

Overview of the Built Environment Research Landscape and Funder Recommendations

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Contents

Executive Summary	3
1. Background to the review	6
2. Analysis of currently funded research and research gaps	9
3. Analysis of cross-cutting issues in built environment research.....	22
4. Geographical coverage	26
5. Addressing the challenges of built environment research.....	28
6. Recommendations	35
7. Forthcoming research.....	37
Annex 1: Centres of Research Expertise	38
Annex 2: Research Funding	40
Annex 3: Survey of the Built Environment Research Landscape	44

Executive Summary

Background

The built environment is critical to international development and to achieving the Sustainable Development Goals. By 2050, an estimated 68% of the world's population will live in towns and cities. The majority will dwell in small and medium-sized urban centres in Africa and Asia,¹ approximately half of which are yet to be built. This presents policymakers and built environment professionals with a huge challenge but also a significant opportunity: to change how towns and cities are built, incorporating affordable, low-carbon building techniques that are resilient to climate change and support the equitable and sustainable provision of basic services.

UK research funders have acknowledged the need to engage with the built environment, given its intersection with and impact on some of the most critical challenges the world faces, notably climate change, poverty reduction, sustainable development and rapid urbanisation. This report details the findings and recommendations of a review of research on the built environment and its intersection with the achievement of the Sustainable Development Goals (SDGs) in the global south.² IIED was commissioned by UKCDR to undertake the review to identify research gaps and provide recommendations to research funders.

Our review was informed by the following definition from the All-Party Parliamentary Group for Excellence in the Built Environment: 'The built environment encompasses all forms of building (housing, industrial, commercial, hospitals, schools, etc.) and civil engineering infrastructure, both above and below ground and includes the managed landscapes between and around buildings.'³ Given this broad definition, the comprehensive nature of the SDGs and the timescale of the review, IIED, in discussion with UKCDR, opted to focus on the impacts of the built environment on human development outcomes, as defined by the Human Development Index:⁴ the ability of individuals to have long and healthy lives, have knowledge and earn a livelihood.

Four tools were used to map out the built environment research and funding landscape: (i) an expert-led assessment of recent outputs from centres of research expertise on the built environment and human development in the global south, covering 48 research centres and 336 projects; (ii) a survey of academics and built environment professionals, completed by 113 respondents; (iii) 17 key participant interviews with built environment academics and representatives of UK funding bodies; and (iv) a consultation workshop with representatives from research funders, built environment professions and academia.

Findings and Recommendations

The assessment of research centre outputs identified urban planning as the built environment intervention with the greatest coverage in research. Other interventions with high coverage were transport, housing, water and sanitation and energy and power infrastructure, reflecting a focus of research on capital intensive and bulk infrastructure. The assessment mapped built environment interventions on to a subset of the SDGs linked to human development. The SDGs most closely associated with research on the built environment were SDG 3 on good health and well-being, SDG 8 on decent work and economic growth and SDG 10 on reduced inequalities. The results of the assessment would suggest that there is more limited research available on the built environment and its

¹ United Nations Department of Economic and Social Affairs (16 May 2018) 68% of the world population projected to live in urban areas by 2050, says UN. www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

² Earle, L. and Goh, K. (2019) *Overview of the built environment research landscape and funder recommendations*. London: IIED.

³ From: <http://cic.org.uk/services/all-party-parliamentary-group.php>. It should be noted that the term 'built environment' was not in particularly common usage within most research councils. Within EPSRC it is used to refer in a narrow sense to the design and operation of buildings.

⁴ From: <http://hdr.undp.org/en/content/human-development-index-hdi>

connection with food and nutrition (SDG 2 on zero hunger), clean and affordable energy (SDG 7) education (SDG 4) and gender equality (SDG 5).

Encourage research which takes an urban systems approach to key challenges in built environment

The review process highlighted the importance of future-oriented research: understanding how the built environment intersects with a range of complex challenges – now and in the future – will be critical to designing appropriate policy responses. To contribute to meeting the SDGs, built environment research in the global south must engage with rapid urbanisation, climate change, growing social and spatial inequality, the informal provision of shelter and services, challenges to urban food security and the degradation of urban ecologies and ecosystem services. Survey respondents, interviewees and workshop participants drew attention to the complexity of interactions between people and built environments, particularly in densely populated, fast-growing towns and cities in the global south where research needs to be focused on urban systems. This will require a change in framing, moving away from ‘projectised’ or ‘sectorialised’ approaches to the challenges at hand, to integrated approaches.

Encourage consideration of cross-cutting issues in built environment research

Many of the key issues shaping the built environment, and that need to be informed by built environment research, will affect and be affected by a range of other trends and processes. Of particular importance are: informality (of livelihoods, housing, transport and other basic services) access and affordability for low-income and marginalised groups, climate change and migration – both forced and economic. The review also demonstrated the need for the gender and inclusion dimensions of the built environment to be considered more widely. These are all live issues and priorities for overseas development assistance in general. They have been reflected in the roll-out of the Global Challenges Research Fund (GCRF) and should be critical concerns of built environment research in developing countries or research that considers the transfer of technological innovation to the global south.

Encourage research in countries where predicted urban growth will have the greatest impact on the built environment

The term ‘built environment’ is not synonymous with ‘urban’, but the complexity of human–infrastructure interactions in densely populated built-up urban areas means that towns and cities are a key concern for researchers and professionals within the broad field of the built environment. The review demonstrated that the focus of built environment research does not currently tally with countries undergoing the most rapid urban transitions. New research on the built environment should be encouraged in countries with the highest predicted urban growth rates and urbanisation rates, based on data provided by the UN. This should be analysed in conjunction with overall population size and data on changes in land use to determine where existing infrastructure will be under most pressure and where there are critical levels of demand for new shelter and service provision. This will help to determine ‘neglected geographies’ where more research is warranted.

Take proactive measures to support interdisciplinary research projects, building on positive experience to date

The complexity of urban systems, and of human interactions with the built environment, lends itself to an interdisciplinary or transdisciplinary approach. Many survey respondents identified the challenges of undertaking and finding funding for these approaches and methodologies. The potential contribution that inter-disciplinary approaches could make to improving understanding of the built environment has been recognised in recent Global Challenges Research Fund (GCRF) calls related to cities and infrastructure. Research funders should build on this experience to expand the number and types of call that explicitly foster interdisciplinary approaches. To support this, a new cadre of academics with the interest and ability to work across disciplines will also need to be developed and supported.

Consider funding co-created, practiced-based participatory research and non-traditional research partnerships

Many participants in the review process expressed the need for new ways to design research that reflect and can have a meaningful impact on the complexity of the built environment. This will require research that brings together different stakeholders (academics, policymakers, government stakeholders, communities) through a holistic or ‘co-created’ approach to research design. Related to this, workshops discussions covered the relevance of action and applied research, particularly research that involves low-income and vulnerable communities and that can help build the capacity of policy makers together with built environment professionals, including planners, architects, surveyors and engineers in rapidly urbanising developing countries.

1. Background to the review

1.1 Introduction

This report presents findings of a review of the built environment research landscape.

IIED has been commissioned by UKCDR to undertake a comprehensive overview of research on the built environment and its intersection with the achievement of the Sustainable Development Goals (SDGs) in the global south. The ultimate aim of the review is to identify research gaps and opportunities and to provide recommendations to research funders.

The review has been informed by the following definition from the [All-Party Parliamentary Group for Excellence in the Built Environment](#): ‘The built environment encompasses all forms of building (housing, industrial, commercial, hospitals, schools, etc.) and civil engineering infrastructure, both above and below ground and includes the managed landscapes between and around buildings.’

Given the broad scope of the term ‘built environment’, the comprehensive nature of the SDGs and the timescale for the review, IIED, in discussion with UKCDR, has narrowed its scope to focus on the impacts of the built environment on human development outcomes, as defined by the [Human Development Index](#) – the ability of individuals to have long and healthy lives, have knowledge and earn a livelihood.

The report provides a brief overview of methodology and the boundaries of the review before discussing the empirical findings. The empirical section is followed by analysis of the findings. The report concludes with recommendations to UK funders on research gaps and suggestions for funding mechanisms to support new research.

1.2 Methodology

Four main tools have been used to generate data on the built environment research landscape and on funding associated with this research. These are (i) an expert-led assessment of the outputs of centres of research expertise on the built environment and human development in the global south (ii) a non-representative, open-ended survey of academics and built environment professionals (completed by 113 respondents) (iii) 17 key informant interviews and (iv) a consultation workshop with representatives from research funders, academia and built environment practice.

(i) Survey respondents were asked to identify centres of research expertise that focus on the links between the built environment and human development. Research centres identified by more than one respondent were prioritised for assessment. 48 research centres were identified in this way (see Annex 1), and more than 1000 research projects carried out by these centres were assessed. Of these, 336 projects met the inclusion criteria and their details were recorded according to the data extraction strategy prepared during the inception phase. The following inclusion criteria were used:

- Research projects had an identifiable body of research (published articles and reports, grey literature)
- Research focused on at least one DAC-list country
- Research was ongoing or completed within the past 5 years (responding to UKCDR’s brief for a review of the current landscape)
- Research considered one or more identifiable interventions within the built environment and its links to human development

Research was categorised according to a list of built environment interventions most relevant for developing countries and mapped onto a subset of SDGs – those relating most closely to human development. It should be noted that SDG 9 on industry, innovation and infrastructure and SDG 11 on sustainable cities and communities were not included. This is because potentially all of the research projects considered in this review would be impacting to a degree on the achievement of these two Goals.

The following data was extracted from the assessment of the research projects and recorded in an Excel spreadsheet:

- The name and type of institution leading the research
- Funding source and amount (where available)
- Research partners
- Geographical scope
- The type of intervention in the built environment
- Whether research was considering the contributions or challenges to the achievement of human development (acknowledging that some research may do both)
- The aspects of human development that were considered (referring to the sub-set of SDGs)

In addition, analysis of research project descriptions and journal article abstracts was undertaken on cross-cutting issues related to built environment research to ascertain:

- if and how issues of **access and affordability** were considered (including gender and disability),
- whether **informal provision** of goods services was included, and
- if the research factored in the **impacts of climate change**.

(ii) As well as being used to identify research centres, the open-ended survey questions were also used to invite respondents to give their views on where ‘impact pathways’ between built environment interventions and human development outcomes outlined by the SDGs are least researched, critical areas for new research and the most appropriate funding mechanisms.

(iii) 12 key informant interviews were carried out with representatives of UKCDR member institutions who manage research on the built environment, and a small group of academics closely involved in the design of Global Challenges Research Fund (GCRF) calls related to the built environment. Interviews were also carried out with the 5 peer reviewers supporting the IIED research team. Peer reviewers were built environment academics based in Brazil, India, South Africa, Uganda and Thailand. These interviews have been used to further illustrate findings from the survey and the assessment of research centre outputs.

(iv) The consultation workshop brought together a group of approximately 20 UKCDR members, built environment academics and professionals to discuss preliminary findings of the review. The five peer reviewers gave presentations with national and regional perspectives on trends in and funding for built environment research.

1.3 Limitations to the Review

The need to limit the scope of this potentially very extensive review means that certain topics have not been fully covered.

- In practice, the ‘hard’ elements of the built environment cannot be divorced from the ‘soft’ elements that enable it – governance, finance, regulation etc. These issues are critical in the design, implementation and management of built environment interventions that enhance human development, particularly in contexts with lower institutional and financial capacities. However, the focus of the assessment of interventions within the built environment excluded research that looked only at the enabling environment. Projects investigating, for example, the potential of land value capture or taxation as financing mechanisms for urban transformation were not included in the assessment.
- Research projects with a broad focus on ‘building resilience’ were not included in the assessment unless they considered specific built environment interventions. ‘Urban resilience’ as a concept encompasses a very broad set of practices and institutions, of which infrastructure and the built environment are just one part.

- The reduction of carbon emissions through interventions in the built environment (eg low-carbon building practices and transport infrastructure) will have long-term impacts on human development. However, unless research explicitly made these links, they were not captured in the assessment.
- SDG14 on heritage was not included in the assessment. It is recognised that this is a priority area of interest for the AHRC and is clearly linked to the built environment. However, the scope of the review did not allow for its inclusion.

Other non-thematic limitations:

- Only English-language research outputs were assessed
- New research projects, programmes and networks that have not yet produced any outputs were not included in the assessment. Some recent relevant research calls and recently funded projects are highlighted in section 7.
- Because of its relatively broad coverage, the analysis cannot point conclusively to thematic areas that are under-researched. This would require an in-depth systematic review of literature under each of the thematic headings. However, the review does draw out potential thematic areas which could benefit from further research. These are highlighted in the final recommendations.

Finally, it should be underscored that the survey was not representative: it was distributed through a snowballing technique and was based on open-ended questions. (The survey is attached as Annex 3). Many participants provided very little detail in their responses. In particular, Question 5, which asked respondents to identify under-researched ‘impact pathways’ between interventions in the built environment and impacts on human development, proved to be a challenge. Although most respondents made an attempt to answer, responses often listed thematic issues or specific interventions related to the built environment, but without reference to their potential impacts on human development. This meant that in many cases, there was no significant difference to the answers given in Question 6, which asked respondents to identify regions and thematic areas where new research is most critical.

This is perhaps in itself an indication of a major challenge in built environment research – namely that an understanding of how men and women engage with infrastructure and built form and how this impacts upon their lives and life chances requires an interdisciplinary approach. This issue is addressed in section 5.3.

1.4 The role of the Built Environment in International Development

*We are often talking about the ‘built environment’ but we need to be talking about the ‘to be built environment’.*⁵

Based on data compiled for the 2018 Revision of the World Urbanization Prospects, the UN’s Department of Economic and Social Affairs (DESA) has estimated that by 2050, 68% of the world’s population will be living in towns and cities - the majority in small and medium-sized urban centres in Africa and Asia. Over the next thirty years, the world’s urban population will increase from approximately 4.4 billion in 2020 to approximately 6.7 billion in 2050.⁶ These projections are broadly accepted and frequently cited and have led to estimations that approximately half of the urban centres that will accommodate these new urban populations have yet to be built. This in itself represents a massive challenge to policy makers and built environment professionals, but also a significant opportunity to alter the way in which towns and cities are built, incorporating affordable low-carbon building techniques that are resilient to the impacts of climate change and supporting the equitable and sustainable provision of basic services.

While the term ‘built environment’ is not synonymous with ‘urban’, the complexity of human-infrastructure interactions in densely populated built-up urban areas means that towns and cities are a

⁵ Workshop participant, Sept 23rd 2019.

