers, who had the least resources and reserves, shortages of finance to top up available government grants, as well as rising prices of building materials in the aftermath of the earthquake, hampered speedy recovery. Disputes between neighbours over damaged walls and repairs often slowed down the

rebuilding even further. This added to existing, social and other inequalities, and created new ones. The situation was compounded by government guidance on building for seismic resilience which was largely inadequate and not effectively communicated to local communities.

The research findings informed the development of a set of guidelines and tools which can be used by city authorities, policymakers and international humanitarian organisations to better support people's efforts to rebuild their lives in ways that are more attuned to future shocks and seismic risk. They also underpinned the founding of an important co-ordination mechanism, led by the International Federation of the Red Cross and Red Crescent Societies and the United Nations High Commission on Refugees, which is intended to address some of the shortcomings of disaster relief agencies and NGOs as they operate on the ground. The research project furthermore generated fascinating insights and approaches to do with the reconstruction of Kathmandu's UNESCO World Heritage Site. Following the earthquake, few questions were asked about why monuments had collapsed in the first place. The predominant approach to risk reduction was to demolish those monuments which had been damaged and rebuild them with modern materials. This not only threatened their authenticity but also removed signs of the resilience of traditional seismic adaptation in the Kathmandu Valley. Although heavily reliant on the UNESCO World Heritage site for their livelihoods, and with no definitive evidence of whether modern materials were more resilient, local communities were frequently excluded from decision-making processes.

Analysing soil profiles and monument foundations, the researchers were able to identify why some monuments had collapsed during the earthquake and how they could be designed anew, drawing on traditional methods, to preserve their intangible value while minimising future earthquake effects. This has had multiple and far-reaching positive effects in terms of reconstruction, policymaking, and the everyday lives of Kathmandu's residents. Working with the Kasthamandap Reconstruction Committee, the research team was able to identify those monuments most urgently at risk of collapse and develop a schedule for their restoration. This has had important implications for local tourism and livelihoods. The project furthermore served to provide engineering validation for traditional construction techniques, and evidence that reconstruction can effectively use vernacular forms. This directly addressed a significant concern expressed by the International Council on Monuments and Sites that authenticity in Kathmandu was unnecessarily being destroyed, and intangible value disrupted by the ways in which restoration work and international disaster relief efforts were implemented. In addition, the research findings served to directly support efforts to enhance the government of Nepal's conservation guidelines and underpinned the inaugural exhibition of Kathmandu's Earthquake Museum, which was opened by the President of Nepal in May 2018 and has attracted over 100,000 visitors to date.

Just as earthquakes can cause significant disruption to lives and livelihoods, so do landslides. Across the Global South, including Latin America, many cities are expanding uncontrollably as new migrants arrive from rural areas to take advantage of the work, income, and lifestyle opportunities that urban life offers. Lacking land and resources to settle in the city and often constrained by available low-income work, rural migrants (and sometimes their descendants too) have few options in terms of accessing affordable housing, so they build makeshift homes, often on the steep, otherwise unusable, land of city peripheries which is particularly prone to landslides. This marginal housing tends to persist, even as long-term lives are established in cities, for complex reasons of land tenure and land commodification, which distribute land in favour of cities' wealthier residents.

In Medellin (Colombia), a research team supported by the *Cities and Infrastructure* programme, with expertise in geography, engineering and architecture,[4] set out to investigate local communities' perceptions and experiences of landslide risk. It uncovered a range of causes behind recurring landslides, including poor surface water management, local communities cutting into steep hillsides to build housing, and construction on top of unstable landfill sites. The researchers

brought the findings to the attention of city authorities and engaged directly with local communities to co-design bottom-up approaches enabling makeshift housing residents to monitor and manage landslide risks for themselves. Local people learned to safely reroute water and minimise cutting into steep areas. They were discouraged from building on landfill sites and the city authorities committed to finding new, more stable sites for informal settlements in the future. Encouraged by the effect of the practical interventions in Medellin, the research team adapted its community-based approach to landslide mitigation and tested it in similar circumstances in makeshift hillside neighbourhoods in Sao Paulo (Brazil). The project served to enhance knowledge of landslide risks (and how to effectively manage them) among low-income communities and brought the difficulties experienced by people on the ground, along with viable solutions, to the attention of city authorities. It furthermore confirmed the effectiveness and transferability of the methodology – based on community engagement and easy, low-cost mitigation measures - to other cities and regions in Latin America but also more widely across the Global South.

