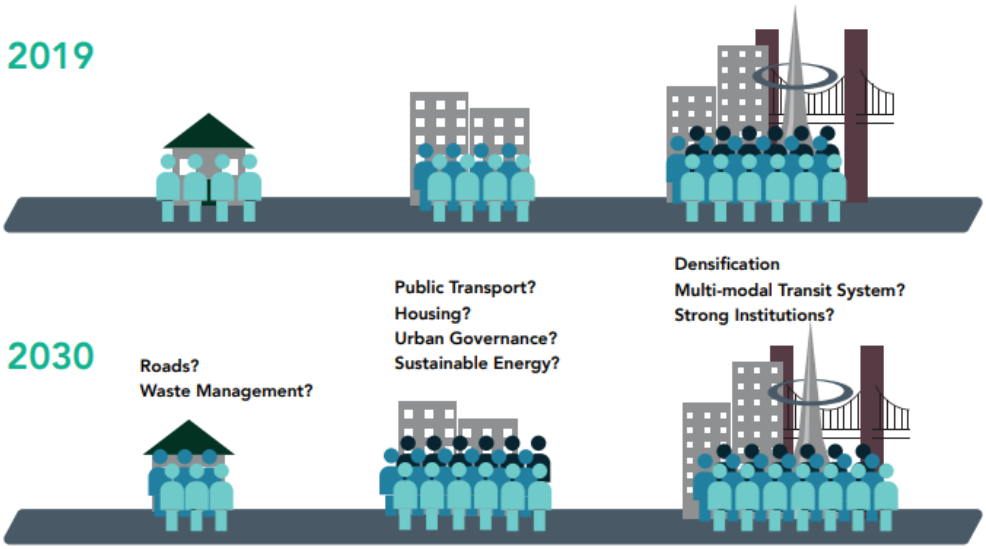
Counting the Costs



Project Summary

Phase I Application of the Pilot SDG 11 Costing Methodology

Research Team

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The 'Counting the Costs' project is a collaboration between AidData, a research lab at the College of William and Mary, and UN-Habitat's Municipal Finance and Urban Economy branch.

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I. INTRODUCTION AND OVERVIEW

UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls.

Several previous studies have attempted to quantify the costs to achieve the SDGs, but none comprehensively capture the cost of achieving SDG 11 or urban sustainability more broadly. Nonetheless, these costing efforts offer a starting point upon which this pilot builds. We briefly profile five of these previous studies below to identify their strengths, weaknesses, and the lessons they offer for the pilot.[1]

When it comes to infrastructure spending, two previous studies provide a good starting point for costing the hardware of infrastructure. The McKinsey Global Institute's *Bridging Global Infrastructure Gaps* report estimates that the world must spend US$3.3 trillion annually to close the infrastructure gap by 2030 – a shortfall of US$0.8 trillion in light of current spending of US$2.5 trillion per year. The McKinsey estimate includes the costs for basic and local infrastructure in high, middle, and low-income countries. Meanwhile, the Global Infrastructure Hub's *Global Infrastructure Outlook* (GIO) study estimates a similar shortfall of US$0.6 trillion per year, but places current spending at US$3.3 trillion and total need at US$3.9 trillion per year. [2]

One important difference between the two estimates is that the GIO report maps infrastructure-related costs to various SDGs, including SDG 6 (Water) and SDG 7 (Energy), while the McKinsey effort does not. Both methodologies provide a good starting point for costing the hardware of infrastructure, but fall short in two respects: (1) they do not take into account social policies (e.g., institutions to support sustainable urbanization) and (2) the macroeconomic nature of the approach increases the uncertainty of the estimates and provides only a fuzzy picture, at best, of the true costs to achieve SDG11.

Moving from infrastructure to other facets of the SDGs, the Sustainable Development Solutions Network (SDSN) benchmarked the costs to achieve the SDGs using costing studies done for the Millennium Development Goals (MDG) in their *Investment Needs to Achieve the Sustainable Development Goals* report.[3] While limited to only those goals that overlap between the MDGs and the SDGs – Health, Education, Environment, Food, Water & Sanitation, Telecommunication, SDG Data, and Emergency Response/Humanitarian – the underlying research offers references to various MDG costing studies that may be relevant to costing SDG 11 achievement by 2030.