⁶ Source: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html>

key concern of researchers and professionals within the broad field of the built environment.⁷ As elaborated by UN DESA: ‘Urbanization is a complex socio-economic process that *transforms the built environment*’.⁸ Peer reviewers and academics interviewed for the review often referred to urban systems (explored in more detail in 5.2) rather than to the built environment *per se*. Urban areas are critical for achieving sustainable development as they are home to the majority of the world’s population. They are the engines of economic growth, but they are also potentially places of huge risk, in relation to health and climate crises in particular. Getting urban development right is critical for the achievement of the SDGs. As indicated by the then UN Secretary General Ban Ki-moon in 2012 in the run-up to Rio +20: ‘Our struggle for global sustainability will be won or lost in cities’.⁹

The future of the built environment will clearly be critical to the project of international development and to achieving the SDGs. Meeting the SDGs will require governments and international development practitioners to engage with the built environment as it currently exists and to shape how it evolves – as underlined by key informants:

Everything that we work on relating to socio-economic development and improving people's livelihoods - all of that manifests itself in space. And how that manifests in space has an impact on people's livelihoods. So, you have to understand the built environment in order to ensure that your policies and your programs do not have negative externalities.

Development outcomes are very significantly directly or indirectly mediated through human-infrastructure interactions. So, to not have a lens or at least have one of several lenses that look specifically at the ways in which humans are living in built spaces is a big gap.

As summarised by a UKCDR representative, the current and future status of the built environment is a ‘global challenge which is cross-sectional in nature that needs to be addressed by interdisciplinary research’. The following report examines how the global research community is responding to this challenge.

2. Analysis of currently funded research and research gaps

The findings in this section were based on the analysis of the outputs of centres of research expertise on the built environment and human development in the global south. The analysis is structured according to the 13 built environment interventions used in the classification of these research outputs. This classification system was adapted from the [Uniclass system](#) - a categorisation of physical interventions developed for the construction industry. The data extraction process recorded which types of built environment interventions were the subject of research, and which of a subset of SDGs (see table 2) were impacted by this intervention. The analysis demonstrates the relative frequency of the different ‘impact pathways’ between the built environment interventions and the SDGs. The presentation of this data is considered in conjunction with observations on research gaps gathered from survey respondents, key informant interviews and participants at the consultation workshop.

Coverage of built environment interventions in research projects

Table 1 demonstrates the coverage of built environment interventions in the research projects that met the inclusion criteria for assessment. Urban planning had the greatest coverage by number of research projects. However, it should be noted that of the 112 projects considering planning, only 19 focused solely on urban planning, with the others all investigating at least one other built environment intervention. Other interventions with high coverage in research were transport, housing, water and

⁷ It should be noted that the term ‘built environment’ was not in particularly common usage within most research councils. Within EPSRC it is used to refer in a narrow sense to the design and operation of buildings.

⁸ UN DESA (2019) World Urbanization Prospects: The 2018 Revision. New York: United Nations, p.10. emphasis added.

⁹ Source: <https://www.un.org/press/en/2012/sgsm14249.doc.htm>

sanitation and energy and power infrastructure, reflecting a focus on capital intensive and bulk infrastructure. Of the 336 research projects assessed, 168 investigated multiple built environment interventions. For that reason, the sum of the number of research projects in the table is greater than the overall number of projects included in the assessment.

Built Environment Intervention	No. Research Projects
Urban planning	112
Transport infrastructure	93
Housing	93
Water and sanitation infrastructure	90
Energy and power infrastructure	62
Communications and ICT infrastructure	50
Agricultural and marine facilities	42
Waste management infrastructure	33
Healthcare facilities	27
Public, recreational and green spaces	27
Industrial facilities	22
Cultural and educational facilities	19
Civic and commercial facilities	12

Table 1: Coverage of built environment interventions in assessed research projects



Infographic 1: Subset of SDGs closely correlated to human development used in the assessment

The SDGs and research on built environment interventions

Across the different built environment interventions, the most commonly observed impact pathways are with SDG 3 on good health and well-being, SDG 8 on decent work and economic growth and SDG 10 on reduced inequalities. The results of the assessment would suggest that there is more limited research available on the built environment and its connection with food and nutrition (SDG 2 on zero hunger), clean and affordable energy (SDG 7) education (SDG 4) and gender equality (SDG 5). Although SDG 16 was relatively well-represented overall, it reflects a wide range of themes, including crime and violence. The review found limited research on the positive or negative impacts of the built environment on levels of criminality and violence.



Infographic 2: The SDGs and research on built environment interventions - coverage of the subset of SDGs across all built environment research assessed for this review

Icons sourced from:
<https://www.un.org/sustainabledevelopment/news/communications-material/>

Analysis of research on built environment interventions and links to the SDGs

This section explores the impact pathways within each built environment intervention. It incorporates findings from the analysis of research centre outputs as well as additional observations from survey respondents, peer reviewers and others consulted during the review process.

2.1 Urban Planning

The assessment of research centres identified 112 projects that covered urban planning - the built environment intervention with the most coverage. However, it was generally considered in conjunction with other interventions. Only 19 projects had urban planning as a sole area of focus. The most common impact pathways in research on urban planning were those that demonstrated its impacts (both positive and negative) on SDG 3 on health and well-being, SDG 8 on decent work and SDG 10 on reduced inequalities.

Of the 112 projects that investigated the impact of urban planning on human development, 43 projects considered issues of informality and 28 projects considered issues relating to climate change. A relatively low number of projects (10) considered issues of **participation** in relation to urban planning. Of these, 6 projects investigated the positive contribution of participatory urban planning to human development. For example:

- “Achieving inclusive cities through scaling up participatory planning in Africa” (SEED) investigated how to scale up community-led neighbourhood planning to city-scale processes.
- “Community Action Area Planning and Change by Design” (SLURC) investigated the positive contribution of community action area planning to increasing participation and addressing local priorities in Freetown.
- “Participatory Cities” (Mistra Urban Futures) investigated the impacts of democratic and participatory urban governance to address how to build more participatory cities.

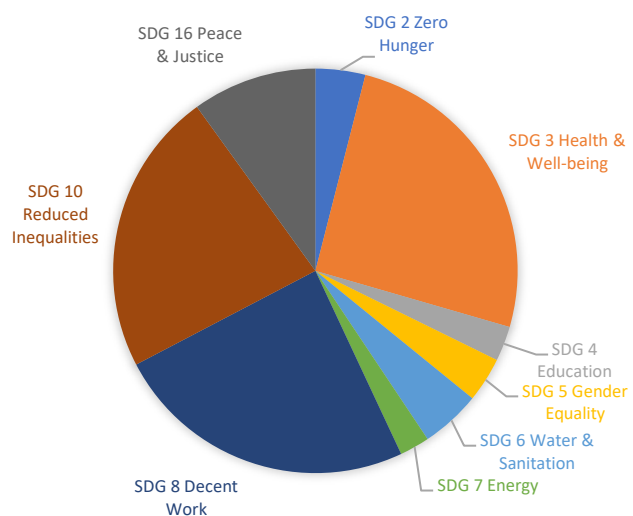


Figure 1: Coverage of the SDGs in research on urban planning

A relatively small number of projects considered issues of safety and security in relation to urban planning – these were classified as projects demonstrating an impact pathway to SDG 16 on peace, justice and strong institutions. For example:

- “Urban Violence, Safety and Governance CityLab” (ACC) investigated the impact of settlement upgrading on the incidence of violence, demonstrating the negative impacts associated with changes to existing forms of informal institutions, particularly diminished social cohesion.

Survey respondents did not identify many specific ‘pathways’ between urban planning and human development that require more research, but identified a more general need for greater understanding of how urban areas are growing in the absence of planning, and in particular, how the size and number of informal settlements or slums are increasing, and contributing to urban sprawl. As one respondent remarked ‘*Self-building represent arounds 70 to 80% of housing provision in Brazil. Its production is poorly understood from variables such as: land, income, building practices, autonomy, time, people, culture...*’. This lack of knowledge, combined with the potential impacts of climate change, was regarded as a particular concern across the global south.

Overall, the findings of the review would suggest a need for more research on how planning can respond to the growth of informal settlements, and the implications of this growth for safety and

security, and for the impacts of climate change. Grassroots participation in planning processes could also be an area for further research.

2.2 Transport Infrastructure

Transport infrastructure was covered in 93 projects. Research in this field had the same ‘top 3’ impact pathways as urban planning, but with a heavier weighting towards impacts on decent work (SDG 8), followed by SDGs 3 and 10.

Of the 93 projects that covered transport infrastructure, 28 projects considered issues of informality and 28 projects considered transport in relation to issues of **mobility and accessibility**. For these projects, mobility was often considered in relation to its impact on SDG 8 on decent work (13 projects) and SDG 10 on reducing inequalities (14 projects). These projects include:

- “FedEx-EMBARQ Mobility and Accessibility Program” (WRI Ross Centre)
- “T-SUM: Transitions to Sustainable Urban Mobility” (DPU)
- “Urban distances and labour market participation of the poor: The case of urban Ghana” (IGC)

Despite the focus on mobility/accessibility issues, only 11 projects considered how mobility and accessibility were differentiated according to socio-economic status or gender. Only 2 projects considered accessibility for people with disabilities.

- “AT2030: Life Changing Assistive Technology for All” (SLURC)
- “Market Based Solutions for the Extreme Poor” (IDS)

Survey respondents’ references to transport infrastructure highlighted the use of non-motorised transport (NMT) by low-income groups, and the limited investigation of the impacts of large infrastructure investments on NMT. Interviewees noted that there has been significant research into transport innovations in Latin America (notably Brazil and Colombia) and that documentation of these initiatives has influenced policy makers elsewhere.

In sum, the review would suggest greater investigation of accessibility of transport infrastructure for low-income groups, women, and for people with disabilities is required, covering both formal and informal provision

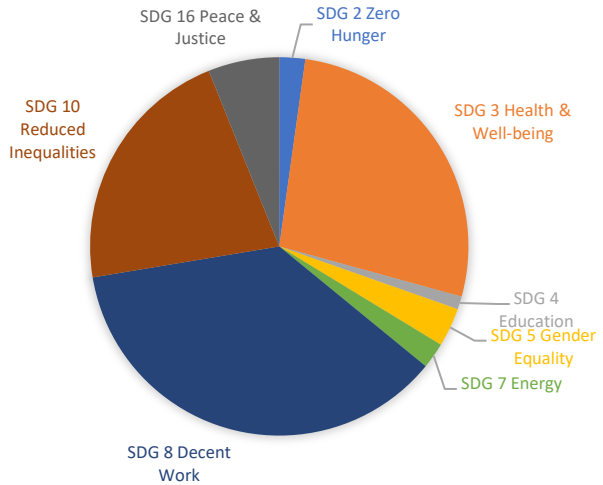


Figure 2: Coverage of the SDGs in research on transport infrastructure

2.3 Housing

Housing was covered in 93 projects – making it ‘equal second’ with transport infrastructure in terms of coverage in the assessment of research centre outputs. Housing was again predominantly linked to SDGs 10, 3 and 8, but with greater emphasis on health and well-being and equality over decent work. Housing was a key concern of survey respondents and other experts interviewed for this report, with the greatest level and detail of commentary of all built environment interventions.

Of the 93 projects that investigated the impact of housing interventions on human development, 21 considered how decent housing can make a positive (rather than negative) contribution to human development. Roughly half of all projects (44) considered issues of informality – perhaps a low number, given very limited access of low-income groups to formal housing in the global south. 20 projects focused on affordability – of these, 7 considered positive case studies of efforts to render housing affordable for low-income groups:

- “Helping the Poor Stay Put: Affordable Housing and Non-Peripheralization in Rio de Janeiro, Brazil” (King’s College London Urban Futures) investigated the impact of affordable social housing for the poor.
- “Helping low-income groups in Karachi, Bangkok and Kathmandu to take advantage of urban density” (IIED) aimed to identify planning processes related to affordable housing that allowed the poor to benefit from urban densification.

10 projects investigated the challenges related to enhancing human development in relation to housing interventions:

- “Precarious Homes” (LSE Cities) investigated the challenges to providing affordable housing and examines how current provision contributes to precarity and spatial inequality for urban residents.
- “Resilient Cities Housing Initiative (RCHI)” (MIT DUSP) investigated the challenges to developing housing for the most disadvantaged dwellers.

Participants in the review acknowledged that low-income housing in the global south has historically been a focus of research. However, certain issues require further or new examination. The need for more research on **affordable housing** was highlighted, given urbanisation trends and rising land values in large urban centres. Coupled with affordability was the need for more examination of **locally available, sustainable and/or low-carbon building materials**, alongside **sustainable building practices**.

The review would suggest the need for ongoing research on low-income and informal housing generally, and a more specific emphasis on research that brings together researchers focusing on affordability and access with those working on low-carbon, low-cost building techniques and materials.

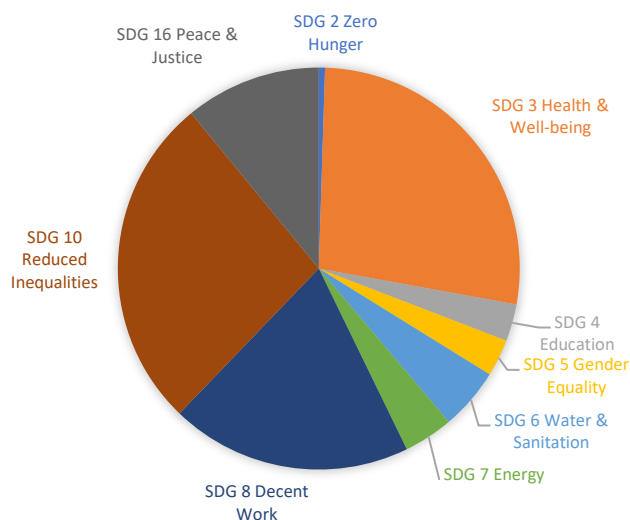


Figure 3: Coverage of the SDGs in research on housing

2.4 Water and Sanitation Infrastructure

90 projects investigated the impact of water and sanitation infrastructure on human development. Unsurprisingly, SDG 6 on water and sanitation and SDG 3 on health predominated. However, research also made links to SDG 8 on decent work, particularly in relation to agricultural irrigation and community-led water management.

Out of the total of 90 projects, 36 projects considered issues of access and affordability and 38 projects considered issues of informality, but only 23 applied both these lenses. As with other built environment interventions considered here, this perhaps does not reflect the extent to which large numbers of the urban poor are reliant on informal provision of water and sanitation – either because these are not affordable or because no formal provision is available.

In most low-income countries, women and girls have primary responsibility for household water collection (8 out of 10 households with water off premises).¹⁰ Despite this, only 16 projects investigated the **gendered dimensions** of water and sanitation interventions, with a focus on the impact on SDG 5:

- “Indefensible Space” (DPU) investigated the challenges to women’s safety associated with sanitation infrastructure for women living in informal settlements in India.
- “Urban Water and Sanitation” (IIED) investigated how to improve water and sanitation infrastructure with a focus on the gendered impacts of interventions for various cities in the Global South.