(iii) The everyday challenges of sustainable lives

The research supported by the *Cities and Infrastructure* programm*e* has produced a wealth of new data illuminating the challenges that low-income communities face in developing viable and sustainable lives in cities across the Global South. These challenges relate to man-made and natural crises such as extreme heat, flooding, earthquakes and landslides, but also everyday disruptions having to do with access to energy, clean water and food, safety, and community life. The 17 projects have furthered existing knowledge of the barriers local people face in accessing infrastructures that are critical to supporting their survival and wellbeing, and have suggested – and demonstrated - a range of workable approaches to effectively overcoming these barriers.

Access to Nutritious Food

Food is essential to sustaining individual and community health and wellbeing, but not everyone has access to nutritious food. In the Mare favela in Rio de Janeiro (Brazil), a research team comprised of medical and health scientists, geographers and political scientists[5] undertook a holistic review of the food landscape and infrastructures of this informal settlement. It documented food consumption in granular detail, uncovering the extent to which local people live on repetitive diets of high-calorie food with low nutritional value. The researchers then tracked supply chains, concluding that fresh food production was highly centralised in industrial-agricultural businesses and that the links between these businesses and low-income communities were fragile and prone to easy collapse. The project served to vividly illustrate the poor nutritional status of favela residents and the food poverty pervasive in the community, identifying at the same time viable ways of addressing these challenges. The proposed solutions included small but potentially highly effective initiatives, such as fledgling community gardens, and fresh food supplies produced by local growers that were not, but could be, better connected to consumers. The researchers demonstrated how these initiatives could be effectively scaled up to create robust and sustainable fresh food production, circumvent long and fragile supply chains, improve diets and steer favela communities away from expensive, poor, and unreliable fast food options. The data collected through the project has fed into a number of public education initiatives on food and nutrition to date and has also underpinned the development of a local collective focused on urban gardening. This collective is in the process of gaining traction in other informal settlements in Brazil and elsewhere, largely driven by the authority of the data gathered in the Mare favela and the evidence of early implementation outcomes with positive impact on the everyday health and wellbeing of low-income communities.

Access to Energy

Collapsing and non-existent energy supplies constrain urban life in significant and uneven ways. Wealthier and middle-income communities in the Global South tend to get better and more

reliable energy supply, while low-income households struggle with illegal electricity hook-ups and the fire hazards posed by alternatives. In Bangalore (India) and Cape Town (South Africa), a team including architectural engineers, geographers, and researchers in business studies and international development[6] set out to explore how governments, private sector actors and NGOs deliver solar energy to meet the needs and aspirations of low-income communities. The research findings revealed a complicated story of disconnections, with stakeholders largely working in segmented silos with little cooperation between them. Private energy providers are frequently frustrated with governments for eroding their profit margins while expecting them to take responsibility for the ongoing maintenance of energy infrastructure. Local communities, on the other hand, are rarely consulted about what they need, and are often given equipment they neither want nor know how to use. The data collected over the course of the project painted a vivid picture of systemic failures and enabled the research team to put forward several possible solutions with potential to work better in practice and match people's expectations of being included on energy grids. Solutions involved better collaboration between public authorities and private energy providers, informed by consultation with energy users in low-income communities. The underlying conclusion of the project was that public-private energy schemes should not overly focus on infrastructure delivery but should pay adequate attention to how they are actually governed, with a focus on citizenship and active participation of local people. The provision of energy infrastructure to low-income communities is vital; but of equal importance are the ways in which delivery is managed. This is an important lesson that is relevant to cities and regions across the Global South.

