

Urban Sustainability in the Global South – A review of projects connected to low and middleincome countries at SLU

- SLU Urban Futures & SLU Global Collaboration

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Abstract

This report is a first step in mapping projects and publications within SLU connected to urban issues in low and middle-income countries, with the aim of synthesizing research strengths and themes in this area. The work in compiling this report was coordinated by Andrew Gallagher, project assistant at SLU Urban Futures, from August 2020 to January 2021. The report illustrates the relevance of urban research connected to the global south by drawing upon relevant literature and policy documents. The report evidences urban research conducted across departments and platforms at SLU, showing the diversity of material and its connection to the sustainable development agenda. It is suitable as reading material for anyone interested in SLU's research connected to low and middleincome countries and those interested in issues relating to urban sustainability.

Please note that this report is in not conclusive for the theme of urban sustainability. The listed projects and their connections to themes and Sustainable Development Goals is by no way exhaustive; thus can be complemented and amended where seen fit. This document is an inventory of existing projects and research connected to low and middle-income countries with a focus on urban issues, and is intended to offer insights for researchers to develop and promote cross-disciplinary collaborations in this area. The analysis provides a start to a complex conversation relating to the interconnectedness of the Sustainable Development Agenda and issues of the urban in order to support the development future urban research at SLU.

Keywords: Urban Sustainability, Global South, Low and Middle-income Countries, SDGs

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Abbreviations

SLU	Swedish University of Agricultural Sciences
SDG	Sustainable Development Goal
UN	United Nations
NUA	New Urban Agenda
EU	European Union
SIDA	Swedish International Development Cooperation Agency
CGIR	Consultative Group for International Agricultural Research
FAO	Food and Agriculture Organization of the United Nations
LTV Faculty	Faculty of Landscape Architecture, Horticulture and Crop
	Production Science, SLU

1. Introduction

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1.1. The relevance of the urban with a focus on the global south

The New Urban Agenda and the inclusion of a standalone urban goal (SDG 11) through Agenda 2030 illustrates increased policy attention towards cities as an integral part of the global sustainable development agenda (Simon et al. 2016; Valencia 2019). Although not formally connected, the New Urban Agenda (NUA) and the Sustainable Development Goals (SDGs) are signed by government signatories and for the first time recognize the role of sub-national entities, such as metropolitan authorities, in the achievement of supranational policies, and point to the urgent need for integrated multi-level governance to engage with the complexities posed by global challenges (Leck and Simon 2018).

Urbanization is the greatest contributor to global change processes, of which the city is its engine. Rapid urbanization is happening on an unprecedented scale across the globe, where according to the United Nation's Sustainable Development Report (2019), 66% of the global population will live in cities by 2050. As populations rise and the footprint of urban areas grow, there is a growing need to better understand processes of urbanization and its related land use in connection with impacts upon resource use, environmental change, health and socio-demographic change (Haase et al. 2018). Urbanization processes have complex connections to global processes, and the new policy and governance solutions demonstrate the urgency of addressing these multiple processes on different scales. Despite its complexity, the recognition that urbanization processes are accelerating global climate and environmental change (Grimm et al. 2008) places cities at the forefront of sustainable development efforts. The word 'cities' is used in this report as a reference to areas of dense urbanization. However, it is important to note that urban does not only refer to dense cities, but to urbanized agglomerations of different kinds, which are systematically connected and may sprawl beyond jurisdictions and formalized settlements.

The global south will experience the most rapid urbanization in the 21st century, where 90% of urban growth will happen across cities in Africa and Asia (UN 2020). Consequently the resulting impacts on land-use, environmental change, sociodemographic change and health will be intensified. A greater emphasis on understanding urban issues in low and middle-income countries is required as cities in these regions and countries typically experience more complex sustainability challenges with fewer financial and knowledge capacities (Donaldson, Marais, & Nel 2020; Marais & Cloete 2017). COVID-19 has exposed some of the weaknesses in global development efforts, where urbanization in the global south is outpacing the development of housing, infrastructure and services (UN 2020), and magnifying interconnected problems of sanitation, health and access to basic public services. For example, "The proportion of the urban population living in slums rose to 24 per cent in 2018, or over 1 billion people, due to increases in Northern Africa and Western Asia and sub-Saharan Africa" (UN 2020), pointing to worsening development trends that could exacerbate the negative impacts of urbanization.

Cities in the global south are often hampered in their efforts to tackle issues of urbanization and sustainability by weak institutions, poor governance mechanisms, and higher levels of poverty, highlighting the need for a more concerted effort to improve capacity building and policy-making. However, the absence of formalized approaches to processes of change reveals an array of ad-hoc, localized initiatives that are overlooked by policy-makers and researchers (Parnell 2016). In light of the wicked problems connected to global climate change and processes or urbanization, innovation on a local scale in specific contexts can help inform policy-making and governance processes. This is increasingly important as macro policy terrains such as biodiversity, climate change and health that have largely been absent from discussions on space, scale and location have now been included as factors within city policy concerns through the New Urban Agenda (Earle 2016). The various drivers and effects of urbanization are markedly different across regions and cities in both the global north and global south (Alberti 2017), therefore greater emphasis should be placed on understanding the interconnection of these processes within spatial and socio-political, and cultural contexts. A pertinent example is climate change, where the drivers of climate change have historically been caused by the global north, yet have disproportionate effects on the global south through increased food and water scarcity. Moreover, the consequences of these feedbacks will further challenge the spatial, socio-political and cultural make-up of urban areas across the world, as migration increases from areas vulnerable to climate change.

A research focus on cities is central to understanding how urbanization poses strong sustainability implications across multiple scales, where many of the associated challenges and opportunities are found in the global south (Nagendra et al. 2018). Urbanization processes like urban sprawl not only provide a spatial lens to understand issues of urban planning and urban expansion, but also lay bare the interconnected challenges associated with social, ecological and economic systems. Research agendas on urban sustainability lift important questions around equality and equity by ensuring social inclusion, economic well-being and environmental quality within cities, whilst also reducing the negative external impacts of the city beyond its boundaries (ibid). The Sustainable Development Goals and the New Urban Agenda calls for a holistic and transformative approach to address

sustainability challenges, acknowledging a new critical window to make cities pathways for sustainability transitions (Mcphearson et al. 2016; Caprotti et al. 2017).