Interview and survey respondents highlighted ‘blue infrastructure’ and related ecosystem services as a particular concern requiring further research. For example, according to one interviewee, in Asia, new urban areas are being built without regard to where water will come from for their populations.

Cities don’t produce water, food and energy. We take all these natural resources from elsewhere - from the rural areas. But we never plan our cities based on these natural resources, or put a limit on them.

The importance of thinking of city-scale sustainability was raised by another interviewee:

How do city governments enable infrastructure provision and infrastructure use that’s more sustainable? It’s all very well to work in an informal settlement where you try to understand how you can come up with on-site sanitation systems that provide people with a basic level of service but how do you engage in the design of bulk infrastructural systems that are more sustainable in the long run?

And by a survey respondent:

Installing latrines in developing countries is not effective or sustainable in the long run unless there are service business models for emptying and safely disposing of the waste. More research should be funded to look at the impact of improved urban services on human development, not just improved infrastructure.

This would suggest a need for research that addresses infrastructure challenges as well as how users access services. This balance is not always easy to achieve, however. One workshop participant noted that the prioritization of

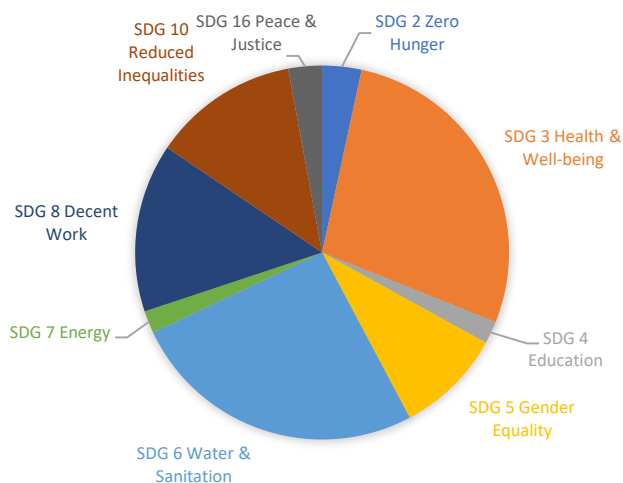


Figure 4: Coverage of the SDGs in research on water and sanitation infrastructure

¹⁰ World Health Organization (WHO) and United Nations Children’s Fund (UNICEF) (2017). *Progress on drinking water, sanitation and hygiene: 2017 update and SDG baselines..* Geneva: World Health Organization (WHO) and United Nations Children’s Fund (UNICEF).

technological innovation by research councils in relation to issues such as water and sanitation has not encouraged academics to engage with the social dimensions of service provision which are clearly also important.

In sum, funders could encourage research on water and sanitation that considers provision at a range of scales, in communities and informal settlements as well as at city-scale. Gendered dimensions of access to water and sanitation should be encouraged, as well as collaborations between engineering and the social sciences.

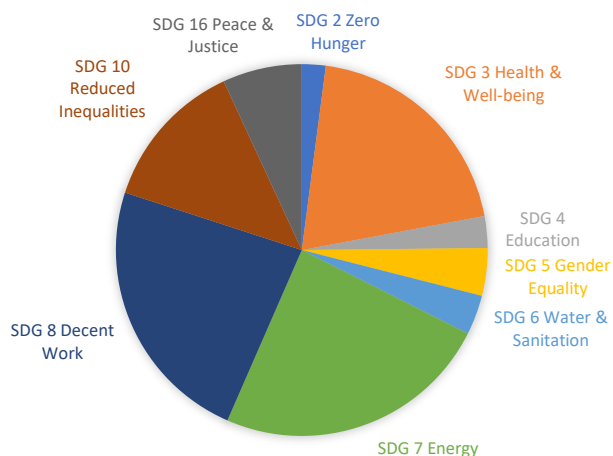


Figure 5: Coverage of the SDGs in research on energy and power infrastructure

2.5 Energy and Power Infrastructure

62 projects covered energy and power infrastructure. SDG 7 on clean and affordable energy and SDG 8 on decent work received most coverage, followed by health and well-being and reduced inequality. As countries undergo demographic transitions to predominantly urban societies, and demands for energy increase, the equitable provision of affordable low-carbon power will become critical. This challenge is reflected in research projects such as:

- “The political economy of state-led transformations in pro-poor low carbon energy” (STEPS Centre) that compared low carbon transitions in Kenya and China to identify factors that improved access to energy for the poor.
- “Research Collaborations on Community Energy Resilience in Low-Income Countries” (Loughborough University) that identified opportunities to improve community resilience through various electricity systems.

Survey respondents also drew attention to the need for low-cost, low-carbon solutions and for the decentralisation of energy provision.

Informal provision of energy and illegal connections are particularly prevalent in urban areas of the global south, but informality was covered in less than a third of projects (17 out of 62). Although the pie chart above demonstrates that the intersections of research on energy with health and wellbeing is strong, it is notable that among the projects considering health impacts, only 4 focused on the impact of energy and power infrastructure on **indoor air pollution**. This is surprising, given that approximately 3 billion people cook using methods that contribute to household air pollution (i.e. solid fuels, open fires, inefficient stoves), and each year, 3.8 million people die from illnesses that can be attributed to household air pollution.¹¹ These projects include:

- “Modern Energy Cooking Services (MECS)” (Loughborough University) that investigated the obstacles that impede the transition towards the adoption of modern energy cooking services in various countries, such as Kenya and Bangladesh.
- “Assessing health risks associated with exposure to household and ambient air pollution in rural and urban China” (University of Oxford) that measures and compares the levels of pollution exposure of indoor and outdoor environments.

¹¹ World Health Organization (WHO) (2018). *Household air pollution and health*. [online] World Health Organization. Available at: <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health> [Accessed 19 Sep. 2019].

Research funders could consider encouraging research on indoor air pollution and on clean energy more generally (responding to the relatively lower level of coverage of SDG 7 across all research reviewed). In addition, the challenge of providing pro-poor low carbon energy in contexts where people access power through illegal or informal connections could also be an important topic for future research.

2.6 Information and Communications Technology (ICT) Infrastructure

50 projects investigated the impact of ICT infrastructure on human development. The SDGs 3, 8, 10 and 16 received the most coverage, and at similar levels. ICT infrastructure, out of all built environment interventions, was most frequently linked with SDG 16 on peace, justice and strong institutions. This reflects a body of research on the use of digital technologies to enhance citizen engagement with government.

Of the total of 50 projects, 17 considered issues of access and affordability. This research reflects concern that the innovations in digital communications and infrastructure while much touted, might not be reaching the most vulnerable. This concern was also highlighted by one interviewee noted:

There's an assumption that any investment in smart infrastructure is a good thing. [It's important] to understand how these smart infrastructures land in different contexts and how they shape people's lifestyles and livelihoods in different ways. [...] These investments can be quite skewed and very selective and may be increasing marginalization, if we are overemphasizing the technologically advanced at the expense of folks who are not able to access the benefits of what might come from such investments.

In addition, the assessment of research centres would suggest the application of technology in defence of the most vulnerable is an area where further research is needed. Of the 50 projects assessed, only 4 projects investigated ICT infrastructure in the form of early warning systems or forecasting systems for flooding and other extreme weather events. These projects include:

- “SatFlood: Providing early-warning of flash flood events in Kenya” (University of Oxford)
- “Dynamic Flood Topographies in the Terai, Nepal: Community Perceptions and Resilience (DISTAL)” (University of Edinburgh)
- “Research for Emergency Aftershock Forecasting (REAR)” (University of Edinburgh)
- “Probability and Uncertainty in Risk Estimation and Communication (PUREC)” (University of Edinburgh)

The findings of the review would suggest the need for a greater focus on the intersection of ICT infrastructure with vulnerability and marginalisation, including research of the impacts of ICT on lives and livelihoods of poorer sectors of society.

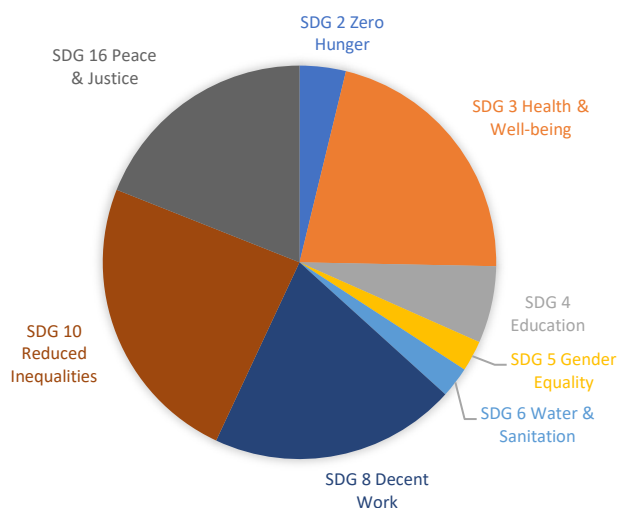


Figure 6: Coverage of the SDGs in research on ICT infrastructure

2.7 Agricultural and Marine Facilities

The assessment of research centres identified 42 projects that looked at agricultural and marine facilities. The impact pathways associated with agricultural and marine facilities were predominantly decent work (SDG 8) zero hunger (SDG 2) and health and well-being (SDG 3). Unlike the other built environment interventions covered in this review, the majority of research projects focused on rural areas. 9 projects considered urban food systems and only 2 considered both the urban and rural domains, and linkages between them.

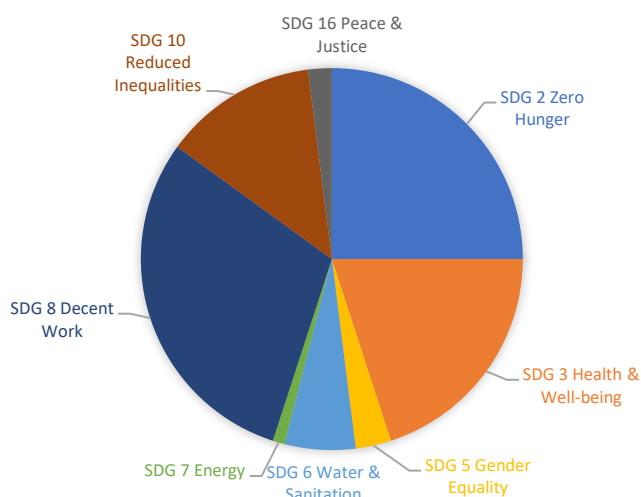


Figure 7: Coverage of the SDGs in research on agriculture and marine facilities

These projects were:

- “Urbanisation, rural-urban transformations and food systems” (IIED) that investigated urban-rural linkages in Sub-Saharan Africa, Asia and China.
- “RurbanAfrica” (IIED) that explored the connections between rural transformations, mobility, and urbanisation processes and the impact these have on poverty in sub-Saharan Africa

Survey respondents highlighted limited research on urban food systems and the importance of the link between land use planning and food security. The need for more research on urban food security and food systems more generally is perhaps reflected in the relatively low number of research projects across all built environment interventions that related to SDG 2.

2.8 Waste Management Infrastructure

33 projects considered the issue of waste management infrastructure and the impacts this can have on human development. SDG 3 on health and well-being was the most frequently observed impact pathway, reflecting the significant public health impacts of poor waste disposal, including its contribution to air pollution, vector-borne diseases and flooding. SDG 8 on decent work also featured relatively highly: waste management can provide livelihood opportunities for low-income groups through waste picking and recycling. Projects reviewing the specific link between waste and livelihoods included:

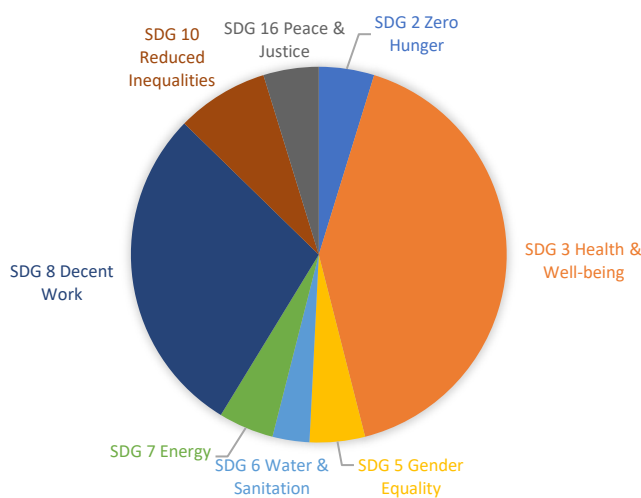


Figure 8: Coverage of the SDGs in research on waste management infrastructure

- “Turning Livelihoods to Rubbish” (ACC) that examines global trends in waste management which are reducing access to the livelihoods generated from waste for the urban poor
- “Informal Work and Wellbeing in Urban South Asia: Who Succeeds, Who Fails and Under What Conditions?” (IDS) that investigates the relationships between various institutional conditions and wellbeing outcomes for informal workers, including waste pickers and collectors, in Bangladesh and India

- “Solid Waste Management” (Mistra Urban Futures) that aims to identify business opportunities in sustainable solid waste management

A small number of survey respondents made brief reference to the need for research on waste disposal. The assessment focused on projects that investigated waste management infrastructure. However, given increases in waste generation in developing countries driven by high population growth and urbanisation, there is a potential gap in research investigating factors that influence waste generation, including waste prevention and waste minimisation practices and activities.¹²

2.9 Healthcare and Cultural and Education Facilities

27 projects investigated healthcare facilities, and 19 projects investigated cultural and educational facilities. Education and health represent critical components of human development. Impacts on health, in particular, was one of the most commonly observed impact pathways in the assessment of research projects. However, there were relatively fewer projects investigating the built environment interventions specifically relating to healthcare and education facilities.