Access to Water

Water is vitally important in sustaining healthy city life, and yet 29% of world population cannot access clean water supplies. In Mexico City, a place of intense urban development with a population that exceeds 21 million, water provision is a serious challenge. With support from the *Cities and Infrastructure* programme, a research team of conservation biologists, environmental geographers, sociologists and geologists with expertise in hydrology[7] investigated Mexico City's watershed in the areas of San Pablo Oztotepec and San Miguel Topilejo. The purpose was to establish the types of vegetation cover that best support water retention and think of ways to manage this vegetation sustainably so as to secure robust water supplies for the sprawling city. The research revealed a number of inefficiencies that could be easily remedied. For instance, the team discovered that rainfall in the San Pablo Oztotepec and San Miguel Topilejo areas was not captured but was instead allowed to run down to Mexico City, where it was collected, shipped back in drums and sold to local people. Through dialogue with local farmers and landowners, the researchers were able to develop a range of viable methods for catching and storing much-needed rainwater locally. The project also revealed how relentlessly the forces of urbanisation work against the sustainable management of the watershed. The peri-urban periphery is precisely where Mexico City is growing most intensively. People move there to access land on which to build homes and the concrete of new settlements quickly replaces vegetation critical to the watershed. New intensive forms of agri-business quickly uproot traditional vegetation too. Working closely with local partners, the research team brought the data they had collected to the attention of city authorities and suggested ways of reordering priorities so as to strike a better balance between water on the one hand and land development and housing on the other. This kick-started important conversations about the need for, and feasibility of, balancing conflicting priorities with far-reaching implications for the water supplies of 21 million people.

Women and Safety

Poverty and exclusion are gendered, and it is important that women's circumstances are treated – in research, policy, and practice - in their own right rather than conflated with those of men. Gender is a cross-cutting theme underpinning the *Cities and Infrastructure* programme in its entirety. The issue of women's safety was at the centre of the research frame for one particular

project focusing on urban India. Women in cities across India experience widespread (sexual) violence, yet existing knowledge of the connections between violence and urban infrastructure is relatively limited. A British Academy-supported team of geographers, sociologists, and digital media and culture experts[8] set out to fill this gap in Kochi and Thiruvananthapuram in the Indian state of Kerala. The research uncovered that broken and disconnected city infrastructures - transport, water, energy, street lighting, and sanitation – are inextricably interwoven with women's everyday lives and significantly exacerbate their vulnerabilities. Women feel unsafe, and are often sexually assaulted, when travelling round cities because of poor street lighting, transport that is not properly joined up, and the absence of police at bus stands and terminals. Women's safety is also significantly compromised as they fetch water on dark streets and walk long distances to collective latrines.

Using open source mapping to piece these experiences together, the research team developed a mobile phone app which women in Kochi and Thiruvananthapuram have begun using in planning their journeys around the city. The data collected over the course of the project has amplified women's voices in important ways. It is being used by grassroots and other civil society organisations in demanding that local councils respond to women's legitimate fears by urgently improving local infrastructures. The data have also informed the development of a set of concrete recommendations for change, identifying the most urgent improvements. This offers city planners and policymakers a long-term roadmap for making urban environments safer and more accessible for all. And while the researchers concluded that digital technology alone could never be an all-encompassing solution to the complexities of gendered urban violence, they were able to demonstrate how a relatively straight-forward measure, such as improving access to mobile technologies, would make it easier for women in India and elsewhere to navigate cities safely.

Road Safety

Road safety is also a key issue for cities in the Global South. In Kampala (Uganda), over half of urban residents walk to work, yet infrastructure provision for non-motorised transport remains limited and poor in quality. In Nairobi (Kenya), there are 600 road deaths per year, of which nearly half are pedestrians. Improving infrastructure for walkers – especially the elderly, children and the disabled – as well as cyclists could significantly reduce these deaths and improve the livability of cities for all residents. The *Cities and infrastructure* programme supported a team of engineers, geographers, artists and urban planners[9] with an interest in devising viable ways to reduce high pedestrian accident rates. This led to a number of practical changes on the ground.