1.2. Conceptualising the Urban

Practical and intellectual understandings of the urban are messy and bring together a diversity of research fields, academic disciplines and policy domains. Spatialtemporal approaches to urbanization have long been used by geographers, economists and social scientists alike. Topologies of cities have emerged that have broken down the city into specific geographies with their own characteristics such as peri-urban, urban planning and administration, city-industry dynamics, urban green infrastructure. The traditional assumption in urban theories is that cities represent a territory that is qualitatively specific, different from "non-urban" spaces (Brenner and Schmidt 2015). Certainly technical infrastructure for supply systems and traffic can be organized differently in a dense urban form than a sprawled environment. Though socio-spatial transformation through globalization and urbanization compel researchers to rethink existing approaches (Wolfram Borgström & Farelli 2019).

Critical Urban Theorists like Lefebre (1974) have tackled this challenge by politicizing the city, emphasizing that space is not just a physical concept but is socially produced through a diversity of needs and identities of different social groups. The complex social production of space through values and identities affects spatial practices, and has led to critiques of power, injustice and social inequality rooted in and between cities (Brenner 2009), which are central questions posed by sustainability challenges that draw upon environmental and economic problems but also the diverse social issues.

Urbanization is bringing together rural hinterlands with urban metropolises through physical urban expansion, economically through global supply chains; and social connectivity through improved transportation and telecommunications bring people and cultures together through processes of globalization (Lenzen et al. 2012). Urban areas have therefore direct and indirect environmental, economic and social impacts on both a local and global scales, which illustrates how the urban agenda is inherently connected to other policy domains through global resource flows that extend the geographical footprint of the city (Hateb et al. 2019). For example, food consumed in cities is produced in rural areas, which means the water and energy footprint of a product is generated far beyond where the product is consumed. Additionally, models of urban sustainability usually address single ecological problems despite urban sustainability problems being regional or global in scale (Wachsmuth et al. 2016). From a spatial perspective, regional and global processes of production, consumption and distribution should be at the forefront of research to capture the greater complexity of urban sustainability.

Alongside the intellectual evolution of the urban, political discourses have simultaneously contributed to the changing concept of the urban, which is aptly captured in the UN Habitat's (2015) definition of the urban:

"all levels of human settlements, including small rural communities, villages, market towns, intermediate cities and large cities and metropolises, i.e. wherever a stable community is continuously located and there are housing units together with permanent social and economic activities, common public space, urban basic services, and a local governance structure" (UN Habitat 2015, p.13).

This is particularly important for understanding the development processes of rural areas that are happening independently of big cities, but also for capturing the unique development trajectories of the increasing numbers of small and medium towns and urban areas (Bai et al. 2018; Marais & Cloete 2017). Africa's urban areas are expanding on an unprecedented scale as rural-urban migration accelerates urban densification and urban sprawl (Haggblade 2020). National definitions of urban boundaries therefore pose normative and methodological problems for understanding sustainability challenges across a constellation of urban settings, and translating global targets to local-level implementation (Capriotti et al. 2017). The availability of data from cities is different across geographical regions; and the type of data poses questions about what kinds of sustainability challenges are incorporated into policy considerations. The context of urban areas and their relationship with social and environmental challenges is markedly different across the world, and the way these challenges are interpreted and acted upon is largely decided by the different actors and authorities that are incorporated or excluded from decision-making and monitoring (Parnell 2016).

Whether desirable or not, a lack of a universal definition of urban settlement leaves researchers and policy makers with no common research framework (Alberti 2018) to grapple with urbanization processes within city boundaries but also beyond where urbanization interacts with other global drivers influencing land use, biodiversity loss, resource extraction, carbon emissions, global and regional climate change, economic activities, and human wellbeing (Bai et al. 2018). Systems approaches to urban sustainability that captures dynamics of urbanization and connect disciplinary knowledge are promoted as a way address the evolving challenges faced by urban areas (Collins et al. 2011; Grimm et al. 2012).

An effort to integrate disciplines and research areas around urbanization processes through holistic and transdisciplinary studies has been called for through transformative approaches to sustainability challenges (Biggeri et al. 2019; Boas et al. 2016; Marshall et al. 2018; Wolfram, Borgström & Farelli 2019). The approaches should (i) be adaptive to understand the wicked problems of sustainability across complex governance structures and (ii) integrative to address conflicts, synergies and trade-offs between sustainability issues and policies like the SDGs, (iii) address structural inequalities through legitimization and inclusion of marginalized voices. The call for a new approach to sustainability should reflect upon local and regional perspectives, which capture the contextual nature of sustainability problems, as well as reflecting place-based solutions, local knowledge and cultural settings in research and policy development (Elkins, Gupta & Boileau 2019).

The Urban at SLU

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2.1. Departments and platforms

SLU hosts two central departments that investigate urban questions:

- Department of Landscape Architecture
- Department for Urban and Rural Development

Whilst these departments host disciplinary studies in architecture, urban planning and social science, there is an emerging culture of collaboration across departments that apply more holistic and integrated approaches to urban studies. Other departments also conduct research connected to urban sustainability, despite not having a disciplinary focus on the urban, the Department of Energy and Technology, the Department of Economics, and the Department for Biosystems and Technology are examples (these projects are listed in Appendix 2). Research increasingly occurs in interdisciplinary and transdisciplinary projects that build upon the knowledge and expertise of multiple disciplines, methods and theories. In particular, SLU's Future Platforms investigate future-oriented research through inter and trans-disciplinary approaches. These platforms are:

- SLU Urban Futures
- SLU Future Food
- SLU One Health
- SLU Future Forests
- SLU Global

SLU's policy to contribute to the United Nation's Sustainable Development Goals both in Sweden and internationally requires that SLU's education, research and environmental analysis address the 17 listed global goals, and is a driving force for further collaboration across themes and disciplines. In the Policy for SLU's global contribution to Agenda 2030 (SLU id) urban sustainability is identified as one of six prioritized areas that SLU should focus its global contribution to Agenda 2030. While there should be great opportunities for SLU to contribute to the area through the development needs and SLU's capacities in the field of urban sustainability, it is an area where SLU currently has relatively limited collaborations in terms of research and larger capacity development programs. A new collaboration between SLU Urban Futures and SLU Global aims to develop inter- and transdisciplinary collaboration with a focus on urban sustainability in the global south.