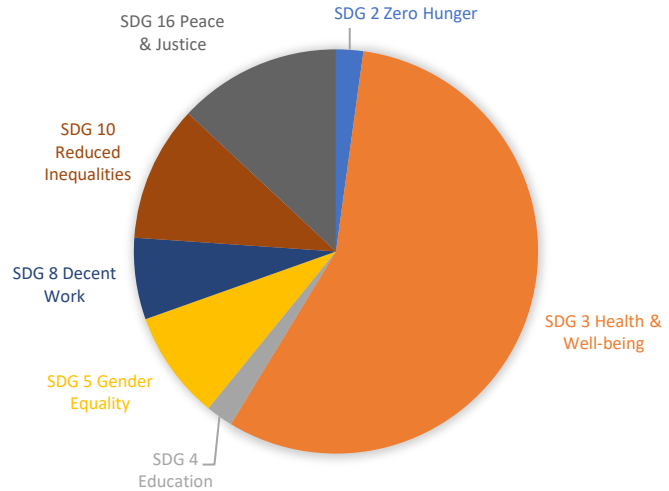


Figure 9: Coverage of the SDGs in research on healthcare facilities

The projects investigating healthcare facilities included:

- “Future Health Systems: Delivering Effective Health Services” (SLURC)
- “Tackling Deadly Disease in Africa Programme (TDDAP)” (IDS)
- “Towards inclusive urban health systems and infrastructure: A comparative assessment of access to healthcare, shelter and vital infrastructure among urban refugees in Nairobi and Kampala” (APHRC Kenya)

The projects investigating educational facilities included:

- “The GCRF Centre for Sustainable, Healthy and Learning Cities and Neighbourhoods (SHLC)” (University of Glasgow)
- “Urban Education Project” (APHRC Kenya)

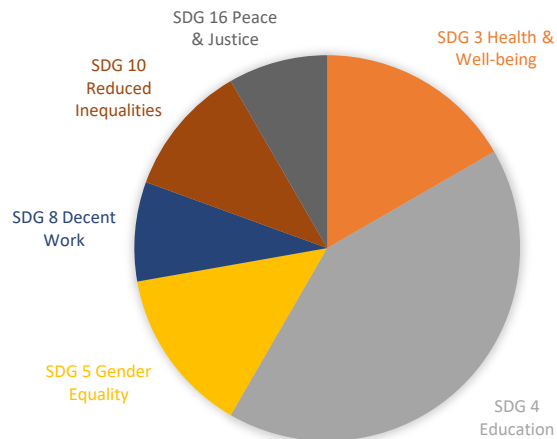


Figure 10: Coverage of the SDGs in research on education facilities

¹² Kaza, Silpa, Lisa Yao, Perinaz Bhada-Tata, and Frank Van Woerden. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development Series. Washington, DC: World Bank.

The low proportion of projects does not reflect a lack of research into health and education more generally. The research team assessed a large number of projects concerning health and education service provision. However, many of these projects focus on service delivery, access to services, price and governance, rather than focusing on the built environment per se. One area singled out for further research from a number of survey respondents was the impact of the built environment on **mental health**.

2.10 Public, Recreational and Green Spaces

27 projects in the assessment of research centre outputs covered the topics of public, recreational and green spaces. These research projects demonstrated connections between public and green spaces and a broad range of SDGs, including the promotion of health and well-being (SDG 3), decent work (SDG 8), peace, justice and strong institutions (SDG 16) and reduced inequalities (SDG 10). For the purposes of this review, research on urban ecology, green infrastructure and urban biodiversity were included in this category of built environment intervention. Of the 27 projects, just 4 projects investigated issues pertaining to urban ecology or ecosystem services. These projects were:

- “Eco-Urbanisation: promoting sustainable development in metropolitan-regional planning in China” (University of Manchester)
- “Institutions for Urban Poor’s Access to Ecosystem Services: A Comparison of Green and Water Structures in Urban Bangladesh and Tanzania” (University of Manchester)
- “Risks and Responses to Urban Futures” (STEPS Centre)
- “Strengthening Urban Resilience through Nature” (Lincoln Institute of Land Policy)

Despite the importance of peri-urban space in relation to urban expansion, only 3 projects investigated the peri-urban sphere in relation to public, recreational and green space. These are:

- “Risks and Responses to Urban Futures” (STEPS Centre), which investigated the relationship between ecosystem services, livelihoods and poverty in peri-urban areas in South Asia.
- “Political economy of peri-urban expansion” (IDS), which investigated the potential and limits of the Resilience Agenda in peri-urban areas of Mumbai and Karachi in the context of rapid urbanisation.
- “Peri-urban Adaptation” (WRI Ross Centre) aimed to support local governments and community organizations in developing resilience strategies in coastal peri-urban areas in Mumbai.

Survey respondents drew attention to the need for more research on urban ecology, enhancing or combatting loss of urban biodiversity, and the role of green infrastructure in alleviating poverty and enhancing resilience to climate change. These are all topics that could be considered for future research funding, alongside the role of peri-urban areas in promoting resilience and ecosystem services.

2.11 Industrial and Commercial Facilities

Relatively few projects considered the impacts of industrial or commercial facilities on human development – 22 in total. The majority focused on SDG 8 on decent work, but links to health and well-being (SDG 3) and reduced inequalities (SDG 10) were also considered by multiple projects. Out of

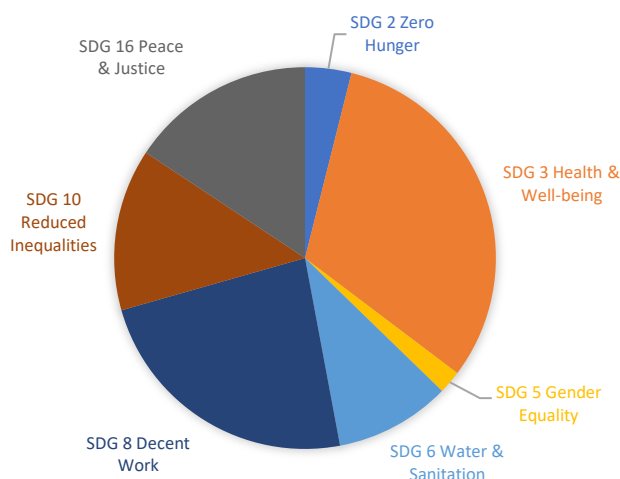


Figure 11: Coverage of the SDGs in research on public, recreational and green spaces

these 22 projects, roughly half considered the positive contribution of industrial facilities to human development, particularly with regard to employment opportunities, while the other half considered the challenges they generate for human development with regard mainly to the impacts of pollution on health.

4 projects investigated the role of foreign investment related to industrial facilities on human development, all of which looked at investments in Africa. These projects are:

- “BRICs and Region-Building in Africa: The Nacala Logistics Corridor” (KCL)
- “Urban development amid the 'new scramble' for Africa” (University of Sheffield)
- “The State of African Cities 2018 - The Geography of African Investment” (Loughborough University)
- “Architecture, Planning and Foreign Policy: Israeli and GDR Development Cooperation in sub-Saharan Africa 1950-1990” (TU Berlin Habitat Unit).

Industrial facilities were very infrequently referred to by survey respondents or interviewees.

11 projects considered **Civic and Commercial facilities**, with just over half focusing on marketplaces within cities. Of these 3 focused particularly on their role within urban food systems and also made links with nutrition and health. These projects include:

- “Consuming Urban Poverty (CUP)” (ACC)
- “Food Value Chain” (Mistra Urban Futures)
- “Hungry Cities” (ACC)

In general, there appears to be limited research on the positive and negative impacts of industrial complexes on human development.

Similarly, civic and commercial facilities appear under-represented in built environment research. However, a more in-depth review of these literatures is required to identify specific themes and challenges that require more support from research funders.

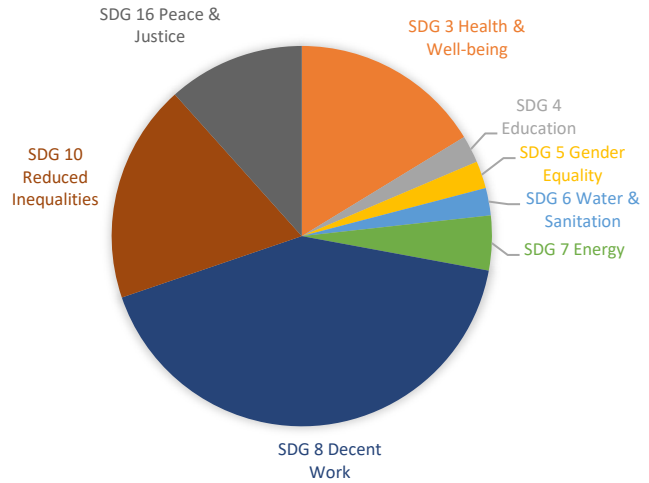


Figure 12: Coverage of the SDGs in research on industrial facilities

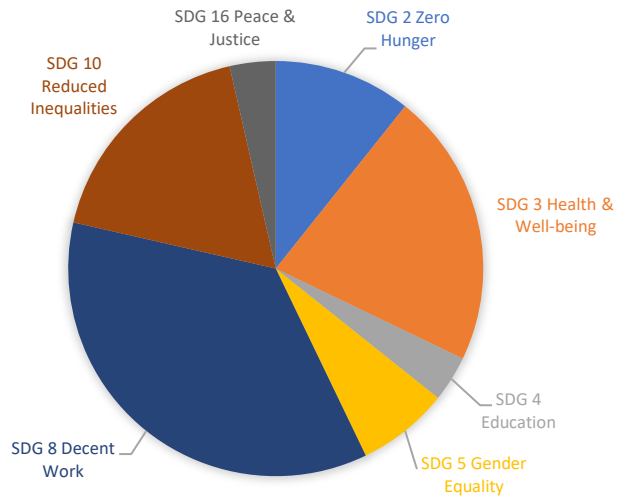


Figure 13: Coverage of the SDGs in research on civic and commercial facilities

3. Analysis of cross-cutting issues in built environment research

In addition to the thematic areas examined above, there are several critical cross-cutting issues that inform or shape research into the built environment. These are: **a) Informality, b) Access (gender and disability), c) Climate Change, d) Migration.**

Given that this review was focused on developing countries where housing, goods and services are often supplied informally, the assessment of research outputs recorded whether both formal and informal provision were considered. It also noted considerations of access and affordability, which are as important as provision itself, using gender and disability as key criteria affecting access. Finally, the assessment considered if and how research projects on the interface of the built environment and human development had factored in issues relating to climate change. The issue of migration is also discussed here, as it emerged as an additional critical cross-cutting theme that was under-represented in the literature.

5.1 Informality

Although already reasonably well-represented in the literature, **informality** was identified as a key area requiring more research by survey respondents:

While urban informality per se cannot be considered under researched, there continues to be a lack of global/comparative understanding about how informality manifests across different contexts, and how it is changing.

In particular, answers referred to the need for improved understanding of the practices through which informal settlements are created, their implications for social and spatial inequality, informal settlement upgrading, and the intersection of informality and institutional violence. Of the 95 projects that covered issues of informality, 31 projects considered issues for those living in **informal settlements**. Of these, for 23 projects, the residents of informal settlements were the main focus of the research. For example:

- “Climate change and urban health” (IIED) investigated the health impacts of climate change for residents of informal settlements.
- “Water, inequalities and experiences of urbanization: a case study on how young women and men negotiate their life trajectories in Ethiopia” (University of Oxford) investigated the challenges associated with water and sanitation infrastructure for those living in informal settlements.

Residents of informal settlements can often only access basic services and transport through the informal sector. 7 projects focused on **informal service provision**, investigating the challenges and positive contributions of informal services to human development. For example:

- “Translocal learning for water justice: Peri-urban pathways in India, Tanzania and Bolivia (WatJust)” (DPU) investigated the positive contribution of alternative and informal water supply arrangements undertaken for and by the peri-urban poor.
- “Digital Matatus” (MIT DUSP) investigated the positive contribution of collaborative mapping of the informal transport system using mobile phone technology.

3 projects investigated the challenges and impacts of **formalisation** of previously informal service provision on human development, particularly with regards to its impact on livelihoods. These projects are:

- “Turning Livelihoods to Rubbish (TLR)” (ACC) investigated the impact of formalisation trends in waste management that reduce livelihoods generated from waste for the urban poor.
- “What do digital technologies mean for African urban development?” (LSE Cities) investigated the impact of the formalisation of the transport sector through digital platform technology such as Uber.

- “Social, Environmental and Economic Impacts of BRT Systems” (WRI Ross Center for Sustainable Cities) investigated the positive contributions of bus rapid transit (BRT) systems on human development based on case studies from around the world, framing BRT as formalising previously informal transport systems.

Globally, it is estimated that a billion people live in informal settlements. Informality will continue to be a feature of the built environment across the global south - informal services and shelter provision will not be eradicated in the near future and in many cases, are the only option for low-income groups in urban areas. As one interviewee put it:

Informality has been looked at as a negative, but informality has provided careers, jobs, lifetime experiences for people. If we continue to think of it as something negative, even though it has provided a living for people for so many years, we will miss the opportunities that could be harnessed and perhaps even enhanced and stepped up.

This would suggest more research is needed on the intersection of formal and informal provision of shelter and services. This was reflected in discussion at the consultation workshop, where the need for a ‘new breed of planning professional’ was highlighted. The world’s growing urban areas need built environment professionals who are able to work with urban poor communities, and with the reality of rapid and informal urbanisation to find locally appropriate solutions. This is captured in the words of one interviewee: ‘How do you train built environment professionals so that they respond to informality appropriately? This obviously moves us to a normative space rather than just a research space’.

5.2 Access (Gender and Disability)

The assessment identified a relatively low number of research projects that focused specifically on gender and disability. Out of the total of 336 projects assessed, 54 projects considered issues relating to **gender**, suggesting that disaggregating the different impacts of built environment interventions on men and women is not routine. These projects covered issues such as: gendered access to infrastructure, livelihood opportunities, participation in governance and decision-making, and the impacts of differentiated access. Of these 54 projects, 7 projects focused specifically on investigating challenges to **women’s** equality and well-being. These included projects that focus on violence against women related to inadequate infrastructure (for instance, transport infrastructure, sanitation infrastructure, energy and power infrastructure) that contribute to their risk of experiencing violence. For example:

- “(Dis)connected infrastructures and Violence against Women” (King’s College London Urban Futures) investigated how to improve women’s knowledge of and safe access to urban infrastructure in India.
- “Indefensible Space” (DPU) investigated the challenges to women’s safety associated with sanitation infrastructure for women living in informal settlements in India.
- “Women and Transportation in East Africa” (SEI) aimed to develop a framework for mainstreaming gender into transport policy and urban planning to combat gender-based violence on public transportation.

7 projects considered how access is differentiated for those with **disabilities**. Of these 7 projects, 2 had people with disabilities as their central focus. These 2 projects are:

- “AT 2030: Life Changing Assistive Technology for All” (Global Disability Innovation Hub), which aimed to improve access to assistive technologies for people with disabilities in the Global South.
- “Market Based Solutions for the Extreme Poor” (IDS), which aimed to identify market-based solutions that benefit the most marginalised people, focusing particularly on women with disabilities as they are often the poorest and most excluded of all.

This would suggest that the different ways in which gender and disability inform experiences of and interaction with the built environment need to be given greater coverage and visibility in research.

5.3 Climate Change

The need for research on the intersection of climate change with the built environment was a regularly recurring theme in survey responses. Survey participants identified a number of areas for research, including how climate change and extreme weather events impact on the built environment and residents of urban areas, but also how the built environment (through adaptation measures) can mediate the impacts of climate change on human development and how future building can reduce emissions (through mitigation efforts).