In Kampala, researchers worked with school children from two primary schools to understand the dangers they face walking to school and to improve their knowledge of road safety using creative methods in drawing, drama, and song. The project funded the provision of a zebra crossing outside one of the schools in a bid to reduce child mortality as well as change public attitudes towards road safety. Kampala Capital City Authority has picked up this initiative and is already expanding it to other schools across the country. A mobile 3D zebra crossing that provides motorists with the optical illusion of raised bars across the road was also tested as part of the project. This was widely reported in the local media and subsequently implemented by the Uganda Road Safety Council across the city centre. In Nairobi, the city governor adopted the traffic-calming approach co-designed by the research team and local communities. Other officials are championing the methodology as best practice, using the team's creative co-design methods in public consultations more widely.

Living in Displacement

Displacement impacts the provision of infrastructure as well as the organisation and governance of city life across the Global South. It shapes the ways cities can be lived; and it shapes the social

relationships between migrants and hosts, which are often fraught with tensions and conflicts over scarce resources. Displacement is rarely voluntary, but driven by fear and constraint. It raises urgent issues of social equity and access to viable lives in the city, and often involves hard choices in prioritising one group over another. Different types of displacement and their implications were explored by various projects supported by the *Cities and Infrastructure* programme.

Lebanon hosts large numbers of refugees fleeing the civil war in Syria and this is putting considerable pressure on local infrastructure in terms of water, energy, transportation, sanitation, housing, and waste management. A team of anthropologists, development planners, architects, civil engineers and public policy experts[10] surveyed the current state of Lebanese infrastructure in Beirut and in Bar Elias, seeking to enhance existing understanding of the vulnerabilities that displacement has created in people's everyday lives and find ways to address them. The research discovered that host and refugees' frustrations and difficulties in navigating the urban environment were often expressed in connection with the design, utility, and aesthetics of space, and that this was feeding into a continuous cycle of community tensions. The project team engaged with local communities to co-design space in ways that were more inclusive and accessible for all. This resulted in a number of tangible improvements, including a communal garden and children's play areas, based on the ideas and aspirations of refugees and long-term local residents alike. These relatively small-scale adaptations brought the communities closer together and helped to ease existing tensions, demonstrating how low-cost and easy to implement measures can produce far-reaching results when carefully tailored to local communities with their active engagement.

A research team working in Uganda and Kenya[11] also investigated the relationship between refugees – this time from the Democratic Republic of the Congo, South Sudan and Somalia - and their host communities, in order to understand the daily challenges that refugees face in accessing basic infrastructure (shelter, water and sanitation) as well as health services. Working with grassroots organisation in Kampala and Nairobi, experts in human settlement, international development and health surveyed the situation in both cities and concluded that just like their host communities, refugees suffer from typhoid, diabetes, high blood pressure and malaria. But refugees also experience health conditions which result from their displacement; including depression, other mental illnesses, physical injuries linked to armed conflict and sexually transmitted diseases as a result of violence against women. The research produced a detailed account of refugees' health status in the urban settings of Kampala and Nairobi – a novel contribution to studies which have previously focused on refugees living in camps. The data were made available to relevant authorities in both cities: they can now see where the biggest gaps in health provision are and what needs to be prioritised.

Organised religion can adversely impact urban infrastructure and cause displacement too. Across the African continent, evangelical mega-churches have established themselves as significant agents of urbanisation and change, often providing key services such as healthcare and education but also impacting local communities in less positive ways. Combining expertise in anthropology, sociology, art, photography, urban and religious studies, a team of researchers supported by the *Cities and Infrastructure* programme set about exploring the impact of these churches on the social and infrastructural fabrics of life in Lagos (Nigeria)[12]. The research findings demonstrate how large-scale religious operations are constantly reimagining, reshaping and transforming cities. Mega-churches in Lagos have made significant investments in schools and universities, effectively taking over areas of infrastructure provision that are normally dealt with by city and planning authorities, such as traffic management, health facilities, and electricity supplies. Churches have become alternative city authorities for the better-off citizens of Lagos, while low-income local residents are significantly disadvantaged. They suffer noise and traffic congestion as a result of 24-hour services that summon congregations of thousands. Their access to lands and livelihoods is often obstructed by the large-scale operations of churches. This magnifies existing exclusions and inequalities. The research findings have prompted a range of important multi-stakeholder conversations about the

way forward. Without the data and interventions of the project, this situation would have continued unnoticed and unchallenged. The research is being used to amplify the voices of local, particularly disadvantaged communities, and, ensure that city authorities hear them and become aware of the urgent need for action.