2.2. About the Collaboration: Urban Sustainability in the Global South

SLU Global together with SLU Urban Futures are working together to strengthen research collaboration in the thematic area of urban sustainability in the Global South. The collaboration is facilitated through an affiliate programme between SLU Global and SLU Urban Futures that commenced in Summer 2020 and will continue throughout 2021. The collaboration brings together the capacities and expertise embodied within the two platforms:

SLU Global supports collaboration for global development with a focus on low and middle-income countries. The unit based at the Vice Chancellor's office facilitates international engagement at SLU based upon Agenda 2030. SLU Global focuses their contribution to Agenda 2030 on six priority areas based upon the universities mission and strengths:

- Climate change
- Food security
- Circular and biobased economy
- Biodiversity and ecosytems
- Global health
- Urban sustainability

SLU Urban Futures' missions is to inspire and support SLU develop and strengthen transdisciplinary research, education and collaboration within the field of sustainable urban development. The platform provides an urban lens to the collaboration that includes spatial and socio-ecological sustainability perspectives on urban landscapes. SLU Urban Futures explores the relationships between landscapes, humans and non-human actors, and investigates urban-rural dependencies and interactions. Some particular thematic foci and method labs are for example:

- Food & Cities
- Urban Childhood
- Urban ecosystem services

- Urban wildlife
- Urban forests
- Transformations method-labs:
 - *Futures lab* for curiosity-driven and interdisciplinary explorations of future research questions and societal challenges
 - *Synthesis lab* for methodological experiments in synthesis-driven knowledge generation
 - *Criticality lab* for mobilizing discursive formats in education and through events
 - *Policy lab* for critical reflection upon policy domains in order to help co-create relevant and actionable future research agendas

The affiliation between Urban Futures and SLU Global will catalyze collaboration within the area of urban sustainability with a focus on the global south. There is a need to strengthen urban research at SLU, which as an institution has previously been defined by research associated with the rural. The commitment to research that contributes to Agenda 2030 elevates the need for research that The collaboration will encourage transdisciplinary collaboration that is society-relevant, and change within SLU's research culture that is integrates research on human and environmental systems. The affiliation will help strengthen critical infrastructure at SLU that addresses the relations between spaces and systems affected by processes of urbanization with a focus on low and middle-income countries.



A search was conducted on SLU's webpages for all projects in connection to low and middle-income countries. The project search used each departmental webpage to find ongoing projects connected to research conducted with a focus on/connection to countries in the global south. Further searches were conducted using the SLU Global platform and their 'SLU and Agenda 2030' pages, which collates some of the existing projects. Each SLU Future Platform, SLU Urban Futures, Future Food, One Health, Future Forests were also connected to the webpage searches. A more generalized key word search was conducted using the search function on the SLU website, using the key words 'Urban', 'Developing Countries', 'Global South', 'Low and middle Income Countries', however, as expected this brought back many of the projects found through the departmental searches. The search was conducted during the period August to October 2020, therefore any projects announced after this period have not been included in the analysis.

The projects were divided by identification as either departmental projects, capacity building programmes, development programmes, networks or SDG themes. The following information was given for each project: Department and unit, SDG coverage, country, contact for project, and key words. The projects were then coded using the information from SDGs, country and key words. All the projects are listed in Appendix 1, which includes links to each project page, as well as categorization data.

In addition, this report can build on a publications search conducted by Assem Abou Hateb in 2019, which used the keywords Urban* OR city OR cities OR town to gather publications from all departments across SLU that were related to the urban. A further publications analysis used the entries to Scientific Publications by SDG conducted by the university library, which is hosted on the SLU Global webpage. The list of publications linked to SDG 11 (Sustainable Cities and Communities), was filtered by selecting publications connected to low and middle-income countries, then each publication was coded using key words from the publications list is available, which includes the DOI for each publication and the key word categorization data.

Further analysis was conducted using the survey results from a survey by SLU Global on the Internationalisation of Research at SLU. The survey returned opinion based answers from researchers, specifically around the relationship between research, the SDGs, and low and middle-income countries. It is worth noting that the information from this survey only applies to the LTV faculty, and does not give an accurate representation of SLU as a whole.

This report reviews a range of policy documents, reports and academic articles to explore the urban theme and to provide analysis on the findings. The document search and analysis investigates how urban issues connect to other policy areas, and highlights important research themes and policy focus areas.

4. Results

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SLU has a long history of research collaboration with 20% of publications conducted in partnership with authors in low and middle-income countries. SLU engages in multiple collaborations with a focus on low and middle-income countries through the following forums:

- Departmental research projects
- Development programmes (such as SIANI, AgriFoSe2030, etc.)
- Capacity building programmes (bilateral agreements)
- Academic networks

Additionally, four themed areas ran from 2017-2019 in relation to the Sustainable Development Goals. There are numerous resources to access and track previous and ongoing research connected to low and middle-income countries. SLU Global has developed an interactive map highlighting research done in collaboration with low and middle income countries. It is also possible to look at scientific publications by SDG, which categorises research according to the Agenda 2030 goals. SLU Global hosts a webpage that highlights activities happening related to each SDG within education, research, and through partnerships at SLU on the SLU and Agenda 2030 page. SLU Urban Futures highlights activities, projects and research ongoing at SLU related to urban sustainability and in particular with an inter- and transdisciplinary approach. Currently no resource exists to map research, publications and projects at the intersection of urban and the global south, which is the reason for establishing this study.

4.1. Projects

4.1.1. Thematic overview of projects in low and middle-income countries

The project search returned 54 departmental research projects connect to research in low and middle-income countries; 4 bilateral research capacity building projects; 9 development programmes; and 4 networks. Although these projects are listed separately, it should be noted that some of departmental research projects are not independent are included in the work packages of larger research capacity and development programmes.

Of these 77 resources, 25 projects have an explicit thematic link to urban issues, and multiple projects have indirect links to urban issues. A clear majority of projects at SLU connect to SDG 15 (life on land) and SDG 2 (no hunger), with 46 and 32

projects respectively incorporating these goals into their project theme. These projects demonstrate a direct connection to agriculture and food systems, with different focuses on agricultural production, food security, urban and peri-urban farming, livestock production, rural development and agricultural entrepreneurship. The keyword analysis, depicted in Figure 1, demonstrates the following subject-focus of projects across SLU connected to low and middle income countries, with the larger text representing topics most referenced. Topics listed in descending order from most mentions are as follows: Agriculture (21), Forestry (15), Food Security (14), Governance (12), Health (12), Water (10), Capacity Building (9), Climate Change (9), Education (9).

Research is conducted in the following countries in descending order: Ethiopia (11), Kenya (11), Uganda (9), Nepal (6), Tanzania (6), Egypt (4), India (4), Rwanda (4).