Of the 58 research projects that considered issues relating to climate change:

23 projects were **framed within the context** of predicted climate change, and acknowledged the challenges posed by climate change to vulnerability (i.e. through climate variability, displacement, uncertainty). Examples of these projects include:

- “The RELIEF Centre” (DPU) investigated how to achieve human development with regards to the built environment in the context of mass displacement, exacerbated by climate change.
- “Urban Uncertainty” (LSE Cities) investigated the challenges associated with designing, implementing and governing built environment interventions in the context of uncertainty, including uncertainty surrounding climate change.
- “Vulnerability to Extreme Weather Events in Cities: Implications for Infrastructure and Livelihoods” (Loughborough University) investigated the challenges to human development posed by the built environment under conditions of extreme weather events, acknowledging the contribution of climate change to the predictability and incidence of extreme weather events.

20 projects **aimed to respond** to the challenges posed by climate change, by enhancing climate resilience and adaptive capacity. Examples of these projects include:

- “Coalition for Urban Transitions” is a global research and policy initiative that aims to address challenges related to climate change by enhancing the sustainability of cities.
- “Development of a Public Private People Partnership for Climate Compatible Development in Maputo” (DPU) investigates the challenges and opportunities for improving infrastructure and service delivery to enhance climate change adaptation in Maputo.
- “The Climate Opportunity” (C40 Cities) aims to enhance climate action by investigating the positive contribution of emission-reducing built environment interventions on other aspects of human development, such as health and prosperity.
- “Revitalising Informal Settlements and their environments (RISE)” (Monash Sustainable Development Institute) investigates the location-specific solutions that integrate green infrastructure and their positive contributions to health and the environment.

There were 7 projects that proposed **climate change mitigation measures**, including building retrofits and low emissions development strategies. These projects include:

- “C40 China Buildings Programme” (C40 Cities), which aims to strengthen and accelerate building policies that reduce building emissions.
- “Electric Buses in Cities: Driving Towards Cleaner Air and Lower CO₂” (C40 Cities), which investigates how different types of cities can deploy electric bus strategies.
- “Sustainable manufacturing and environmental pollution programme” (SEI) aims to foster solutions to tackling industrial air pollution that contributes to climate change.

The findings of the assessment would suggest a need for greater attention on how climate change might alter the impacts that built environment interventions have on human development, and the adaptation measures needed to respond to this. In addition, greater consideration is also required on mitigation measures that are affordable and appropriate for low-income groups.

5.4 Migration

Migration dynamics play an important role in urbanisation processes. Large flows of economic migrants, refugees and internally displaced people into towns and cities have significant impacts on the provision of shelter and basic services. Despite the importance of this theme, only 10 projects included in the extraction report centrally addressed issues pertaining to migration. These include:

- “CapaCITIES” (IIHS) that examined the economic and spatial implications of migration dynamics.
- “Safe and sustainable cities: human security, migration, and well-being” (University of Exeter)
- “Urban Development, Migration, Segregation and Inequality” (University of Glasgow)
- “Making Lives: Refugee Self-Reliance and Humanitarian Action in Urban Markets” (DPU)

The low proportion of projects does not reflect a lack of research into migration issues, more generally. Several of the research institutions considered in the assessment have separate centres focusing on migration research. However, there were few projects that focused on migration and also met the inclusion criteria, because they lacked focus on a DAC list country, did not consider the built environment explicitly, and/or did not consider human development outcomes. Interviewees also highlighted a lack of research on the spatial implications of migration. While in Africa there is much study of migration patterns, including seasonal and circular migration, and continental migration routes, there is very little study of the impacts of these flows on infrastructure and housing. This would suggest that more research is needed on the spatial implications of migration flows in towns and cities in developing countries.

4. Geographical coverage

The assessment included only those research projects that covered a built environment intervention in at least one DAC-list country. Many studies covered more than one country. The following charts (figures 14-16) set out the countries covered in the assessed research projects. It should be noted, however, that some bias may have been introduced into the country coverage, due to the fact that some of the research centres identified through the survey are based in DAC-list countries and specialise in research in their host country and region. This is notably the case for Kenya, South Africa and Sierra Leone. However, the over-representation of South and East Africa in the built environment research canon was highlighted by the two Africa-based peer reviewers. There may also be bias as only English-language research was assessed.

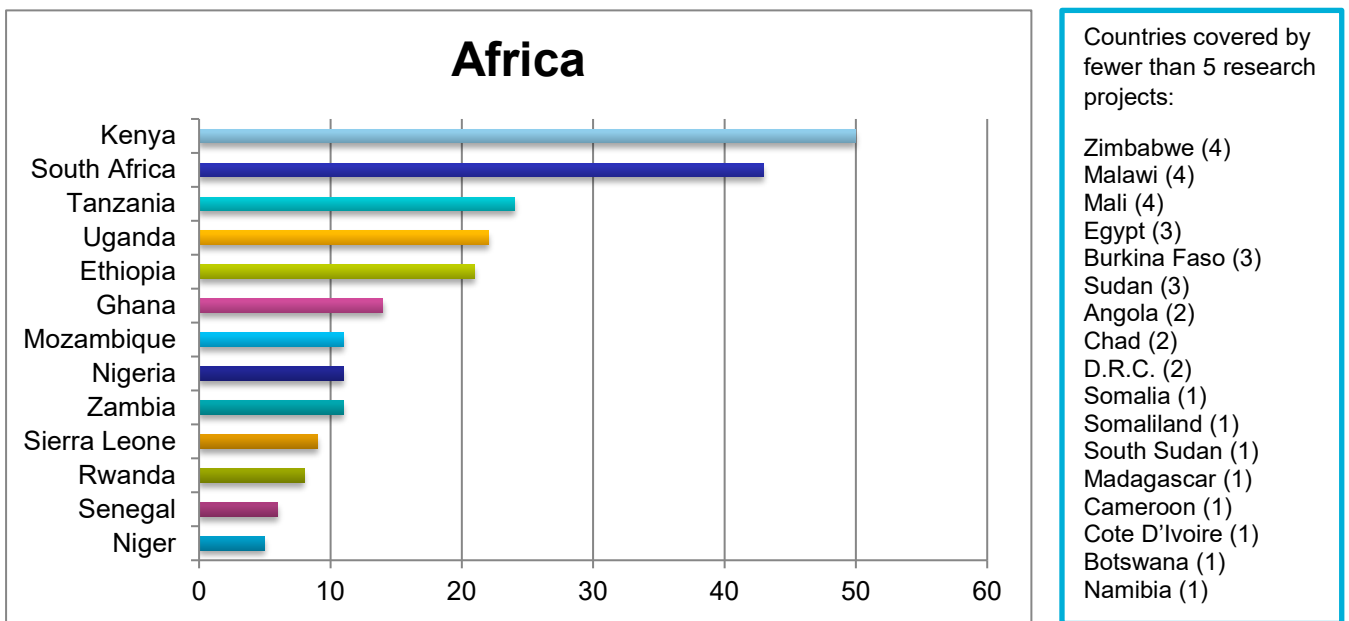
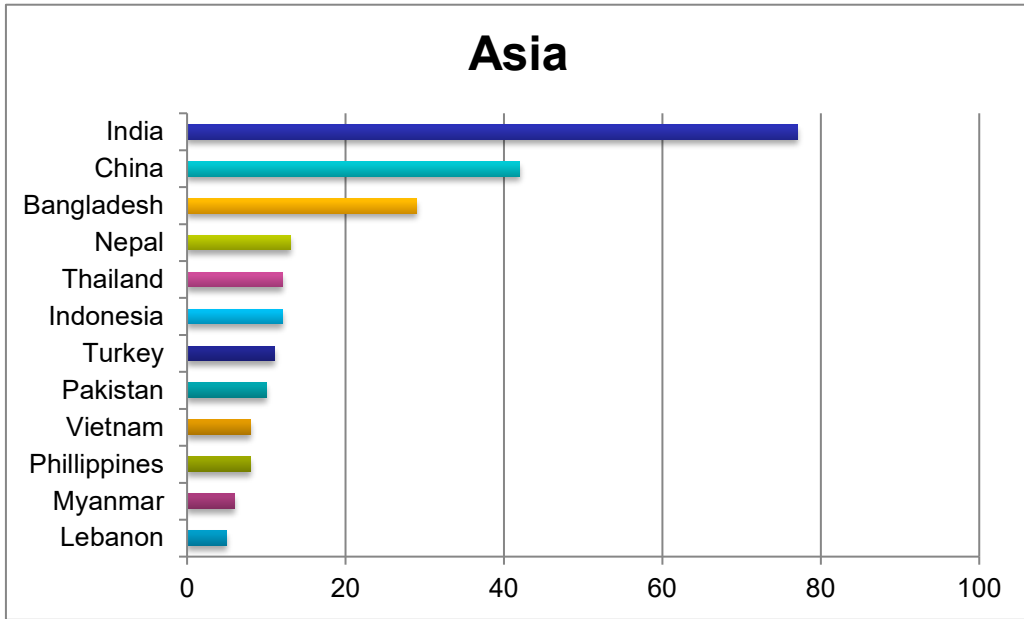


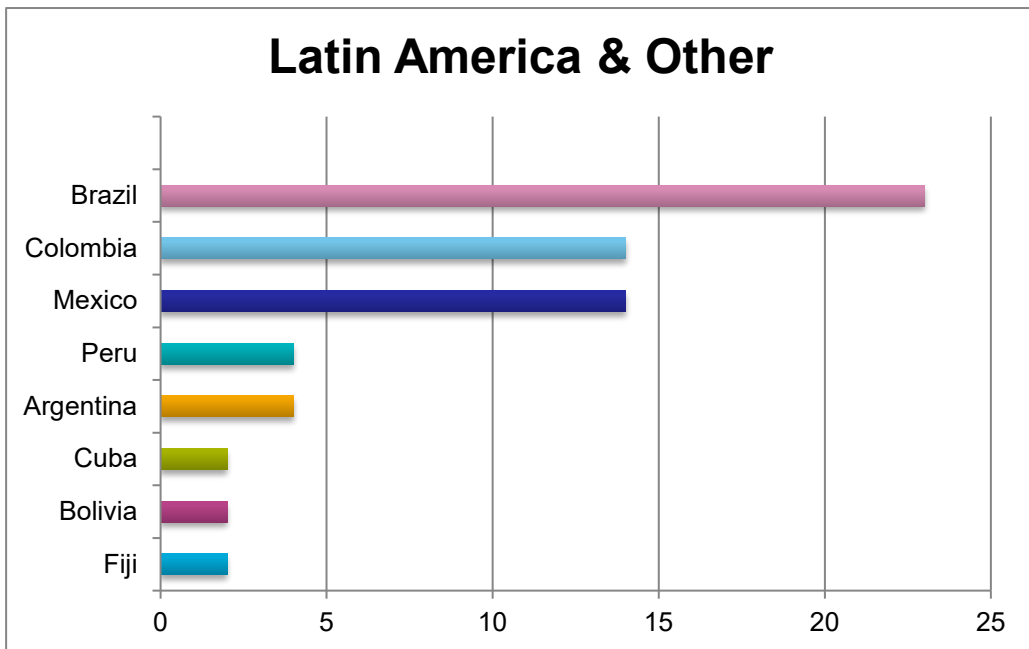
Figure 14: Number of research projects investigating African countries on the DAC List of ODA recipients.



Countries covered by fewer than 5 research projects:

- Cambodia (4)
- Jordan (3)
- Malaysia (3)
- Sri Lanka (3)
- Mongolia (1)
- Kyrgyzstan (1)
- Tajikistan (1)
- Lao PDR (1)
- Iran (1)

Figure 15: Number of research projects investigating Asian countries on the DAC List of ODA recipients.



Countries covered by fewer than 2 research projects:

- Guyana
- Costa Rica
- Guatemala
- El Salvador
- Honduras
- Haiti
- Jamaica
- Albania

Figure 16: Number of research projects investigating Latin American and other countries on the DAC List of ODA recipients.

5. Addressing the challenges of built environment research

5.1 Where Should We Be Doing Research? – Urban Futures

If research on the built environment is to focus on geographic areas where urban areas are being built most rapidly, it will need to shift focus. The bar charts below (figures 17-19) show average annual urban growth rates for Africa and Asia and Latin America. The number of projects per country is indicated in brackets. It demonstrates that geographical research focus over the past five years does not tally closely with countries that will have been experiencing most significant changes in and additional pressures on their built environments.

New research on the built environment should be encouraged in countries with the highest predicted urban growth rates and urbanisation rates, based on data provided by the UN. This should be analysed in conjunction with overall population size and data on changes in land use to determine where existing infrastructure will be under most pressure and where there are critical levels of demand for new shelter and service provision. This will help to determine ‘neglected geographies’ where more research is warranted.