In delivering much needed improvements, major city infrastructure projects can also trigger displacement for low-income households. In Lahore (Pakistan) - a city of over 11 million – city authorities built a public transit system, the Orange Metro Line, bulldozing in the process a multitude of low-income neighbourhoods with little warning. A research team comprising anthropologists, lawyers, architects and specialists in South Asian languages[13] compiled an archive of stories detailing the experiences of local people forcibly removed from the Anarkali/Mauji Darya area of Lahore. This archive provides a vivid account of displacement and amplifies the voices of communities which would have otherwise remained unknown and unheard. While it is too late to rectify this particular situation, other cities across Pakistan - and indeed across the Global South - are being remodelled by the same kinds of modernising projects and there are clearly lessons to be learned. The project has put forward a range of practicable suggestions as to how demolition can be better handled. These include meaningful consultation with local communities, sufficient advance notice, adequate compensation, and access to land and housing elsewhere.

Conclusion

The results of the research projects comprising the *Cities and Infrastructure* programme speak loudly for themselves as their impacts are only just beginning to unfold. These projects have made important contributions to dialogue between researchers in the Global North and the Global South and to showing the benefits of interdisciplinary working in producing high quality data.[14] The research produced reveals in compelling detail the everyday difficulties experienced by low-income and other disadvantaged communities in cities across the Global South. It draws attention to the broken and often non-existent infrastructures with which local people live, and which they somehow make work in cities that are growing at an alarming rate. The vivid accounts of urban life emerging from the rich and sophisticated data collected through the projects already underpin a range of workable solutions.

The *Cities and Infrastructure* programme has generated new ideas about low-cost sustainable improvements in urban infrastructure in developing countries and begun to set these in motion. It has indicated ways of mitigating the adverse consequences for wellbeing of climate change experienced through extreme heat and flooding. It has shown how to build resilience and skills on the ground to offset the effects of earthquakes, landslides, and similar disasters. It has pointed to new directions in securing sustainable food, water and energy supplies on which city life depends and to which low-income communities need better access. The research has shown how to make cities safer for women and for pedestrians. It has identified ways of overcoming difficulties in living with (different kinds of) displacement in urban settings. And it has taken a big step towards demonstrating how we can make cities more inclusive, resilient, and safe for all – a key aspiration of the UN's 2030 Agenda for Sustainable Development.

The *Cities and Infrastructure* programme has allowed UK researchers to collaborate closely and equitably with colleagues in the Global South, strengthening knowledge and research capacity on both sides, ultimately for the benefit of ordinary people in developing countries. It has enabled the creation of productive and sustained connections with local networks of stakeholders, including NGOs, city planners and other practitioners, policymakers, and those communities in most need of urgent improvements to infrastructure, involving them directly in co-designing their future. The knowledge and solutions generated by the investments of this research programme are likely to travel beyond the field sites of the 17 projects. Many of the specific discoveries are already being

scaled up. While circumstances in different cities (and countries) vary, they are rarely unique, and lessons can be learned and shared across locations.

The research supported through the *Cities and Infrastructure* programme has furthermore demonstrated the value added of developing knowledge and practice across disciplinary boundaries. When social scientists, engineers, mathematicians, artists, and medical professionals collaborate, taking problem-centred approaches to the most pressing challenges of urban life, new angles on enduring issues and innovative solutions come to light. The fresh thinking, original methodological approaches, and tangible changes on the ground which the projects supported through this British Academy programme have generated are bound to have a lasting legacy, supporting future research initiatives, underpinning further practical improvements in infrastructure across the Global South, and empowering local communities to advocate for, and ultimately effect, meaningful change in city life.