There are overarching connections with SDG 1 (no poverty) and SDG 5 (gender equality) across a multitude of thematic areas, with 20 and 14 project connections respectively. The least connected SDGs are SDG 7 (affordable and clean energy) and SDG 4 (quality education), with 4 and 5 connections respectively (See appendix 3 for list of SDG connections). There is a weak correlation between these findings and the key word search that gives 'energy' and 'emissions' a low ranking with a 1 mention each. The findings for education do not necessarily correlate with the key word analysis, as the key word 'education' was linked to all four of the research networks that host educational exchanges between partner institutions and SLU, and are not specific research projects.

A vast majority of projects are multidisciplinary, and often looked at themes that are interconnected from different disciplinary perspectives. The Department for Urban and Rural Development host the most (13) research projects connected to low and middle-income countries, and the Department for Animal Breeding and Genetics rank second, hosting 4 projects. See appendix 1 and 2 for number of projects in low and middle-income countries by department.



4.1.2. Thematic overview of projects connected to the urban

This section gives and overview overarching research themes covered across research programmes and projects relating to urban issues, and demonstrates conceptual connections with the various targets of SDG11:

Table 1: United Nations SDG 11 targets

SDG 11 (Sustainable Cities and Communities): Targets

11.1 Ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.

11.2 Provide access to safe, affordable, accessible and sustainable transport systems for all.

11.3 Enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management.

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage.

11.5 Significantly reduce the number of deaths and people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters.

11.6 Reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

11.7 Provide unaversive access to safe, inclusive and accessible, green and public spaces.

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.

11.b Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigations and adaptation to climate change, resilience to disasters.

11.c Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings and utilizing local materials.

There is an urban focus across projects connected to low and middle income countries, with 19 projects connecting to the thematic areas of SDG 11. The key word analysis demonstrates that topics connecting to urban issues mostly relate to subject areas within agriculture, food and forestry. Aside from agriculture and food, other thematic topics like housing, slums, sanitation and livelihoods rank within the median of 3 to 4 references. However, urban research in the global south covers a range of issues that bridge social, economic and ecological research perspectives:

Urban planning and housing is a thematic focus of urban research in the global south at SLU. The research capacity development programme in Tanzania, and additionally the research capacity programme in Bolivia includes multiple aspects of urban planning. Sub-projects within these programmes deal with issues of governance, municipal services and community outreach that connect to targets 11.3 and 11.b. Sub-projects on housing and habitation investigating issues of housing and slums directly address 11.1, and research themes on urban densification and urban sprawl have conceptual links with target 11.3. Within the Tanzania programme, the issue of green spaces in cities connects to target 11.7. The sub-project within the Bolivia programme addresses target 11.b by bridging issues of climate mitigation and adaptation with housing.

Urban agriculture and food is an integrated theme across urban research in the global south. Sub-projects of the research capacity programme in Tanzania investigate sustainable agricultural productivity and processing in relation to value chains for enhancing food security in Tanzania, and agri-business and sustainable development. There are strong associations between research looking at food systems, which inherently span rural, peri-urban and urban research and target 11.a that places focus on positive economic, social and environmental links between urban, peri-urban and rural areas. Likewise, a number of projects bridge academic research on entrepreneurship in agriculture, gender and accessibility in food systems, and issues of food production and consumption that connect to targets 11.5 and 11.b dealing with economic insecurity and vulnerability.

Water and sanitation provides perspectives on urban planning and governance in the Critical Waterscapes project in Argentina that reinforces research on target 11.1. Similarly, the project's connects urban water issues with processes of climate change, globalization and waterscapes in urban design that aligns with the emphasis target 11.5 places on vulnerability in reference to water-related disasters. Research projects from the department of energy and technology offer a contrasting technical perspective of sanitation issues connected to waste in urban slums; and the interconnections between sanitation, health and technology, which can be coupled to target 11.6 on municipal waste management. The research capacity development programme in Bolivia on habitat and environment in the same manner brings the themes of water use, recycling and sanitation together in the project 'systems and technologies for safe resource recovery and reuse.

Other departmental projects diverged from these overarching themes but nevertheless linked to target themes spanning air pollution, health, and democratic institutions. Likewise, the development programme on *Strengthened Institutions for Sustainable Climate* highlighted issues relating to ecosystem services, buildings, transport, and renewable energy. However, there were no listed sub-projects concerning these subjects directly. Target 11.2 relating to sustainable transport, and 11.6 relating to air quality are less well represented across research projects.

There were overarching connections linked to gender equality and no poverty in the projects, despite not being the central research issues. However, this reflects the interwoven nature of these issues across all targets that place a focus on helping the most vulnerable and poorest in society, which often include women and children.

4.1.3. Publications

The publication search conducted in 2019 returned a total of 801 publications from all departments across SLU. Each of these were connected to one of the key words Urban* OR city OR cities OR town. The Department of Landscape Architecture returned the highest number of matches with 137 publications, with the Department of Rural and Urban Development, and the Department of Landscape Management returning 101 and 67 matches respectively. The natural science department returned notably fewer matches. A separate publications search conducted using the publications gathered under the SDG11 library search, returned 476 publications from across SLU. All of these publications list and the publications list from 2019. Out of the 476 urban publications, 98 also connected to low and middle income countries.

In line with the results from project themes, Agriculture and food is thematic areas connected to most publications from research connected to urban and the global south. Figure 2 illustrates the variety of topics, subject areas and themes identified as key words in articles, with the larger text representing more references topics. Topics like food security, peri-urban and urban agriculture, urban livestock, and issues of production and consumption were frequently occurring. Water and sanitation was also highly represented in published literature, with research papers on water systems, water treatment, sewage, and irrigation. A substantial amount of publications reflected aspects of the theme urban planning, ranging from publications on parks and green spaces, land use, land governance, and municipal services. An additional research theme on forests was identified from the publications list that was not as well reflected in the themes across research projects. Notably, many of the research publications demonstrated interactions across multiple themes, which reflects the multidisciplinary approaches to research relating to urban sustainability at SLU. There is a greater diversity of issues and themes covered in the publications list like issues relating to migration, crime, biodiversity and ecosystem services. To some extent this could relate to publications connected to independent research, PhD projects and research that is not captured in larger departmental and research capacity building programmes.

China, Uganda, Kenya, Ethiopia, and Ghana (in descending order of mentions) were most connected to research publications within the area of urban research in the global south, pointing to a strong research focus on Sub-Saharan Africa.

Energy issues and educational issues were not well reflected in publications within urban studies in the global south, suggesting that SDG 4 and 7 are underrepresented in publications. The results only demonstrate findings from a specific list of publications that does not represent an exhaustive list of all research conducted at SLU.