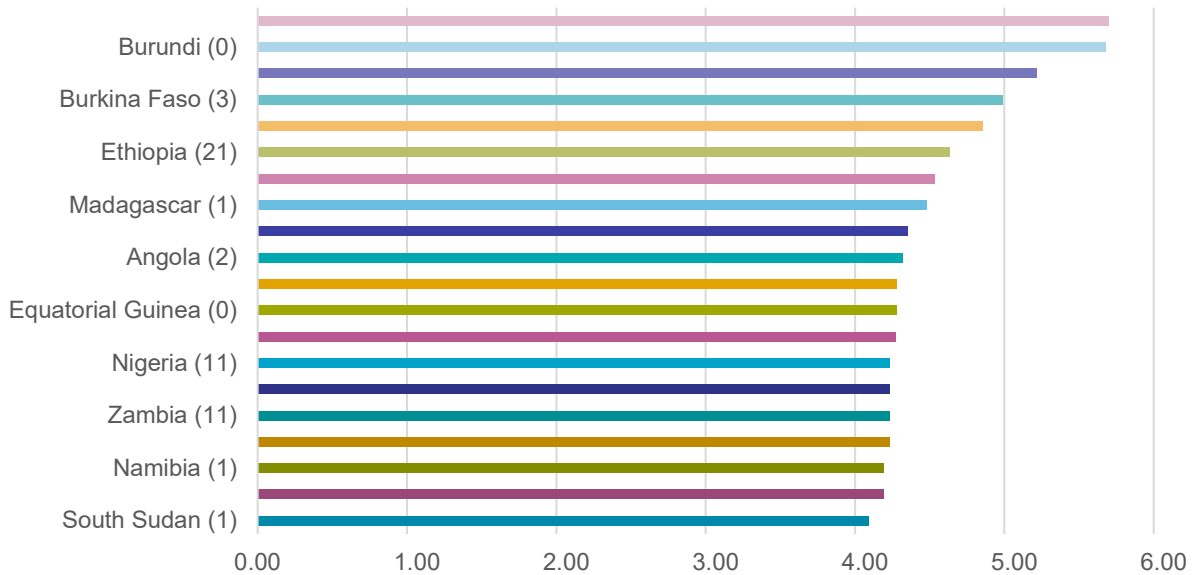


Figure 17: 20 African countries with highest annual percentage change in urban population 2015-2020 and numbers of research projects in brackets [Source: World Urbanization Prospects 2018, File 6: Average Annual Rate of Change of the Urban Population 2015-2020 <https://population.un.org/wup/Download/>]

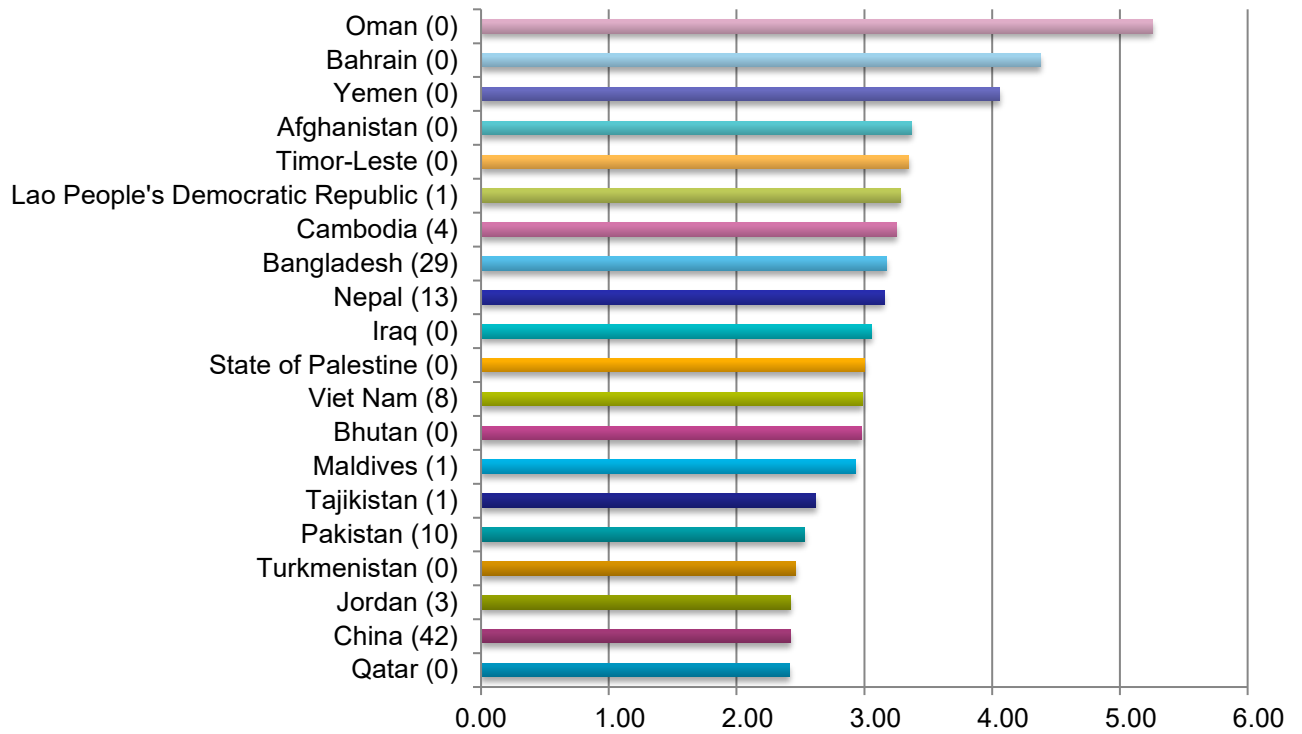


Figure 18: 20 Asian countries with highest annual percentage change in urban population 2015-2020 and numbers of research projects in brackets. [Source: World Urbanization Prospects 2018, File 6: Average Annual Rate of Change of the Urban Population 2015-2020 <https://population.un.org/wup/Download/>]

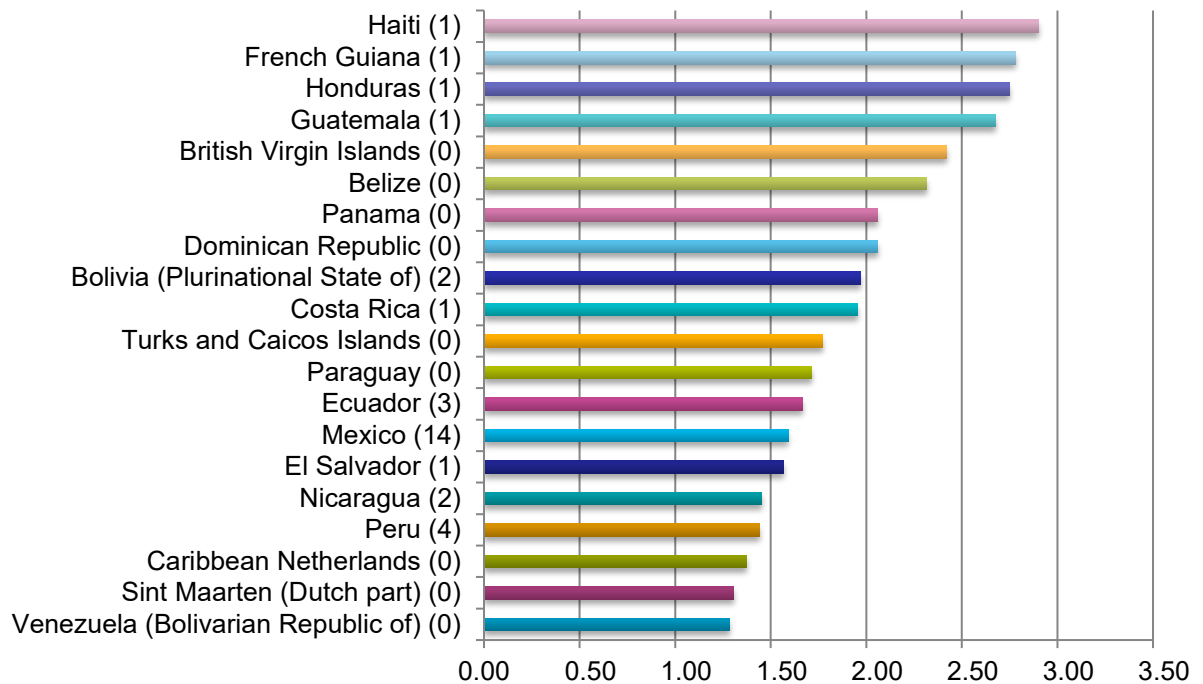


Figure 19: 20 Latin American and Caribbean countries with highest annual percentage change in urban population 2015-2020 and numbers of research projects in brackets. [Source: World Urbanization Prospects 2018, File 6: Average Annual Rate of Change of the Urban Population 2015-2020 <https://population.un.org/wup/Download/>]

5.2 What type of research can respond to complexity?

We need to transition from thematic focused research to urban systems research. When you invoke urban systems research you can choose a combination of thematic areas, as long as there is a logic in terms of interactions between those sectors.¹³

Systems-based approach

Interviewees and survey respondents drew attention to the complexity of human-built environment interactions, particularly in densely populated, fast-growing towns and cities in the global south. Highlighting the ‘complex mosaic’ of urban land-uses, one interviewee outlined the interlinked challenges of today’s urban systems, including environmental degradation, disaster risk, pollution and growing large informal economies. In general, interview and survey participants called for new ways of undertaking and funding research that reflects this complexity. This will require a change in framing, moving away from ‘projectised’ or ‘sectorialised’ conceptualisations of the challenges at hand, to ‘integrated’ approaches that generate ‘new ways of thinking, new ways of doing research, new methodologies that generate equilibrium between green, blue, grey and infrastructure and the demands of populations’.¹⁴ The focus needs to be on understanding the current realities of the built environment, working with interconnected urban systems, and looking ahead to how these may evolve.

Many participants in the review process expressed the need for new ways to design research that are in-line with and can have a meaningful impact on the complexity of urban centres. As articulated by a workshop participant: ‘Research should be designed in a context-specific way that takes into account how implementable the research findings are in the context of the political, social, economic environment and landscape’. This means research that brings together different stakeholders (academics, policymakers, government stakeholders, communities) through the concept of co-creation – taking on a holistic approach to research design. As another workshop participant put it: ‘Co-creation is key to developing trust and ownership of the findings’ and could also create a ‘more sustainable approach to research partnerships.’

Multi-stakeholder, participatory action research

Related to this, workshop discussions covered the relevance of action and applied research, particularly research that involves low-income and vulnerable communities. This is of relevance across the built environment interventions considered in this review, as low-income groups interact with all of them in their daily lives and while accessing livelihood opportunities. A presentation from one of the peer reviewers drew on experiences of an action research project that combined training for young professionals with a slum upgrading project that had gone on to have significant impact at the city scale. Summarising, he noted:

Research funding needs to value collaborative approaches undertaken with vulnerable communities alongside traditional indicators for academic outputs.

Survey respondents concurred:

We need more innovative means of research e.g. led by community organisations, to address their key issues. If we are too hung up on scientifically rigorous research, that blocks out the potential for valuable insight we can gain from more bottom up, community-driven research where they identify the research questions and collect the data. It may be messier as a process but it provides real insight into the lived reality on the ground that hasn’t been mediated by the views of ‘proper’ researchers.

Policy makers and researcher communities, [are] only just beginning to understand the complex interlinkages between human and non-human systems and their predictable and unpredictable outcomes. Funding institutions (and their reviewers) are still very much rooted in mainstream understandings of ‘development’ and ideal development pathways. They fail to recognise that

¹³ Key informant interview.

¹⁴ Key informant interview.

alternatives are not only possible, but desirable, and that action research is sometimes the only plausible route to identify alternatives.

One interviewee gave an example of flexibility within a DFID-funded research programme that facilitated an unplanned action research component. It was unusual as it allowed the research team to make a cash grant of £10 000 to a community-based saving scheme whose members then engaged with government to replicate what had been achieved with the grant. This process became a subject of study for the programme.

A large number of survey participants – when asked for examples of the impact of research on the built environment – referred to multi-stakeholder, participatory action research. They highlighted routes to impact through ‘close connections with local networks and intense participatory work’, building ‘bottom up meets top-down stakeholder networks (Local organisations, Universities, Foundations, Government, etc.)’, and ‘by engaging with key stakeholders throughout the research and by working closely with locally selected community champions in the settlements [being] researched.’

Workshop discussions highlighted that the best-placed researchers for this type of work might not be UK universities. While the Research Councils and UK universities have co-evolved over many years, other UK-based institutions, and universities and research centres in developing countries may have different funding models and incentives. Research funders could consider how they can build flexibility into funding calls to facilitate the involvement of research institutes, think tanks and other actors that have research capacity (such as NGOs) but do not have university status. This might also require placing greater value on the way that research is carried out and with whom, rather than relying solely on traditional metrics of academic value.

New generation of built environment research professionals

Finally, the presentations from peer reviewers at the workshop prompted discussion of the need for a ‘new generation of built environment professionals’ who are able to operate across disciplines and are able to navigate the complexities of the built environments and its rapid evolutions. It was recognised during the workshop that research can have a significant impact on education when it is used to inform university curricula and professional training schemes.

5.3 What is the most effective way to do built environment research? Taking an approach that crosses disciplinary boundaries¹⁵

Interdisciplinary research goes beyond just putting teams together from different disciplinary perspectives. It calls for individuals from those teams being able to transcend their own frontiers of expertise. In a way it also calls for a new crop of urban researchers or urban practitioners.¹⁶

The multiple and complex ways in which the built environment can impact on human development would suggest the need for methodologies and approaches that can reflect this complexity. This was clearly stated by a number of survey respondents, notably in response to a question on the potential barriers to more research on the intersections between the built environment and human development. These respondents highlighted the need for ‘interdisciplinary’ and ‘transdisciplinary’ research – across disciplines such as engineering and other physical sciences, architecture and planning and the social

¹⁵ A review of the terms ‘multidisciplinary’, ‘interdisciplinary’ and ‘transdisciplinary’ published in the journal *Clinical Investigative Medicine* found that they were used interchangeably in the health sciences. The author summarises their differences thus: Multidisciplinarity draws on knowledge from different disciplines but stays within their boundaries. Interdisciplinarity analyzes, synthesizes and harmonizes links between disciplines into a coordinated and coherent whole. Transdisciplinarity integrates the natural, social and health sciences in a humanities context, and transcends their traditional boundaries.

https://www.researchgate.net/post/What_is_difference_between_terms_of_multidisciplinary_transdisciplinary_and_cross_disciplinary_approaches

¹⁶ Key informant interview

sciences. They also highlighted the challenges of undertaking and finding funding for this type of research. The views of three of these respondents are presented here:

We need a better understanding of how infrastructures and services can work together to enhance human development. So, not just isolated work on say sanitation or energy, but work that considers how policy and practice can bring them together and with what impacts. The problem is that most practitioners and researchers operate with very narrow/confined systems boundaries.

Truly interdisciplinary approaches with teams of experts from different approaches are under-represented. Lack of funding is part of it, but more problematic are attitudes in relative discipline areas (along with funding and even home institutions) that don't encourage or incentivize necessary interdisciplinary and multidisciplinary research.

[There is a lack of research on] policy relevant issues that go beyond project related considerations connecting infrastructure, urban development and architecture on the one hand and the built environment in relation to program and human centred issues on the other. The important cosmos of connecting different fields is in my view largely underestimated in favour to sectorial thinking and very focused expert opinions. Culture and social sciences should talk a lot closer with the development and built environment.

The challenge of bridging disciplines within built environment research became evident during the assessment of research centre outputs. Survey respondents guiding the assessment identified a number of research centres specialising in architecture or engineering, such as the Institute for Sustainable Building Design, at Heriot-Watt University and the Centre for Sustainable Development at the University of Cambridge. Despite their focus on the built environment, projects from these centres largely did not meet the inclusion criteria and details were not uploaded to the extraction report. This is because they either lacked a focus on DAC list countries or did not consider the impact of the built environment on human development. This indicates that there may be limited attention to the social dimensions of the built environment within these disciplines, with a tendency to focus narrowly on its physical and technical elements. It would suggest a need for greater encouragement of interdisciplinary or transdisciplinary research into the interface between the built environment and human development, and the promotion of greater collaboration between architecture and engineering and the social sciences.¹⁷

The 'fragmentation' of research was also highlighted by one interviewee working in social sciences:

I always have a sense that around the corner there must be a lot of amazing people doing research that I just can't quite grasp [...] I'm thinking about engineers in particular [...] I know obviously there are a lot of great people working on those topics [of housing and critical infrastructure] but they don't really inhabit my world. [...] But whenever I've had conversations the engineers tend to bring it to quite a narrow definition of what their worldview is and it'll be the physical form and then you get the social science just talking about the political stuff but they don't come together.