Two sector-specific costing studies offer additional lessons learned to inform our pilot. The World Bank's *Costs of Meeting the 2030 Sustainable Development Goal Targets on Drinking Water, Sanitation, and Hygiene* estimates that it will take US$13.8 to $46.7 billion per year (0.1% of global GDP) to achieve only two SDG targets: 6.1 (safe and affordable drinking water) and 6.2 (sanitation and hygiene for all).[4] The World Bank's estimate captures the costs of capital investments, program delivery, operations, and capital maintenance for WASH-related investments in most low and middle-income countries, as well as high-income countries with low WASH coverage. Meanwhile, the World Health Organization estimates a cost of US$58 per person/year to achieve health-related SDG targets (34 indicators, across 17 targets and 4 goals) by 2030 for low and middle-income countries. Their study, *Financing Transformative Health Systems Towards Achievement of the Health SDGs: A Model for Projected Resource Needs,* analyzes 67

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[1] While we profile five costing studies here, there exist additional relevant studies, such as: UNCTAD's *World Investment Report 2014: Investing in the SDGs – An Action Plan*; the African Development Bank's *Africa Infrastructure Development Index*; OECD's *Measuring Distance to the SDGs Targets*; and Adegbola Ojo et al.'s *The Development of an Infrastructure Quality Index for Nigerian Metropolitan Areas Using Multivariate Geo-Statistical Data Fusion*.

[2] See: https://outlook.gihub.org/

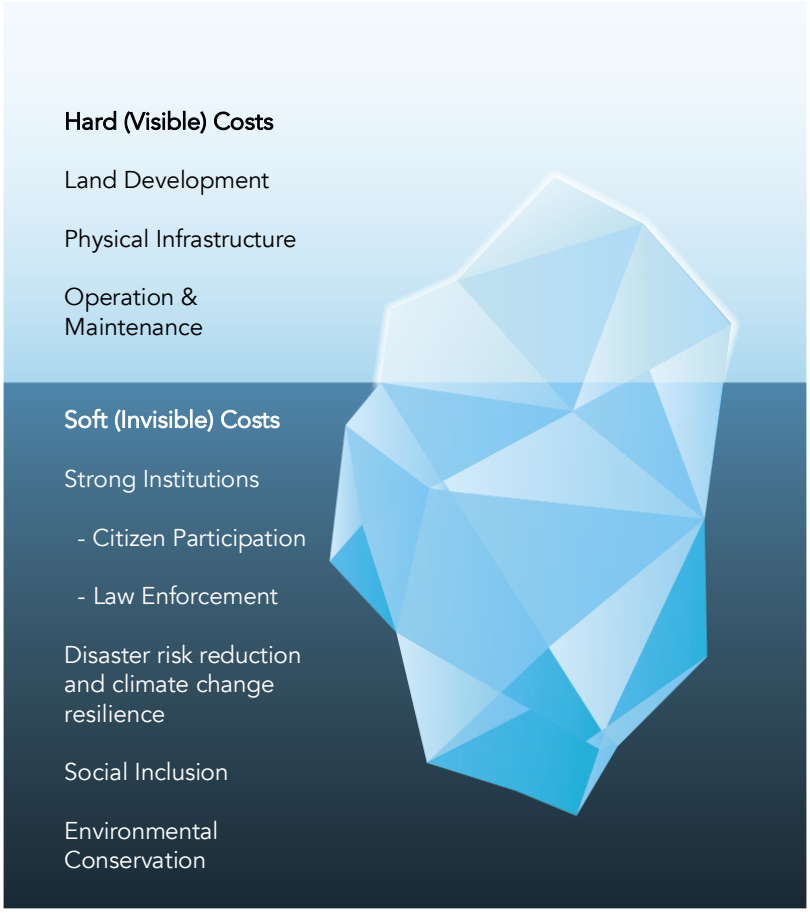
[3] See: http://unsdsn.org/wp-content/uploads/2015/09/151112-SDG-Financing-Needs.pdf

[4] The authors estimated the amount of population to be served in rural and urban areas by 2030, accounting for population growth and internal migration, in 140 countries (covering roughly 85% of the world population). See: http://documents.worldbank.org/curated/en/415441467988938343/pdf/103171-PUB-Box394556B-PUBLIC-EPI-K8543-ADD-SERIES.pdf

countries representing varied levels of existing health systems capacity and uses the local cost of inputs or interventions as the basis for the costing exercise.[5]

The clear limitation of these sector-specific costing exercises is that they track financing and estimate costs based upon the inputs and gaps in a particular subset of the SDGs agenda that is beyond infrastructure. Nonetheless, these studies provide insights into how to gauge both the hard and soft investments needed to support progress against a given SDG, as well as how to take into account differing levels of existing capacity—both of which will be essential to the proposed pilot effort to cost SDG 11.