Figure 2: Themes within publications with a focus on low and middle-income countries

4.1.4. Funding

Research capacity development projects are funded through several organisations including the Swedish International Development Cooperation Agency (Sida), the European Union (EU), the Swedish Research Council Formas, the Swedish Research Council (Vetenskapsrådet), the Consultative Group for International Agricultural Research (CGIAR) institutes. Most of the projects are funded primarily through SIDA, of which SLU participates through bilateral cooperation with partner countries.

A majority of departmental research projects connected to low and middle income countries are connected to research development capacity work packages, and therefore receive funding from the afore mentioned bodies. Other specific funding streams include:

- Horizon 2020
- UNDP
- FAO

- STINT
- Swedish Research Links
- Erasmus+
- Grand Challenges Canada
- German Federal Ministry of Economic Cooperation Development
- Sustainable Agriculture Research and Extension Center (SAREC)
- Linneas Palm Scholarship
- Urban Futures Seed Funding
- Research into Practice
- Kamprad Family Foundation
- EU FP7 Marie Curie Career Integration Grant
- SLU Future Animals, Nature and Health
- Kolmården Fund Raising Foundation

There are several funding streams available to researchers at SLU. SLU currently uses <u>Pivot</u>, which is a global search engine for funding calls (however the contract with this search engine will end in February 2021):

- Open calls at Formas, Forte and Vetenskapsrådet are in <u>Prisma</u>.
- Calls with a focus on global development are found via <u>SLU Global</u>

List of Swedish funding sources: <u>https://staff.ki.se/list-of-swedish-and-nordic-external-funding-sources-a-o</u>

5. Future Urban Research

5.1. An integrated approach to SDG synergies, conflicts and trade-offs

SLU has a commitment to research for the SDGs through SLU's global contribution to Agenda 2030. Research at SLU makes a direct contribution to the Sustainable Development Goals through knowledge production, capacity development, environmental monitoring, and critical research and development on the understanding of sustainability in different contexts and dimensions through an inter- and transdisciplinary approach. Despite this institutional commitment, only 37% of respondents at the LTV Faculty stated that the SDGs and Agenda 2030 influence their work, in a survey conducted by SLU Global. The same survey illustrated that 58.43% of respondents are aware of SLU's global contribution to Agenda 2030 and the diagram below shows the areas of contribution:



Rate the extent to which your work contributes to the following 6 themes outlined in SLU's global contribution to Agenda 2030:

Figure 3: Survey results from LTV Faculty contributions to SLU's priority areas

The findings of the survey demonstrate that a higher proportion of research within the LTV Faculty contributes to the climate change, biodiversity and ecosystems priority areas. Circular and bio-based economy has the lowest contribution from researchers at LTV. Notwithstanding, researchers directly and indirectly interact with multiple policy areas, which highlights the cross-cutting nature of themes connected to SLU's contribution to Agenda 2030. More broadly, it reflects the interconnections and synergies operating across the SDGs, drawing together multiple research areas, disciplines and policy areas.

Figure 4 highlights SLU's priorities in the policy for SLU Global's contribution to Agenda 2030. A breakdown of sub-themes was identified using the descriptions of each priority area. The topics covered in each priority area illustrate some of the interconnections across the central policy areas of urban sustainability, climate change, and food systems, emphasizing how policy areas interact and are mutually reinforcing. This is a representative diagram, which shows just some of the connections relating to important themes identified as relevant for urban sustainability in this report, however, there exist many more complex interactions:



Figure 4: Illustration of synergies between SLU's priority areas

Scholarship is emerging that looks at the myriad interrelationships and dependencies between the SDGs through an analysis of synergies, trade-offs and conflicts within and between the goals (Kroll et al. 2019; Maes et al. 2019; Mainali et al. 2018; Prahdan et al. 2017). A nexus approach is forwarded by some scholars as a way to support the cross-sectoral implementation of the SDGs, which identifies how different targets might serve multiple goals and therefore support the development of an integrated framework for implementation (Weitz et al. 2014). Although a nexus approach presents questions concerning measuring, governance

and accountability (Bowen et al. 2017), it provides an opportunity to proactively address recognized complexities within the SDGs and formulate robust solutions by turning trade-offs in to synergies (Weitz et al. 2014).

5.1.1. SDG 11

The theme of urban sustainability is well represented within research conducted in the global south at SLU, with 38 projects having a research connection to SDG 11. The research themes connected to urban issues are the most diverse of all of the research areas listed within projects at SLU, which highlights the relevance of urban research as a priority area. SDG 11 interacts in complex ways with the other 16 goals for sustainable development, and a complete analysis of interaction is beyond the scope of this study. Nonetheless, the following section provides some key highlights into the interactions between different goals and research areas at SLU, drawing upon literature to critically engage with goal synergies, conflicts and tradeoffs.

Arguably, all aspects of sustainability arise from human activities, which are concentrated in urban areas (Mehta et al. 2016; Verma and Rashubanshi 2018). Cities are the hub of economic growth and employment, which directly impact goals to lift people out of poverty. Urban areas intersect with food, product, and energy consumption, which are interconnected across goals relating to biodiversity, water, energy use. Maes et al. (2019) have found 91 targets out of 169 targets listed under the SDGs as requiring action in relation to urban ecosystems in order to deliver upon Agenda 2030.

The interdependencies between cities and agricultural landscapes through food systems, and the imposing conditions human populations place on agricultural productivity and ecological systems, brings together SDG 2, SDG 15, and SDG 11 in multitude relationships. 6 projects specifically connect goals 11 and 15 bridging issues of urbanization and land use. The measure built into Goal 11 are built upon the principle of 'positive economic, social and environmental links between urban, peri-urban and rural areas' (UN 2018), inextricably links the thematic areas connected to both urban and rural development. Ongoing projects linked to urban sustainability in the global south clearly underscore these relationships, where 9 projects investigate aspects of urban and peri-urban agriculture with critical perspectives on poverty, gender equality, economy and employment.

The link between SDG 15 and SDG 11 encounters conflicts and tradeoffs. Urban expansion and rapid urbanization through urban sprawl demonstrates how urban areas engulf surrounding land (Hatab et al. 2019). Land use change increases the human impact on natural ecosystems often resulting in the destruction of

ecosystems, habitat fragmentation, and a reduction in biodiversity both within urban boundaries and beyond (Hirsch 2010). However, research is emerging that looks at the intersection of research themes on biodiversity, ecosystems and urban environments as a way to understand and conceptualize these tradeoffs (Maes et al. 2019). Nature Based Solutions off-set challenges associated with climate change and urbanization by leveraging the ecosystem services to provide co-benefits for human and natural systems (Kabisch et al. 2016), highlighting possible ways to research relating to human and natural systems.