Interestingly, this 'fragmentation' was also observed by an interviewee working in one of the research councils, who has struggled to identify individuals across UKRI who can speak to built environment research.

¹⁷ Anecdotal evidence suggests there is a growing interest in the built environment from the social sciences, with the potential for a convergence of interests as both constituencies recognise the need for a more integrated approach. The following are among a number of institutions in India which are understood to have an interest in this area: the Tata School of Social Sciences (TISS), the Indian Institute of Management (IIM), the Indian Institute of Technology (IIT), the Indian Institute for Human Settlements (IIHS). A similar interest has been expressed by the 17 members of the [African Urban Research Initiative \(AURI\)](#).

It should be noted that there was broad agreement among research council interviewees and workshop participants, that the Global Challenges Research Fund (GCRF) has encouraged the creation of joint calls between different councils that promote interdisciplinary approaches to challenge topics. The inclusion of 'Cities and sustainable infrastructure' as a 'challenge' within the GCRF has had an impact on the number of interdisciplinary research projects focusing on the built environment, as demonstrated by the list of research funders in Annex 2. As explained by one research council participant interviewed for this review, it drew together a wide range of research councils and engaged academics from different disciplines from design of the call to building the review panel.

5.4 Which type of funding schemes and mechanisms can support innovative and impactful built environment research?

As demonstrated above, interview and survey respondents highlighted that understanding how humans interact with the built environment requires an inherently trans or inter-disciplinary endeavour. The consultation workshop considered what additional steps UK research councils and other research funders could take to encourage academics from different disciplines to collaborate, as well as to support the creation of cadres of researchers who are comfortable working across multiple disciplines.

At individual level: Support researchers to work across disciplines

Some research councils already provide support to academics in UK institutions to work across disciplines. These approaches could be adapted by research councils looking to encourage trans-disciplinary approaches among academics working on the built environment in developing countries. These could include:

- *Doctoral training centres,*
- *PhD and early career fellowships,*
- *Opportunities for 'discipline hopping' where researchers are supported to pursue an immersive experience in other disciplines and user environments.*
- *Policy placements or internships for academics or doctoral students to spend time in non-academic institutions – e.g. line ministries for urban development or planning departments of city governments.*

It might also require working with universities to ensure masters courses and doctoral training reflect this approach, and could be encouraged by the appointment of senior academics as trans-disciplinary 'champions'. However, building a cadre of academics with the interest and ability to work outside the UK, in partnership and across disciplines may take time. The challenges were expressed by one academic interviewed for this study:

[Within engineering] people get very excited about the latest material technology - that's how careers are made. But it's not so exciting for people taking technology and deploying it in a challenging social or political context. It's not motivating for UK-trained engineers. There's just a small group for whom it is. Maybe it's about new PhDs coming through. Also, large consortiums are places where you can grow relationships and allow these sort of hybrids to appear.

At institutional level: Build capacity and North-South partnerships to support built environment research and capacity building

Specifically in relation to GCRF, participants noted that 'capacity building' in the GCRF is often framed as building capacity of individuals – but it is also important to build capacities of institutions – a point made repeatedly by survey respondents. This is particularly important in the field of the built environment. A series of recent surveys of the architecture and planning professions in the Commonwealth have demonstrated low numbers and limited capacity of built environment professionals in rapidly urbanising countries and weakness in built environment policy, i.e. planning policy and building code.¹⁸ Research funders might consider how existing mechanisms to support

¹⁸ Commonwealth Association of Architects (2018) *Survey of the architectural profession in the Commonwealth* https://issuu.com/comarchitect.org/docs/caa_survey_of_the_architectural_pro Commonwealth Association of

research partnerships between academic organisations could be adapted to incorporate professional bodies of planners, architects, engineers, land economists and surveyors. Of particular relevance would be support for their efforts to promote the professional development of their members. This includes ensuring members are up to date on research, technical developments and best practice and also involves bringing their professional expertise to bear on policy development.

An example of such an initiative is the recent collaboration between Commonwealth associations of architects, planners, engineers, surveyors and land economists, the Commonwealth Local Government Forum and the Association of Commonwealth Universities. It has been established to engage with the challenge of delivering sustainable urbanisation in the Commonwealth. This example of a north-south partnership aims to enhance effective planning of the built environment in the immediate and longer term, through a range of measures: professional development and accreditation of built environment professionals, increased capacity of universities to provide quality education and training to the next generation of these professionals and support to better planning and implementation of urban policies through improved collaboration between local and national government, professional bodies and universities.

Funding discussions at the workshop also considered how to facilitate new partnerships between northern and southern research institutions. Noting that it can take time to establish and test new collaborations, it was suggested that mechanisms that already exist in the UK could be trialled to support an 'incremental' approach to partnership building with institutions in the global south. For example:

- *Wave funding*, such as that used by UKRI's [Strength in Places Fund](#), which allows time for potential applicants to observe the first round of funding and have more time to assemble teams, in the knowledge that another 'wave' of funding will become available.
- *Seedcorn funding* for testing ideas and partnerships, with the potential to apply for further funding and scale up collaborative projects (also a component of the Strength in Places Fund).
- *Sandpits* - residential interactive workshops that have a 'highly multidisciplinary mix of participants, some active researchers and others potential users of research outcomes, to drive lateral thinking and radical approaches to address research challenges'.
<https://epsrc.ukri.org/funding/applicationprocess/routes/network/ideas/whatisasandpit/>
- *Network funding* which can help build the foundations for new collaborations

Referring back to discussions on action and applied research, which have the potential to build the capacity of low-income urban communities and built environment professionals, these approaches might benefit from stage-gate reviews or [metered funding](#), where research funding is released in line with the evolution of a research project.

Interviewees and participants at the workshop welcomed the opportunity that the GCRF had provided for research councils to launch joint calls and for the resultant creative proposals bringing together different disciplines and working across the global south. Experience of supporting built environment research in developing countries varies greatly among research funders. The transfer of learning to funders who are new in this space could be encouraged.

Finally, it was suggested that one way to improve the relevance of research for the global south would be to increase interactions between research funders and policy makers and researchers in the global south. Ideally, research would be 'demand-led' by policy makers (including those in municipal governments) and academics based in developing countries, who are best-placed to identify where particular challenges require further research.

Planners (2018) *Survey of the planning profession in the Commonwealth*
https://issuu.com/comarchitect.org/docs/cap_survey_of_the_planning_professi

6. Recommendations

Identifying research themes

The complexity of the built environment, the vastness of the topic and the limited time available for this review make the generation of specific recommendations around research themes difficult. However, a number of specific topics were highlighted by interviewees and survey respondents as requiring further research, and were also identified as possible gaps during the assessment of research centres. Potential areas for new research could be considered in a series of more narrowly focused literature reviews. These issues include:

- Greater understanding of the ways in which informal settlements are growing in size and number and are contributing to sprawl.
- How planning can respond to the growth of informal settlements, including in promoting safety and security and mitigating the impacts of climate change.
- Citizen and grassroots participation in urban planning processes.
- Accessibility of transport infrastructure for low-income groups, women, and for people with disabilities, covering both formal and informal provision.
- Ongoing research on low-income and informal housing generally, and a more specific emphasis on research that brings together researchers focusing on affordability and access with those working on low-carbon, low-cost building techniques and materials.
- Research on water and sanitation that considers provision at a range of scales – in communities and informal settlements as well as at city-scale – and that brings together engineering with natural and social sciences.
- The gendered dimensions of water and sanitation infrastructure provision and access.
- Low-cost, low-carbon energy solutions for the urban poor, particularly in contexts where power is accessed through illegal or informal connections.
- Indoor air pollution and its impacts on health.
- The intersection of ICT infrastructure with vulnerability and marginalisation, including research of the impacts of ICT on lives and livelihoods of poorer sectors of society
- Urban food systems generally, and specifically the link between land use planning and food security.
- Factors that influence waste generation, including waste prevention and waste minimisation practices and activities.
- The impacts of the built environment on mental health.
- Urban ecology, enhancing or combatting loss of urban biodiversity, and the role of green infrastructure in alleviating poverty and enhancing resilience to climate change.
- The role of peri-urban areas in promoting resilience and ecosystem services.
- How climate change might alter the impacts that built environment interventions have on human development, and the adaptation measures needed to respond to this.
- Mitigation measures that are affordable and appropriate for low-income groups.
- The spatial implications of migration flows in towns and cities in developing countries.

Recommendations on ways to approach built environment research

The process of the review also produced recommendations for how such research should be approached: responsive to global challenges, bridging disciplines, focusing on under-researched geographical areas and promoting the participation of practitioners, policy makers and affected communities.

Encourage research which takes an urban systems approach to key challenges in built environment

What is clear from the assessment of research centre outputs and the contributions of participants is that there are current trends in the global south that built environment research must engage with, if the SDGs are to be met. These are rapid urbanisation, climate change, growing social and spatial inequality, the informal production of shelter and services, challenges to urban food security and the degradation of urban ecologies and ecosystem services.

Encourage consideration of cross-cutting issues in built environment research

Many of the key issues shaping the built environment, and that need to be informed by built environment research, will affect and be affected by a range of other trends and processes. Of particular importance are the issues identified above: *informality, access, climate change and migration*. The findings of the review would suggest that the mainstreaming of gender and disability concerns into research on the built environment is not widespread and needs to be actively encouraged.

Encourage research in countries where predicted urban growth will have the greatest impact on the built environment

Research on the built environment should be encouraged in countries with the highest actual and predicted urban growth rates and urbanisation rates, and countries with very large urban populations that are also continuing to grow. In these countries and regions existing infrastructure will be under immense pressure and there will be critical levels of demand for new shelter and service provision. Currently the focus of built environment research does not tally with the countries and regions undergoing the most rapid urban transitions. However, research funding for these contexts should also recognise the challenges that they present including the limited number of experienced and capable institutions that can be research partners; inadequate basic information (e.g. up-to-date census); limited pre-existing empirical research that can form the basis for more sophisticated analysis; security concerns (in some cases) and the additional costs of conducting research in less 'well-connected' locations.

Take proactive measures to encourage interdisciplinary research projects, building on positive experience to date

The complexity of urban systems, and of human interactions with the built environment, lends itself to an interdisciplinary or transdisciplinary approach. While this has been recognised in recent GCRF calls related to cities and infrastructure, research funders should build on this experience to expand the number of calls that encourage greater interdisciplinary approaches. Research funder experiences of supporting interdisciplinary research in the UK should be adapted to support innovative north-south and south-south partnerships across disciplines, notably architecture, planning and the physical, natural and social sciences.

Fund co-created, practice-based participatory research and non-traditional research partnerships

The nature of the built environment lends itself to collaborative research methodologies and approaches – including action, applied and practice-based research that can build capacity of policy makers (including in local and municipal government), built environment professionals (in both private and public practice) and vulnerable low-income groups. Research that encourages significant participation by non-academic partners, notably civil society and local government will help encourage research uptake and impact. Practice-based research involving built environment professionals is also a way to support the generation of a cadre of architects, planners and engineers that can respond to the new challenges of a rapidly urbanising world.

7. Forthcoming research

New research projects and hubs that have yet to deliver research products were excluded from the assessment, as were recent calls for proposals that are still under consideration. However, consultation workshop participants and interviewees highlighted a number of relevant forthcoming programmes funded by UKCDR members. These have the potential to respond to some of the recommendations outlined above.

[ESRC Rethinking the off-grid city: Human-infrastructure interactions in the context of urban crises and urban change](#) Led by AHRC on behalf of UKRI, with AHRC, EPSRC, NERC and British Academy as fund partners, this recently closed call will support inter-disciplinary research with ‘a view towards creating practical policy and programming alternatives, engineering solutions and/or social innovations. Conceptually the call also offers the opportunity to re-think and explore the concept of cities, especially in the context of growing urban populations that are not fully on the formal grid.’ This call documents gave a clear indication of the need for interdisciplinary proposals and is likely to lead to innovative partnerships between the social and physical sciences.

[DFID African Cities Research Programme](#) Currently under procurement, up to £48m over 6-9 years will be awarded to a research consortium to produce new operationally-relevant knowledge and evidence on African ‘cities as systems’ to help tackle the most significant problems constraining growth and development in individual African Cities, leading to the development of, and investment in, more effective economic development and poverty-reduction policies and programmes in African cities, by DFID and its partners. The call may result in greater focus on some of Africa’s least studied cities, as it encouraged applicants to consider fragile and conflict-affected countries where research is inherently more difficult.

[Tomorrow’s Cities](#) This GCRF Multi-Hazard Urban Disaster Risk Transitions hub was awarded £17.6m in February 2019. Its aim is to catalyse a transition from a culture of crisis management to one of multi-hazard risk-informed planning and decision-making that strengthens the voice and capacity of the urban poor. This project has a strong focus on policy engagement with municipal authorities and other urban stakeholders – including the urban poor. Its approach tallies with calls for action research and the establishment of non-traditional partnerships. It also reflects the need for research that mainstreams the impacts of climate change into built environment interventions.

[ARISE](#) Accountability and Responsiveness in Informal Settlements for Equity is a new research consortium with a budget of £13m set up to enhance accountability and improve the health and wellbeing of marginalised populations living in informal urban settlements in low- and middle-income countries. It responds to the need to increase understanding of the challenges facing people living in informal settlements.

[Water Security & Sustainable Development hub](#) is a new research consortium with funding of £18m, focusing on sustainable water security through developing and demonstrating a systems approach that better understands water systems; values all aspects of water; and strengthens water governance to enable integrated water management. It responds to calls for greater collaboration between engineers, natural and social scientists working on water, to ensure technological, social and political issues around water are considered in conjunction.