To fill the gap in knowledge around the hard and soft costs of achieving SDG-11, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), devised a two-phase effort to develop a systematic, replicable, and scalable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead-up to 2030.



Approach

Based upon the review of previous costing studies and the envisioned objectives of this pilot, AidData and UN-Habitat initially identified three possible approaches to cost SDG 11 (top-down, bottom-up and hybrid), each with their own trade-offs. After further evaluation of the three approaches, the hybrid approach (outlined below), was identified as most suitable for implementation during the first phase of this project.

The hybrid approach incorporates elements of both a top-down and a bottom-up approach to costing SDG 11 achievement. Many of the soft costs related to SDG 11 are difficult to contextualize and quantify. This is especially the case for expenditures related to governance and planning and various public programs. However, for other dimensions, such as housing and transportation, many standards for sustainability exist. In this hybrid approach, we used primary data on cities to calculate gaps using the standards and supplemented our results with top-down costs

[5] Costs are also modeled using different approaches (1) where countries' advancement towards global targets was constrained by their health systems' absorptive capacity (progress scenario) and (2) where countries' health systems are not a constraint (ambitious scenario). See: http://dx.doi.org/10.1016/S2214-109X(17)30263-2

derived from (top-down) budget information on those costs that are difficult to capture using a bottom-up approach.

To settle on a list of countries and cities to test our methodology on, we decided to use a stratified sampling approach. This sampling approach offers generalizable information, while being the most resource feasible. Criteria—such as population (tier I, II & III cities), development region, country income group, and purchasing power parity—were considered to ensure the sample's representativeness. We chose India, Malaysia, Cote d'Ivoire, Bolivia, Colombia, and Sweden as our six pilot countries. We sampled small, medium, and large cities[6] within each country (ensuring that we included all provincial capitals) to capture sufficient differences between these city categories. In selecting these countries for the pilot, we wished to gather lessons across regions as well as levels of development and income.

Implementation

In phase I, we developed our methodology through a series of technical consultations with experts in the field of urban development. The costing methodology we outline *in this report*: (1) takes into account both physical and institutional infrastructure needs (e.g., city planning capacity); (2) assesses the anticipated costs of realizing SDG 11 targets related to five thematic areas;[7] and (3) is replicable, scalable, and has the ability to contextualize calculations for more accurate results by country.[8]

In phase II, beyond inclusion of other thematic areas, AidData and UN-Habitat hope to refine and scale the methodology on the basis of lessons learned from this pilot exercise with the aim of producing estimates and tools that we can update on a regular basis in the lead up to 2030 and are equally relevant to stakeholders working at local, national, and international levels.

[6] We define small, medium and large cities using the criteria of less than 100,000, between 100,000 and 1 million, and greater than 1 million in population respectively.

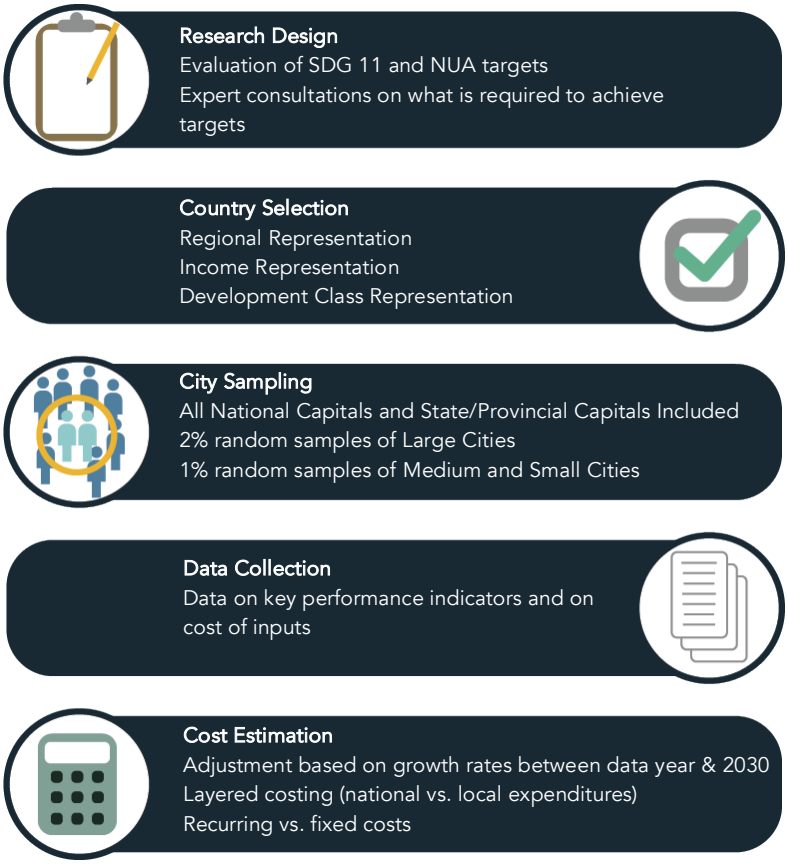
[7] The five thematic areas are: Housing, Transportation, Solid Waste Management, Public Spaces, and Urban Governance and Planning. We chose only five areas for phase I, but plan to extend our study into other relevant thematic areas such as Energy, Water, and Heritage and Conservation. Our initial intention was to include several other thematic areas in this phase, but we limited ourselves to five due to resource constraints.