A project on active ageing in India, and another on pollution and human health highlight that urban ecosystems can help manage benefits for human health and well-being (Hartig et al., 2014). However, evidence of correlations between health and wellbeing and urban ecosystems is lacking (Maes et al. 2019), despite the impact of urban lifestyles and the built environment being regarded as an impediment to the sustainable development of cities (Forman, 2014; Francis and Chadwick, 2013; Gaston, 2010).

The Department of Energy and Technology conducts research on issues relating to sanitation and irrigation in the global south; the Department Urban and Rural Development further contributes to the subject of irrigation, both of which make significant contributions to SDG 6 to 'ensure availability and sustainable management of water and sanitation for all' (UN 2015). 5 projects investigate drinking water, wastewater and sanitation, which bridge SDGs 6 (water and sanitation), 3 (health and wellbeing), and 11 (sustainable cities and communities). An additional project on waterscapes further draws connections between water and cities. Cities and urban areas across the world have large water footprints and cumulatively consume hundreds of billions of gallons of water per day (McDonald et al. 2014). This is from both direct use of water resources, and indirect use through the consumption of goods and products. Water demand is driven by population growth but also by increased economic development that uses water resources beyond municipality supplies (Bartlett, 2003, Bhatia and Falkenmark, 1993). Subsequently there are conceptual trade-offs between SDGs that have targets relating economic development and industrial growth, i.e. SDG 8 and 9.

Prahdan at al. 2017 (p.1172) argue that a strong correlation exists between SDG 11 (sustainable cities and communities) and SDG 13 (climate action). Cities are the drivers of global climate change and similarly experience localized impacts, especially in the global south where financial and knowledge capacities are weaker (Negandra 2018). Despite this, only 3 projects were identified as incorporating research towards both SDG11 and SDG13, suggesting there exist greater opportunities for collaboration between urban research and climate science.

No poverty and gender quality are crosscutting themes across projects connected to research in low and middle-income countries at SLU, reflecting the overarching focus of these themes within Sustainable Development Goals. The UN's Agenda 2030 recognizes gender equality, the empowerment of women and poverty reduction as "the greatest global challenge and an indispensable requirement for sustainable development" (UN 2015). Notably, progress in targets and measures relating to poverty reduction have been statistically linked with progress in SDGs 3 (good health and wellbeing), 4 (quality education), 5 (gender equality), 6 (clean water and sanitation), and 10 (reduced inequalities) (Pradhan et al. 2017, p.1172), which demonstrates the connections between these socio-economic indicators that are synergistic with all of the other SDGs.

In summary, SDG 11 provides a gateway into understanding the impact of human systems on the natural environment, and a lens to view how these systems interact. Rapid urbanization presents unique challenges relating to environmental degradation and increasing inequalities, therefore understanding and enabling urban transformation are central to global pathways towards sustainability (Wolfram, Borgström & Farrelly 2019).

5.2. Principles of future urban research

The trade-offs and synergies discussed above demonstrates the complexity of research connecting to Agenda 2030, which cuts across the entire UN sustainable development agenda. As demonstrated in this scoping study, the research is thematically diverse and research spans across geographical locations. The 2019 Urban Sustainability working group highlighted that researchers generally do not agree on the most important research questions within the broad field of urban sustainability due to the fragmented nature of departmental work and lack of communication between researchers at SLU. Developing an urban sustainability research agenda in the global should rest upon four principles:

1) Holistic and Integrative Research

The absence of integrated approaches to urban sustainability challenges that sufficiently account for trade-offs and synergies across different sectors in sustainability research has resulted in "(i) incoherent policies; (ii) adverse impacts of development policies of one specific sector on the other; (iii) loss of opportunity for positive synergy effects; and (iv) delayed outcomes leading to sustainable development" (Mainali et al. 2018). From both the research at SLU but also globally, knowledge on cities is extensive but research on urbanization processes is lacking; and research on urbanization has not sufficiently focused on the process nor the intersection of urbanization with other environmental systems (Solecki, Seto & Marcotulli 2013). Fragmented research will (i) inform policies that deal only address the symptoms of urbanization, (ii) have reinforcing negative consequences, and lack perspectives that deal with the consequences of the failure of SDGs (Bower et al. 2017). For example, improving the conditions in slums might lead to more unplanned urban expansion in developing countries. Future research activities should address the dynamics between the drivers and effects of urbanization, across space, place time and cultures (Alberti 2017). Centralising urbanization processes as a research focus will further bring together disciplines, and bridge research agendas across urban and rural studies for an integrated approach to sustainabilty science (Short Gianotti et al. 2016), that move beyond business as usual (Bowen et al. 2017).

2) Trans-Inter-disciplinary approaches

Years of research on urban ecosystems that focus on the unique ecological characteristics of urban areas and their environmental impacts have lifted the interaction between ecological systems and human systems (Grimm et al. 2008; Groffman et al. 2010). There are, however, fundamental challenges for applying urban ecology to unique local environments with differing environmental conditions; and integrating understanding of human-environmental interactions with emerging socio-ecological conditions and global processes like climate change (ibid). There have been efforts to establish a new urban systems science that integrates knowledge across disciplines (Brenner et al. 2015; Mcphearson 2016). Given the geographical diversity of cities and complexity of challenges it is not surprising that there has been a proliferation of scholarly work addressing urban sustainability (Mcpherson 2016). Studies integrating ecological sciences with social sciences like psychology, sociology, geography and economics are still hampered by methodological and theoretical challenges presented by normative questions and most are therefore not trans-or interdisciplinary in nature (ibid). Efforts towards supporting trans-disciplinary research synthesis is crucial to generate knowledge that brings together different research (Groffman et al. 2017; Solecki, seto & Marcotulli 2013), but also needs to be sufficiently adaptive to changing and emerging socio-ecological conditions and policy agendas (McPherson et al. 2016).

3) Co-production and capacity-building with partners

Understanding urban phenomena requires new urban knowledge that is integrated across disciplines but also knowledge bases outside of academia (McPhearson et al. 2016). According to Bowen et al. (2017, p.91) "Cooperation between actors across scales, in diverse contexts, and over time, is fundamental to implementing

the SDGs" (Bowen et al. 2017, p.91), reinforcing the need for active participation of different knowledge holders in order to co-produce knowledge that is actionable, reliable and societally relevant (Bai et al. 2018).