Annex 1: Centres of Research Expertise

Institution	Department	Location
African Population and Health Research Centre (APHRC)		Nairobi, Kenya
C40 Cities		London
Cardiff University	School of Geography and Planning	Cardiff, United Kingdom
Centre for Research in Energy and Energy Conservation (CREEC)		Kampala, Uganda
Drexel University	Dornsife School of Public Health	Philadelphia, USA
Erasmus University Rotterdam	Institute for Housing and Urban Development Studies (IHS)	Rotterdam, the Netherlands
Federal University of Rio de Janeiro	Urban and Regional Research and Planning Institute (IPPUR UFRJ)	Rio de Janeiro, Brazil
Goldsmiths University	Centre for Urban and Community Research	London, United Kingdom
Heriot-Watt University	School of Energy, Geoscience, Infrastructure and Society	Edinburgh, United Kingdom
Imperial College London		London, United Kingdom
Indian Institute of Human Settlements (IIHS)		Bengaluru, India
International Growth Centre (IGC)		London, United Kingdom
King's College London	Department of Geography	London, United Kingdom
Lincoln Institute of Land Policy		Cambridge, USA
London School of Economics and Political Science (LSE)	LSE Cities	London, United Kingdom
London School of Hygiene and Tropical Medicine		London, United Kingdom
Loughborough University	School of Geography and Environment	Loughborough, United Kingdom
LSE and University of Oxford	International Growth Centre (IGC)	London, United Kingdom
Mistra Urban Futures		Goteburg, Sweden
MIT	Department of Urban Studies and Planning	Cambridge, USA
Monash University	Sustainable Development Institute	Melbourne, Australia
Newcastle University	Global Urban Research Unit	Newcastle, United Kingdom
Sierra Leone Urban Research Centre (SLURC)		Freetown, Sierra Leone
Stockholm Environment Institute (SEI)		Stockholm, Sweden
Sustainable Built Environment National Research Centre		Perth, Australia

Thammasat University	Urban Futures Research Unit	Bangkok, Thailand
TU Berlin	Habitat Unit	Berlin, Germany
TU Delft	Faculty of Architecture and the Built Environment	Delft, the Netherlands
UCL	Bartlett Development Planning Unit (DPU)	London, United Kingdom
University College Dublin	School of Architecture, Planning and Environmental Policy	Dublin, Ireland
University of Cambridge	Martin Centre for Architectural and Urban Studies	Cambridge, United Kingdom
University of Cape Town	African Centre for Cities (ACC)	Cape Town, South Africa
University of Edinburgh	School of Geosciences	Edinburgh, United Kingdom
University of Exeter	Department of Geography	Exeter, United Kingdom
University of Glasgow	School of Social and Political Science	Glasgow, United Kingdom
University of Kent	School of Architecture and Planning	Kent, United Kingdom
University of Manchester	School of Environment, Education and Development (SEED)	Manchester, United Kingdom
University of New South Wales	City Futures Research Centre	Sydney, Australia
University of Newcastle	School of Architecture and Built Environment	Callaghan, Australia
University of Oxford	School of Geography and the Environment	Oxford, United Kingdom
University of Oxford	Urban Transformations Hub	Oxford, United Kingdom
University of Sheffield	Department of Urban Studies and Planning	Sheffield, United Kingdom
University of Surrey	Centre for Environment and Sustainability	Surrey, United Kingdom
University of Sussex	Institute of Development Studies (IDS)	Sussex, United Kingdom
University of Sussex	Social, Technological and Environmental Pathways to Sustainability (STEPS) Centre	Sussex, United Kingdom
University of Westminster	Max Lock Centre	London, United Kingdom
University of Witwatersrand	Centre for Urbanism and Built Environment Studies (CUBES)	Johannesburg, South Africa
World Resources Institute (WRI)	Ross Center for Sustainable Cities	Washington, USA

Annex 2: Research Funding

No information on the research funder was available for 44 of the 336 research projects included in the assessment. The information below relates to the 292 research projects for which information on the funder was available. Projects may receive funding from multiple sources and for this reason, projects may be counted more than once.

Please note that information on funding amounts was only available for 63 projects. As such, analysis of the scale of built environment research funding is not possible. Where funding information on a project is available, it has been listed under the funding source.

Overview of Funding Sources

Source of funding	Number of research projects
UK ODA	194
Other bilateral aid budgets (+ EU)	46
UK foundations	19
Non-UK foundations	37
International organisations	20
Other	10

UK Official Development Assistance (ODA) funded projects relating to the built environment

UK Funding Body	Number of Research Projects
DFID (incl. IGC)	104
International Growth Centre (IGC)	39
BEIS	99
BEIS (delivery partner not specified)	1
UKRI	82
British Academy	14
Royal Society	2
DSHC	1

194 projects were fully or partially funded by UK ODA. Of these:

- 103 projects were funded by DFID¹⁹. Of these:
 - 39 projects were channelled through the IGC.
 - 20 projects were funded by DFID in collaboration with another UK funding body.
 - 12 projects were funded in collaboration with an international funding body.
- 99 projects were funded by BEIS (including in conjunction with DFID).
 - 82 projects received funding from various UKRI research councils. Some projects received funding from multiple research councils. For this reason, some projects may be listed multiple times:
 - UKRI (council not specified) funds 10 projects
 - AHRC funds 1 project
 - BBSRC funds 4 projects
 - ESRC funds 48 projects
 - EPSRC funds 5 projects

¹⁹ Funding amounts were available for 10 of the 103 DFID projects. They varied from £259,312 for the “Safe and sustainable cities: human security, migration, and well-being” project (University of Exeter) to £140,000,000 for the “Building Resilience and Adaptation to Climate Change Extremes and Disasters (BRACED) Programme” funded through the UK’s International Climate Fund (ICF).

- MRC funds 9 projects
- NERC funds 21 projects
- Other BEIS delivery partners:
 - British Academy funded 14 projects
 - Royal Society funded 2 projects
 - BEIS (delivery partner not specified) funded 1 project
- 1 project was funded by the Department of Health and Social Care (DHSC)

Research Programmes on the Built Environment funded through UK ODA

- DFID provided funding through the following programmes:
 - Urbanisation and Infrastructure Research and Evaluation Manager (UIREM) – Nigeria programme
 - East Africa Research Fund
 - £998,000 for the “Spatial Inequality in Times of Urban Transition: Complex Land Markets” project (DPU)
 - Disaster and Emergencies Preparedness Programme (DEPP)
 - £978,187 for the “Linking Preparedness, Response and Resilience in Emergency Contexts” project (KCL)
 - Effective States and Inclusive Development programme
 - Energy and Economic Growth programme
 - Humanitarian Innovation and Evidence Programme
- UKRI provided funding through the following programmes:
 - GCRF research programmes:
 - GCRF Building Resilience Programme
 - £88,011 for the “Resilience in Groundwater Supply Systems: integrating resource-based approaches with agency, behaviour and choice in West Africa (RIGSS)” project (Cardiff University)
 - GCRF Growing Research Capability call
 - GCRF Research Grants
 - £130,841 for “Development Implications of Digital Economies (DIODE) Strategic Research Network” project (University of Manchester)
 - £676,575 for “Innovation and scale: Enhanced renewable energy access and local market development in Uganda and Zambia” (University of Oxford)
 - GCRF Global Interdisciplinary Research Hubs:
 - UKRI GCRF Multi-Hazard Urban Disaster Risk Transitions Hub (£20,000,000)
 - UKRI GCRF One Health Poultry Hub
 - UKRI GCRF Water Security and Sustainable Development Hub
 - UKRI GCRF Action against Stunting Hub (£18,271,184)
 - UKRI GCRF Living Deltas Hub (£15,300,000)
- UKRI and DFID together provided funding through the following programmes:
 - Ecosystem Services for Poverty Alleviation (ESPA) programme
 - Unlocking the Potential of Groundwater for the Poor (UPGro) Programme
 - Zoonoses and Emerging Livestock Systems (ZELS) programme
 - Other GCRF research programmes include:
 - GCRF Sustainable Development 2016 (British Academy)
 - Cities and Infrastructure programme (British Academy)
 -
 - Newton Fund:
 - Thailand Research Fund
 - Other:
 - Understanding Sustainable Energy Solutions (USES) research programme
 - Rising Powers Research Programme
 - Towards a Sustainable Earth (TaSE) programme

Other Bilateral Aid Budget (including EU) funded projects relating to the built environment

Of the 46 projects that were funded by other bilateral aid budgets, 8 projects were jointly funded by UK ODA.

The following governments funded research projects (sometimes in conjunction with other donors):

- Germany:
 - German Federal Ministry of Education and Research (BMBF) (4 projects)
 - Deutsche Forschungsgemeinschaft (DFG) (1 project)
 - Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (1 project)
 - Federal Ministry for Economic Cooperation and Development (BMZ) (1 project)
- Canada:
 - International Development Research Centre (IDRC) (3 projects)
 - SAR12,000,000 for “Hungry Cities” (ACC)
 - Department of Foreign Affairs, Trade and Development of Canada (1 project)
 - CAN\$399,993 for “Assessment of the Impact of Gender Equality Programming on Humanitarian Outcomes” (IDS)
 - Global Affairs Canada
- Sweden:
 - Swedish International Development Cooperation Agency (Sida) (5 projects)
 - Swedish Research Council (1 project)
 - \$490,000 for “HICCUP: Heterogeneous Infrastructure of Cities in Uganda Project: Thinking With the South” (ACC)
- Switzerland:
 - Swiss Agency for Development and Cooperation (SDC) (3 projects)
 - Swiss National Science Foundation (1 project)
 - £112,057 for “Smart Cities: ‘Provincializing’ the global urban age in India and South Africa” (KCL)
- Netherlands:
 - Netherlands Ministry of Foreign Affairs (3 projects)
 - Netherlands Organisation for Scientific Research (3 projects)
 - €224,997 for “Public Authority and Legitimacy Making (PALM): Host-Refugee Relations in Urban Jordan and Lebanon” (IDS)
 - €99,756 for “Wellbeing for Urban Refugees: Syrians and Hosts in Jordan and Lebanon (WURSHIJL)” (IDS)
- EU:
 - European Civil Protection and Humanitarian Aid Operations (ECHO) (1 project)
 - European Commission (5 projects)
 - €183,454 for “Investigating Natural, Historical, and Institutional Transformations – Cities” (KCL)
 - €18,000,000 for “Transformation as Praxis: Exploring Socially Just and Transdisciplinary Pathways to Sustainability in Marginal Environments (TAPESTRY)” project (STEPS Centre)
 - €831,916 for “Capacity Building for Smart Data and Inclusive Cities (SDIC)” (IDS)
 - European Union (2 projects)
 - €2,694,863 for “Rurban Africa” (IIED)
- USA:
 - US Agency for International Development (USAID) (3 projects)
- China
 - National Natural Science Foundation of China (2 projects)
 - \$404,710 for “A Systems Approach to Sustainable Sanitation Challenges in Urbanising China (SASSI)” (University of Manchester)
 - £750,000 for “The Remaking of Chinese Urban Neighbourhoods: socio-spatial transformation and access to public services” (University of Glasgow)

Non-governmental Foundations funded projects relating to the built environment

Of the 56 projects funded by non-governmental foundations (19 by UK foundations and 37 by non-UK foundations):

- The following UK-based foundations funded research projects:
 - Wellcome (5 projects)
 - In 2015, Wellcome launched the “Our Planet, Our Health” priority area focussing on planetary health and one of the three areas this priority area focuses on is urban environments. Since then, Wellcome has invested £17.8m in research looking at how urban design and policy can improve health, funding 7 projects, 5 of which met the inclusion criteria for this report.
 - Comic Relief (3 projects)
 - £840,636 for “Sierra Leone Urban Research Centre (SLURC)” (DPU)
 - The Leverhulme Trust (2 projects)
 - Children’s Investment Fund Foundation (4 projects)
 - Y Care International (1 project)
 - Save the Children (2 projects)
 - AUD 92,463 for “Critical Factors for Post-disaster Educational Continuity in Urban Floods in South and Southeast Asia” (University of Newcastle)
 - British Academy (2 projects)
 - £311,371 for “The role and interplay between private and public governance within the land-coastal zone-sea interface and the impact on food security” (Cardiff University)
- The follow non-UK based foundations funded research projects:
 - The Bill and Melinda Gates Foundation (5 projects)
 - Deutsche Bank’s Alfred Herrhausen Society (2 projects)
 - Rockefeller Foundation (3 projects)
 - Lincoln Institute of Land Policy (13 projects)
 - \$15,000 for “Village Lead Land and Property Development in China: A Study of Current Practice in the Succesful Villages” (University of Glasgow)
 - Bloomberg Philanthropies (7 projects)
 - Arghyam (2 projects)
 - BNP Paribas (1 project)

International Organisations funded projects relating to the built environment

The 20 projects that received funding from international organisations included funding from:

- World Bank (4 projects)
- The United Nations (UN)
 - UNCTAD (1 project)
 - UN-Habitat (1 project)
 - UN Women (1 project)
 - UN Population Fund (UNFPA) (1 project)
 - UNDP (1 project)
- International Fund for Agricultural Development (IFAD) (1 project)
- Cities Alliance (2 projects)
- C40 Cities (2 projects)
- The World Justice Project (1 project)
- International Social Science Council (ISSC) (2 projects)

Annex 3: Survey of the Built Environment Research Landscape

1. Please provide your details here

Name (optional)	<input type="text"/>
Institution	<input type="text"/>
Job Title (optional)	<input type="text"/>
Area of Expertise	<input type="text"/>

2. Are you happy to be contacted for a follow-up interview?

- Yes
 No

3. Please provide a list of the institutions you regard as the main funders of research that considers the impact of the built environment on human development. (These could be multilateral agencies, government bodies, foundations etc.)

Funder 1:	<input type="text"/>
Funder 2:	<input type="text"/>
Funder 3:	<input type="text"/>
Funder 4:	<input type="text"/>
Funder 5:	<input type="text"/>

4. Please list up to five centres of research expertise in the built environment and human development. (These could be university departments, research institutes, think tanks etc.)

Institution 1:	<input type="text"/>
Institution 2:	<input type="text"/>
Institution 3:	<input type="text"/>
Institution 4:	<input type="text"/>
Institution 5:	<input type="text"/>

5. Interventions in the built environment can have both negative and positive impacts on human development.

a) Which causal pathways between the built environment and human development do you consider to be under-researched?

b) Are these issues under-researched because of a lack of funding, or for other reasons?

Please use the same text box for answers to both 5a and 5b.

6. In which regions and thematic areas is new research most critical, given the challenges faced in meeting the sustainable development goals in urban areas?

7. Are there particular research funding mechanisms that are best suited to respond to these needs and challenges? To help with your answer, a non-exhaustive list of funding mechanisms is provided below. You may use the response box to make additional comments relating to funding (e.g. on duration, flexibility etc).

- **Open competitive calls with:**
 - **funding channelled to and managed by northern institutions who identify southern partners**
 - **funding provided to both northern and southern institutions**
 - **funding channelled directly to any successful global institution**
 - **funding channelled only to southern institutions**

- **Bilateral/trilateral funding partnerships between countries with matched funding**

- **Regional pooled funds**

- **Fellowships (for PhDs, Post-docs etc)**

- **Institutional/core funding**

- **Partnerships with private sector**

8. [optional] Please provide one or more examples of where research into the intersection of the built environment and human development has had an impact on policy or practice. How was this achieved?

Get in touch

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