[8] Our estimates of input costs were derived through secondary research. Depending on the reliability of data from the sources we used, there may be some difference between our estimated costs and actual costs on the ground. We therefore built our models to have the ability to adjust cost estimates based on improved local information as it becomes available.

Desk Review

To begin, we conducted preliminary desk research to identify: (1) common definitions, parameters, and types of investment activities that scholars or practitioners associate with SDG 11 and urban sustainability; (2) the availability and quality of data on historical financing, existing infrastructure capacity (both hard and soft), and local labor and material costs associated with these activities; and (3) a recommended sampling strategy for a subset of representative countries and urban areas.

On the basis of this desk research we developed a draft methodology to delineate how best to quantify expenditures needed to bridge the anticipated infrastructure gap to achieve SDG 11 in the pilot countries. We also consulted a series of experts to test our methodology and develop it further.



Expert Consultations

We consulted roughly 20 technical experts from across the UN system, academia, civil society, and city governments and gathered input on the following topics:[9]

a. Classification of urban development projects and mapping to relevant SDG targets;
b. Development of a coding manual for classification of primary data;
c. Sampling criteria of cities for which primary data would be collected;
d. Translation of primary data into cost estimates; and
e. Setting expectations and understanding the limitations of this study.

Based upon this feedback, we finalized the implementation plan and pilot methodology to quantify infrastructure and urban sustainability investments, as well as projected costs to achieve SDG 11 in the selected urban contexts.

The next section provides details of this methodology.

[9] For further information on the topics of our consultations, see Annex: Interview Guides

II. METHODOLOGY

In this section, we provide details of our methodology for determining the cost of achieving five pilot dimensions of SDG 11 in small, medium and large cities.

Housing

Housing is perhaps the most important issue that cities need to address in order to achieve Goal 11 of the SDGs. Our evaluation of SDG 11 identified **five** key dimensions of housing that need addressing:

1. Adequate;
2. Affordable;
3. Accessible;
4. Safe; and
5. Include basic service access.

We use UN-Habitat *Global Strategy*'s definition of adequate housing that suggests that a house should have adequate privacy, adequate space, adequate security, adequate lighting and ventilation, adequate basic infrastructure, and an adequate location with regard to the location of work and basic facilities—all at a reasonable cost. To achieve 'housing for all' by 2030, sufficient housing units need to either be upgraded or constructed such that the number of adequate housing units in each city is equal to or greater than the number of households in that city.

However, the existence of housing units does not imply that households in need of adequate housing are able to occupy those units. To account for the affordability gap, we use the number of households in the lowest quintile by income as the households who would be in need of a rent subsidy.

During our expert consultations, interviewees emphasized the sustainability failures of policies that relocate households from inadequate units they currently occupy to new adequate units on urban outskirts. This is because: (1) relocation destroys the livelihood and inclusivity of the vulnerable urban poor; and (2) it encourages sprawl in large cities. To ensure we account for these challenges in our costing for sustainable housing, we first use the cost of redevelopment and in-situ upgrades for all households living in inadequate conditions (for the base year) and then use the market price of an adequate housing unit for growth in the number of households (for subsequent years).

Logical Explanations and Formulas

Using population growth rates and the average household size, we project annual need for adequate housing stock additions.

To determine the cost of providing adequate housing for all households by 2030, we divide the task into two distinct pieces:

1. Housing units that need to be built to provide an adequate home to every household by 2030; and
2. The amount of subsidy that we would need to provide so that the lowest quintile of population by income can afford to live in them.