Endnotes

[1] *Vulnerability to Extreme Weather Events in Cities: Implications for Infrastructure and Livelihoods (VEWEC)*
https://www.thebritishacademy.ac.uk/projects/cities-vulnerability-extreme-weather-events
[2] *Optimal Investment strategies to Minimise Flood Impact on Road Infrastructure in Vietnam*
https://www.thebritishacademy.ac.uk/projects/cities-flood-impact-road-vietnam/
[3] *Safer Self-Recovery: Promoting Resilient Urban Reconstruction After Disasters*
https://www.thebritishacademy.ac.uk/projects/cities-safer-self-recovery/
[4] *Co-production of Landslide Risk Management Strategies through Development of Community-Based Infrastructure in Latin American Cities*
https://www.thebritishacademy.ac.uk/projects/cities-landslide-risk-strategies-latin-america/
[5] *NutriCities: Building Urban Resilience Through Grassroots Nutritional Infrastructures.*
https://www.thebritishacademy.ac.uk/projects/cities-nutricities-grassroots-food-infrastructure-brazil
[6] *Energy Innovation for Low-Cost Housing in India and South Africa: Strategies for Interdisciplinary and Cross-Institutional Dialogue*
https://www.thebritishacademy.ac.uk/projects/cities-energy-innovation-housing-india-south-africa
[7] *Mexico's Megalopolis as a Model for the Key Role of Watershed Protection to Sustainable Cities*
https://www.thebritishacademy.ac.uk/projects/cities-mexico-megalopolis
[8] *Disconnected Infrastructures and Violence Against Women (VAW): Innovating Digital Technologies in Low-Income Neighbourhoods to Produce Safer Indian Cities*
https://www.thebritishacademy.ac.uk/projects/cities-disconnected-infrastructures-violence-against-women
[9] *Implementing Creative Methodological Innovations for Inclusive, Sustainable Transport Planning*
https://www.thebritishacademy.ac.uk/projects/cities-inclusive-sustainable-transport-planning/
[10] *Public Services and Vulnerability in the Lebanese Context of Large-Scale Displacement*
https://www.thebritishacademy.ac.uk/projects/cities-public-services-vulnerability-lebanese-context/
[11] *Towards Inclusive Health Systems and Infrastructure Access: Enhancing the Well-Being of Refugees in East African Cities*
https://www.thebritishacademy.ac.uk/projects/cities-towards-inclusive-health-systems-infrastructure-access
[12] *Religious Urbanisation and Infrastructural Lives in African Mega-Cities: Moral Economies of Development in Kinshasa and Lagos*
https://www.thebritishacademy.ac.uk/projects/cities-religious-urbanisation-african-megacities/
[13] *Rebuilding Kinship and Care after Dislocation in Urban South Asia: Colombo and Lahore Compared*
https://www.thebritishacademy.ac.uk/projects/cities-kinship-care-dislocation-colombo-lahore
[14] E.g. *The Governance of Infrastructure Interfaces: Cities, Technical Systems and Institutional Connections* https://www.thebritishacademy.ac.uk/projects/cities-governance-infrastructure-interfaces/; *Capability Building for Infrastructure Delivery* https://www.thebritishacademy.ac.uk/projects/cities-capability-building-infrastructure/; *Strengthening Urban Engagement of Universities in Asia and Africa* https://www.thebritishacademy.ac.uk/projects/cities-strengthening-urban-engagement-universities-asia-africa/

Annex A

Towards Inclusive Health Systems and Infrastructure Access: Enhancing the Well- Being of Refugees in East African Cities
Principal Investigator: Dr Anna Walnycky, Senior Researcher, International Institute for Environment and Development
Co-Applicant: Professor Blessing Mberu, Head of Urbanisation and Well-Being Research Programme, African Population and Health Research Center

Mexico's Megalopolis as a Model for the Key Role of Watershed Protection to Sustainable Cities
Principal Investigator: Dr Diana Bell, University of East Anglia
Co-Investigator: Professor Roger Few, Professorial Research Fellow, School of International Development, University of East Anglia

Implementing Creative Methodological Innovations for Inclusive Sustainable Transport Planning (I-CMIIST)
Principal Investigator: Dr Steve Cinderby, Senior Research Leader, Stockholm Environment Institute, University of York
Co-Applicant: Professor Michael Wilson, Associate Dean for Research, Professor of Drama, School of the Arts, English and Drama, Loughborough University