SLU should build on the strong tradition of cooperation with countries in the global south through student exchange programmes, research networks, and PhD sandwich programmes to further build an environment of collaborative research and knowledge exchange. The role of a strong science-policy interface that is diverse and inclusive should be integral to research contributing to the New Urban Agenda and SDGs (McPhearson et al. 2016), and the uptake of goals and indicators of the SDGs depend upon the strength of local advocates and communities work with local movements for change (Klopp and Petretta 2017). Therefore, working with municipalities, governments and community organizations is essential to marry the needs of people, policy and places to cutting-edge research. The development of an urban science has predominantly been driven from the perspective of the global north, with a marginalized role for global south scholarship (Negandra et al. 2018). Therefore, participation of researchers, practitioners and policy-makers is integral to build-upon locally-based knowledge and increase the contribution of global south perspectives to new urban science. Capacity-building efforts should address the status quo 'transfer of knowledge and best practice' from Global North to Global south to envision different vision of capacity-building that caters for South-South and South-North transfer to allow for 'mutual learning and cross-fertilization of ideas and innovation' (Negandra et al. 2018, p.348)

4) Place-based and contextual research

Policies and solutions do not always translate from the global north to the global south (Parnell and Robinson 2012). Considering the future growth of cities in Africa and Asia (UN Habitat 2016), low and middle-income countries will provide new perspectives and innovative solutions to sustainability challenges that are based upon local knowledge and contextual understanding of urbanization processes. Innovate approach like citizen science and living labs provide opportunities to engage with the experiences and needs of city residents, using people as data collectors (Bai et al. 2018). These could inform approaches to localize and dogmatize an understanding of interlinkages and interconnections of issues and policies in the unique context of each country, region and population group.

Where benefits arise from the standardization of information around urban development for shared best practice, there is also the risk that by making global goals scalable, it excludes certain forms of knowledge, experience and innovations in social urban realities (Capriotti et al. 2017). The standardization of indicators and targets for urban development may open the SDGs up to influence from vested interests from dominant political and economic discourses. The conflict in interest can already be seen in the approach taken in the New Urban Agenda that places a focus on a strong state with industrialization and economic growth, where the informal and emerging urban development of developing countries does not follow formal planning structures (Capriotti et al. 2017). This helps explain why normative, rights-based approaches have been subjected to a 'pragmatic marginalization' in the SDGs for without a measurement, there cannot be a metric; without a metric, there cannot be a target; and without a target, there cannot be a programme of intervention (Brolan, Hill, and Ooms 2015, 9). As Klopp and Petretta (2017) suggest, the SDGs and new indicators should not overtake existing local monitoring mechanisms but rather complement and strengthen them.

5.3. Trends in emerging urban research

The Sustainable Development Goals report (2020), in the focus area on Goal 11 points to 5 key areas where the global pandemic has highlighted lack of progress or reversal of progress in goal attainment:

- Slums, housing and basic services The proportion of people living in slums has increased to 24% in 2018, and there is a correlation between slum dwelling and vulnerability due to less that adequate access to basic services like sanitation, housing, water and waste-management (UN 2020).
- **Public Transport** The pandemic has highlighted the need for increased public transport that is affordable, accessible and reliable both as a means to mitigate pollution but also improve inclusivity and productivity (ibid).
- Urban planning Reducing urban sprawl and improving the conditions of built-up areas is central to improving public health and reducing vulnerabilities to hazards and natural disasters (ibid).
- **Open public spaces** Public spaces are important for promoting health and productivity, where pedestrianized and green spaces can support the informal economy and livelihoods. South and East Asia, and Africa have the worst access to public spaces (ibid).
- Air quality Exposure to air pollution causes premature death and has detrimental health effects. Reduced pollution due to lockdowns under the pandemic has demonstrated the importance of environmental regulation to improve air quality in cities (ibid).

The UN points to worsening trends in these areas, despite not being new areas of concern. The regions of Sub-Saharan Africa and South and East Asia experience worst attainment in all of these areas, emphasizing that significant effort is required to improve conditions in the global south in order to achieve the ambitions of Agenda 2030. Sweden's global development cooperation sets out specific thematic focus areas relating to these aspects of the urban agenda and global development, which aim to address some of these issues of urbanization. Key priorities listed in the Strategy for Sweden's contribution to global development (2018) reiterate the importance of urban questions, of which Sweden's development operations will contribute to improving:

- Greater access to basic services and housing in urban areas for people living in poverty – including deficiencies in terms of waste, sewage management, recycling, housing and transport, which have major negative consequences for people's health and the environment both inside and outside of cities (UD 2018).
- Climate change resilience of cities and improved use and access of renewable energy Improving sustainable production and consumption and energy use to help reduce pressure on the environment. Increasing efforts for the protection and restoration of natural resources and ecosystems in order to mitigate and adapt to climate change (ibid).

SLU has research expertise and capacity concerning all of these research themes, however, based on the thematic focus of projects relating to urban sustainability in the global south, three overarching themes emerge that integrate disciplinary research and present opportunities for more holistic relating to future urban sustainability agendas:

- Urban Food Security
- Participatory urban planning and public services
- Climate resilience and energy

5.3.1. Urban Food Security

The Sustainable Development Goals have given urgency to issues of food security through SDG 2 zero hunger. Issues related to food production and food poverty have often focused on rural areas, despite that fact that 80% of food produced globally will be consumed in urban areas (FAO 2019). The SDGs establish relationships between urbanization and the deterioration in natural resources, food insecurity, poverty and sustainable development (Hatab et al. 2019); demonstrating that the social, environmental and economic connections between rural, urban and

peri-urban areas that enable food systems are increasingly coming into focus in policy concerning food systems (ibid). The New Urban Agenda recognizes adequate and nutritious food as a component of sustainable urban development, and centralizes the idea of city-region food systems as a model to tackle urban food security (NUA 2016).

The theme of UFS ties together issues relating to food production, processing, distribution, consumption and waste management, as well as the associated regulatory institutions and activities. Although the spatial dimensions of food production and consumption can be understood as technical and logistical, food security has explicit ethical dimensions through questions of access and distribution (Padgham, Jabbour, & Dietrich, 2015). Consequently, a greater understanding of the possible interactions across dimensions of urban food security is long overdue and is required for the design and implementation of effective policy and management interventions (FAO 2019). Based on the SDG strengths demonstrated by projects across SLU, Urban Food Security would provide the foundations for a nexus approach that bridges interconnected issues relating to food-water-energy, as well as addressing socio-political questions of equality and equity, whilst bridging the gap between rural and urban research.