We define the first cost as the sum of costs to upgrade existing inadequate homes and the cost to develop new housing stock to accommodate yearly household growth.

$$C_{Housing} = C_{Upgrade\ Existing} + C_{New\ Housing}$$

Where,

$$C_{Upgrade\ Existing} = N^{HH}_{2019} \times Percentage\ of\ Households\ Living\ in\ Inadequate\ Homes \times Market\ Price\ of\ Upgrading\ a\ Housing\ Unit_{USD2019}$$

And,

$$C_{New\ Housing} = \sum_{i=2020}^{2030} N_i^{HH} \times Market\ Price\ of\ an\ Adequate\ Housing\ Unit_{USD2019}$$

For the affordability subsidy, we use the following formula:

$$C_{Affordability} = \sum_{i=2019}^{2030} [(Avg.Rent_{Adequate\ Home} - 0.3 \times Avg.Inc._{lowest\ quintile}^{HH}) \times (0.2 \times N_i^{HH})]$$

Where,

N_i^{HH} is the total number of new households in the year *i*.

We derive the cost of upgrading an inadequate housing unit from upgrade projects that experts consider a success in the country or a comparable case from another country.

Note: It is important to note the difference between the total cost of housing and the total public cost of housing. To determine how much of this cost is likely a public expense, we only count the one-time cost of upgrading slums, informal settlements, and other inadequate homes, as well as the recurring cost of housing subsidies.

Assumptions Made

The first assumption—inherent in considering the market price of a minimum viable adequate housing unit as our basis for determining the total resources required for mobilization—is that there would be sufficient supply of adequate units by the market. Using the market price as a benchmark accounts for aggregate the cost of land, construction labor and materials and any other project-related costs such as design, management and operations, as well as the developers' incentives and profits.

The second assumption is that households typically should spend 30% of their income on housing. This is not a recognized standard, but it is a good policy guideline that is widely accepted in the social sciences community.[10]

The third assumption is that any costs that are associated with ensuring structural safety of adequate housing units are captured by using the market price of an adequate housing unit. Other dimensions of safety, such as those associated with crime, are not included in our costing as they are implicit in other municipal expenditures, such as urban policing, that are beyond the scope of SDG 11.

The fourth assumption is that the market rent for an adequate home is equal to the monthly mortgage payment a household would pay if they were to purchase the housing unit. This may or may not be true, depending on context.

Our last assumption is that only existing inadequate homes would require upgrades and that, with a sufficient housing subsidy program and a market-based supply of adequate housing, no new inadequate housing structures would emerge. This is likely not the case, because there exist degrading home stock on which we have no data, as well as the probability of further degraded or destroyed housing in the face of external shocks, such as natural disasters and economic downturns.

[10] The OECD benchmarks the "housing cost overburden rate" at 40% of net income. See: https://www.oecd.org/els/family/HC1-2-Housing-costs-over-income.pdf. In our research, the range between regions varied from 20 to 40%. Additionally, the experts we consulted suggested using 30% as a reasonable number to base our calculations around.

Interlinkages with Other Thematic Areas

A critical dimension to sustainable housing is ensuring that the spatial distribution of housing is equitable. In other words, housing stock has accessibility to other land uses within the city. We cannot explicitly cost this in our exercise. Local urban planning authorities need to ensure the *accessibility* and *inclusivity* of housing through proper city planning and reflect it in a city's master plan. We argue that by accounting for the operating cost of a city's planning department and the one-time cost of developing an urban master plan, we also include the cost of accessible and inclusive dimensions of sustainable urban housing. We discuss this cost further in the Urban Governance and Planning Costing methodology section.

Typical Data Sources

We identified national Housing and Population Censuses as the best source of information on the population, household sizes and their living conditions. In cases where censuses were not recent, we scouted for other similar sources such as household surveys and other credible research. Similarly, for household income data, we used household surveys, such as the Living Standards Measurement Survey (LSMS) or the Household Income and Expenditure Surveys (HIES).

For market data on rents and housing prices, we consulted various real estate websites as well as crowdsourced data that measured the cost of living in various cities. One such example is www.numbeo.com.

Transportation

Sustainable transportation is a crucial dimension of urban sustainability and economic growth due to its crosscutting nature. A good transportation system in a city is a prerequisite for urban mobility, economic growth, social inclusion and a clean urban environment.