Reducing Disaster Risk to Life and Livelihoods by Evaluating the Seismic Safety of Kathmandu's Historic Urban Infrastructure
Principal Investigator: Professor Robin Coningham, UNESCO Chair in Archaeological Ethics and Practice in Cultural Heritage, Durham University
Co-Applicants: Professor Ian Simpson, Professor of Biological and Environmental Sciences, University of Stirling; Dr Andrew Wilson, Senior Lecturer of Archaeological and Forensic Sciences, University of Bradford; Professor David Toll, Professor of Engineering, Durham University; Dr Paul Hughes, Assistant Professor of Engineering, Durham University; Dr Vasilis Sarhosis, Assistant Professor of Civil Engineering, Newcastle University; Dr Sean Wilkinson, Reader in Structural Engineering, Newcastle University

Disconnected Infrastructures and Violence Against Women (VAW): Innovating Digital Technologies in Low-Income Neighbourhoods to Produce Safer Indian Cities
Principal Investigator: Dr Ayona Datta, Reader in Urban Futures, King's College London
Co-Applicants: Dr Don Slater, Associate Professor (Reader) of Sociology, London School of Economics; Dr Joanne Entwistle, Reader of Culture, Media and Creative Industries, King's College London; Dr Rakhi Tripathi, Associate Professor and Head, Centre for Digital Innovation, Fore School of Management, Delhi

Religious Urbanisation and Infrastructural Lives in African Mega-Cities: Moral Economies of Development in Kinshasa and Lagos
Principal Investigator: Dr David Garbin, Senior Lecturer of Sociology, University of Kent
Co- Applicants: Dr Gareth Millington, Senior Lecturer of Sociology, University of York; Professor Simon Michael Coleman, Chancellor Jackman Professor of Religion, University of Toronto

Vulnerability to Extreme Weather Events in Cities: Implications for Infrastructure and Livelihoods (VEWEC)
Principal Investigator: Professor Katherine V. Gough, Professor of Human Geography, Loughborough University
Co-Applicants: Professor Paula Griffiths, Professor of Population Health, Loughborough University; Professor Robert Wilby, Professor of Hydro-climatology, Loughborough University; Professor Samuel Nii Ardey Codjoe, Director of the Regional Institute for Population Studies, University of Ghana; Professor Paul William Kojo Yankson, Professor of Geography and Resource Development, University of Ghana; Dr Sam Kayaga, Senior Lecturer of Civil and Building Engineering, Loughborough University; Dr Raymond Kasei, Senior Lecturer and Researcher of Climate Change and Food Security, University for Development Studies

Energy Innovation for Low-Cost Housing in India and South Africa: Strategies for Interdisciplinary and Cross-Institutional Dialogue
Principal Investigator: Dr Charlotte Lemanski, Senior Lecturer of Geography, University of Cambridge
Co-Applicants: Dr Ruchi Choudhary, Reader of Architectural Engineering, University of Cambridge; Dr Minna Sunikka-Blank, Senior Lecturer of Architecture, University of Cambridge; Dr Jaideep Prabhu, Professor of Marketing and Jawaharlal Nehru Professor of Indian Business, University of Cambridge; Dr Jiska de Groot, Group Leader of Energy, Poverty and Development, University of Cape Town; Dr Amir Bazaz, Senior Consultant of Practice, Indian Institute for Human Settlements Bangalore

Public Services and Vulnerability in the Lebanese Context of Large-Scale Displacement
Principal Investigator: Professor Henrietta Moore, Director of the Institute for Global Prosperity, University College London
Co-Applicants: Dr Nikolay Mintchev, Research Associate of Global Prosperity, University College London; Professor Nick Tyler, Chadwick Professor of Civil Engineering, University College London; Dr Camillo Boano, Senior Lecturer of Development Planning, University College London; Dr Andrea Rigon, Lecturer of Development Planning, University College London; Professor Nasser Yassin, Professor of Public Policy and International Affairs, American University of Beirut