Food security is often tackled from the perspective of rural food insecurity, however, fast growing cities and the dynamics of rapid urbanization present a variety of different challenges for urban food security. The relative abundance of food in urban areas does not translate into equal access to nutritious, safe and affordable food. Profound inequalities exist in urban areas, which expels the myth that urban dwellers are more food secure than their rural counterparts. With urbanization intensifying in Africa and Asia, urban food security cannot be ignored as a central challenge in our quest towards urban sustainability as set out in the Sustainable Development Goals and the New Urban Agenda. A closer look at the interaction within food systems and the connection between rural and urban areas is key to addressing the complex challenges within food systems.

SLU is well placed to take up the theme of Urban Food Security, as a vast majority of research cooperation with low and middle-income countries engages with issues of food and agricultural sciences, and there is a strong thematic focus on SDGs 2, 11, and 15 that bring together questions on food security, urbanization and land-use.

There is an enabling research environment to establish a future research theme based on UFS, as many elements of the field are already being investigated across different departments. From the projects conducted in the global south alone, themes within UFS include (Appendix 1):

- Urban livestock production (A.4, C.4)
- Urban food production and food supply chains (A.30, A.59, B.2, B.3, B.4, B.6, C.9, D.3)
- Food waste and sustainable food systems (A.14)
- Nutrition, health and gender (A.20, C.1)
- Urban Green Infrastructure (A.25)

Research cooperation around issues of food are well established through SLU Future Food, and collaboration around food and cities is emerging between SLU Future Food and SLU Urban Futures. Many research projects are based on the experiences of the Global North, emphasizing the need for the affiliation between SLU Global and SLU Urban Futures to integrate a global south perspective.

5.3.2. Participatory urban planning and public services

Rapid urbanization is leading to the expansion of built-areas and Africa alone will have to accommodate an additional 900 million urban dwellers by 2050 (Seto et al. 2013). Understanding and meeting the needs of an increasing population of urban residents will be central to achieving the ambitions of the SDGs and New Urban Agenda. Moreover, the drastic changes to the populations of urban areas will present huge governance challenges, especially in the global south. Informal settlements and slums are increasing in cities in Africa and Asia, which have connected problems of sanitation, health and poverty.

Urban planning is the cornerstone of much of the urban research conducted with a focus on low and middle-income countries at SLU, and connects issues of housing, public services, public spaces, and water issues like sanitation. The research capacity development project in Tanzania contributes a majority of the international research directly connected to SDG 11 with its 6 research themes and 5 PhD projects. Another research capacity development project in Bolivia has a sub-project on housing and urban microclimates. The development programme *Critical Urbanities* places a focus on urban water use, and the project *Strengthened Institutions for Sustainable Climate* researches urban slums and climate change impacts. These various projects demonstrate strong synergies between the cross-cutting issues of SDG 11 on human settlement planning and management, affordable housing, and disaster risk management; as well as addressing specific targets of proportions of people living in slums (UN 2018).

The Department of Landscape Architecture, planning and management's thematic focus areas demonstrate that SLU is well placed to further develop research of urban planning, participation and public services:

- Landscape Planning
- Urban Vegetation
- Landscape governance and Management
- Design of Urban Landscapes

A number of projects at SLU with a focus on the global south already investigate these themes, demonstrating the potential for cross- disciplinary collaboration and knowledge-sharing around this integrated theme (Appendix 1):

- Sanitation (A.15, A.16, A.19)
- Water resources (A.24, C.8)
- Municipal, public services and participatory planning (A.32, B.1, B.4, C.3)
- Public spaces (A.25, B.4, B.6)

5.3.3. Climate resilience and energy

In a rapidly urbanizing world, cities are both a leading contributor to climate change but also face severe climate impacts (Tyler and Moench 2012). Cities with their large populations and expansive industries use 75% of the world's resources and produce 80% of the world's carbon emissions (UN Habitat). Access to clean and affordable energy is considered integral to efforts to reduce greenhouse gas emissions and air pollution, and improve living conditions of urban citizens (UN 2020). Processes of urbanization increase demands on energy production and consumption, which have effects on global processes like climate change and localized impacts in city contexts. The ability to adapt and mitigate stressors and shocks relating to climate change therefore directly connects across policy agendas for sustainable development and disaster risk reduction (UN 2015; UNDRR 2015), through efforts to reduce pressure on natural ecosystems and improve the wellbeing of society through reduced vulnerability.

In the NUA's (2016) ambition for 'environmentally sustainable and resilient urban development', aims to leverage the sustainable management of natural resources like land, water and energy that reduce emissions and air pollution through increased access to clean energy and technology. This is also an integral part of Sweden's development cooperation, which understands that "greater access to

sustainable and modern energy services is key to combat poverty, and this can be achieved, for example, by combining greater expansion of sustainable renewable energy with strategic energy efficiency in sustainable energy systems" (UD 2018).

SLU has an established research agenda relating to various aspects of climate resilience and energy, which can be leveraged to better understand these issues in cities in the global south. The coordination of such a theme can be developed from existing research identified through SLU's ongoing collaboration with low and middle-income countries. Some of these existing projects at SLU (Appendix 1):

- Urban Green Infrastructure and Nature Based Solutions (A.25, C.2)
- Institutional networks and climate responses (A.36, C.3)
- Air pollution and household energy (A.40)
- Climate resilience, gender and conflict (A.52)
- Consumption of carbon emissions (A.53, A.54)
- Urban development and climate resilience (B.1, C.3, C.7)

6. Suggestions going forward

The results of this report demonstrate that there is a substantial research portfolio at SLU that engages with low and middle-income countries around issues relating to urban sustainability. Even though examples of collaboration exist, research is still fragmented and communication between researchers, departments and partners in the global south could be improved. A recent survey conducted at the LTV faculty demonstrates that more information on projects in low and income countries is desired.



The following suggestions could help improve the connectivity between researchers and disciplines, and improve knowledge relating to urban sustainability in the global south:

- **Surveys** Conduct surveys with each department to map the awareness of urban research, and understand how networks can be improved.
- Working groups and contact lists Identify working groups based upon emerging urban research themes, and create contact lists for interested parties to engage with research themes.
- **Workshops** Host a series of transdisciplinary workshops to lift and communicate research findings in relevant urban themes.

- **PhD forum** Strengthen connections to young researchers in low and middle-income countries and improve cooperation between partner institutions.
- Interviews with project leads Conduct in-depth interviews with project leads to get improve understanding of synergies and trade-offs between SDGs in existing projects related to urban sustainability.
- Interviews with external actors Broaden institutional perspectives at SLU and learn from best practice of other institutions and relevant societal actors that have expertise in research collaboration with cities in the global south (e.g. African University Research Networks, SEI, SIDA)

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