Capability Building for Infrastructure Delivery
Principal Investigator: Professor Paul Nightingale, Professor of Strategy, University of Sussex
Co-Investigators: Dr Dzidziso Samuel Kamuriwo, Senior Lecturer in Strategy, Cass Business School, City University of London; Dr Rob Byrne, Lecturer, Science Policy Research Unit, University of Sussex

Strengthening Urban Engagement of Universities in Asia and Africa (SUEUAA)
Principal Investigator: Professor Michael Osborne, Professor of Adult and Lifelong Learning, University of Glasgow
Co-Applicants: Dr Lavinia Hirsu, Lecturer in Applied Linguistics, University of Glasgow; Dr Katarzyna Borkowska, Lecturer in Education, University of Glasgow; Dr Muir Houston, Senior Lecturer of Education, University of Glasgow; Dr Neil Burnside, Lord Kelvin Adam Smith Research Fellow of Engineering, University of Glasgow

The Governance of Infrastructure Interfaces: Cities, Technical Systems, and Institutional Connections
Principal Investigator: Dr Philipp Rode, Associate Professorial Research Fellow, LSE Cities, London School of Economics & Political Science
Co-Investigators: Professor Jo Beall, Director, Education and Society, British Council; Dr Marco Di Nunzio, Urban Age Research Officer, LSE Cities, London School of Economics & Political Science; Dr Nuno da Cruz, Assistant Professorial Research Fellow, LSE Cities, London School of Economics & Political Science

Optimal Investment Strategies to Minimize Flood Impact on Road Infrastructure in Vietnam
Principal Investigator: Dr Maria Paola Scaparra, Reader in Management Science, University of Kent
Co-Investigators: Dr Trung Hieu Tran, Leverhulme Research Fellow in Urban Modelling and Optimisation, University of Nottingham; Professor Paul Nathanail, Professor of Engineering Geology, University of Nottingham; Dr Hiep Nguyen, Director of Applied Geophysics Centre, Vietnam Academy of Science and Technology

Co-Production of Landslide Risk Management Strategies Through Development of Community-Based Infrastructure in Latin American Cities
Principal Investigator: Dr Harry Smith, Associate Professor, School of Energy, Geoscience, Infrastructure and Society, Heriot-Watt University
Co-Applicants: Dr Gabriela Maluf Medero, Associate Professor of Infrastructure and Environment, Heriot-Watt University; Dr Maria Soledad Garcia Ferrari, Senior Lecturer of Architecture and Landscape Architecture, Edinburgh College of Art / University of Edinburgh; Professor Francoise Coupe, Emeritus

Professor of Habitat, Facultad de Arquitectura, Universidad Nacional de Colombia sede Medellin; Professor Alex Abiko, Professor of Construction, Universidade de Sao Paulo

Rebuilding Kinship and Care after Dislocation in Urban South Asia: Colombo and Lahore Compared
Principal Investigator: Professor Jonathan Spencer, Regius Professor of South Asian Language, Culture and Society, University of Edinburgh
Co-Applicants: Dr Ammara Maqsood, ESRC Future Research Leaders Fellow/Junior Research Fellow of Social and Cultural Anthropology, University of Oxford

Safer Self-Recovery: Promoting Resilient Urban Reconstruction After Disasters
Principal Investigator: Professor John Twigg, Principal Research Fellow of Risk and Resilience, Overseas Development Institute
Co-Applicants: Dr Susanne Sargeant, Senior Scientist of Earthquake Seismology, British Geological Survey; Professor Tiziana Rossetto, Professor in Earthquake Engineering and Director of EPICentre, Civil, Environmental and Geomatic Engineering, University College London

NutriCities: Building Urban Resilience Through Grassroots Nutritional Infrastructures
Principal Investigator: Dr Antonis Vradis, Lecturer and Vice-Chancellor's Research Fellow of Geography, Loughborough University
Co-Applicants: Dr Oonagh Markey, Vice Chancellor's Research Fellow of Sport, Exercise and Health Sciences, Loughborough University; Professor Richard Pithouse, Associate Professor for the Humanities, Rhodes University