SDG 11 breaks down a transportation system to include the dimensions of sustainability, access for all, safety, affordability, and the needs of the vulnerable, women, children, and disabled and older persons. Based on our expert consultations on these dimensions, and what their significance in implementation, we identified the following quantifiable baseline needs:

1. There should be enough hybrid or electric buses providing connectivity to all urban dwellers;
2. These buses should be equipped with features such as CCTV cameras and wheelchair accessibility to cater to the needs of women, children, disabled and elderly persons;
3. There should be enough road infrastructure for supporting bus and private vehicle trips, following a well-designed road hierarchy;
4. To ensure public transport access for all, there should be an articulated[11] bus stop within walking distance of all urbanized areas;
5. There should be adequate spending on road safety, such as road signs, pelican crossing signals, functioning traffic lights, and pedestrian crossing infrastructure, as well as soft inputs, such as driver training programs and citizen awareness campaigns; and
6. The system should be affordable to use for all socio-economic groups.

There are a substantial number of moving parts in a city's transportation system, some of which we list above. To ensure that these variables operate in harmony and as part of one transportation system, there needs to be a *sustainable urban mobility plan (SUMP)*. In consultations with transportation experts, we learned that such a plan is essential in creating a contextually relevant holistic system that accounts for individual preferences in choice of transportation mode (walking, bicycling, taking buses, or using private vehicles) and ensures that the system is inclusive and safe. Such a plan would also address the growing concerns over carbon emissions generated by

[11] An articulated bus stop has sufficient safety and accessibility features like lighting, seats and wheelchair ramps.

inefficient transportation systems in cities, by using the *avoid, shift and improve* (ASI) approach.[12] For our costing, we therefore include the cost of developing such a plan for every city.

Logical Explanations and Formulas

Below are the functions we use for costing each dimension of transportation for a city:

Road infrastructure

We determine the length of new roads that need to be constructed based on standards of typical road length per 1000 persons in a well-functioning city. This cost is further broken down by road type (i.e. Arterial/Sub-Arterial, Collector and Local) for more accurate costs. For this, we use the typical road length distribution of a transportation system by road type.[13] By doing so, we account for costs associated with building sidewalks, stormwater drains and other integrated road features that are critical for sustainability. For existing roads, we use local data to determine what length of existing roads need repaving by type of road.

$$C_i^{Roads} = \sum_{i=2019}^{2030} R_i^{new} \times Cost\ of\ Construction\ per\ Km_{USD2019} + \sum_{i=2019}^{2030} R_i^{pave} \times Cost\ of\ Repaving\ per\ Km_{USD2019} + \sum_{i=2019}^{2030} R_i^{total} \times Cost\ of\ Road\ Maintenance\ per\ Km_{USD2019}$$

Where,

R_i^{new} is the length of new road to be built in year *i*;

R_i^{pave} is the length of road to be paved in year *i*; and

R_i^{total} is the total length of roads in year *i*

Besides construction and repaving costs, we also apply an annual road maintenance cost based on the total length of roads in the city.

Buses

For buses, we use the World Bank's standard of between 0.5 to 1.2 buses per 1000 persons,[14] based on city type. For smaller cities we use 0.5, for medium cities we use 0.8 and for large cities we use 1.2. To ensure a cleaner urban environment and an inclusive and safe transit system, we use modern hybrid buses with accessibility and safety features to determine fleet capital cost. Where data is available on the existing number of buses, we discount our cost accordingly.

$$C_i^{Bus} = (0.5/0.8/1.2 \times \frac{Pop_i}{1000} - No.\ of\ Existing\ Buses) \times C^{Hybrid\ Bus}$$

[12] See: Sustainable Urban Transport: Avoid-Shift-Improve (A-S-I), available at: https://bit.ly/2Vk1I48

[13] On average, a city has 5% Arterial, 10% Sub-Arterial, 10% Collector and 75% Local roads. For further information, see: Chapter 2, 2013 Status of the Nation's Highways, Bridges, and Transit, FHWA, available at: https://bit.ly/2YNf8Du

[14] Urban Bus Toolkit (2006) World Bank. Retrieved from: https://bit.ly/33nnogW

Bus Stops and Terminals

We derived our "best guess" on the number of stops that would be required in a city such that access to the transit system was within walkable distance by dividing the total urbanized area by the area of a circle with 0.5km radius. We also applied a spatial growth rate to the area of small cities using the Atlas of Urban Expansion's[15] data.

$$C_i^{BusStop} = (\frac{Total\ Urbanized\ Area}{\pi(0.5km)^2} - No.of\ Existing\ Stops) \times C^{Bus\ Stop}$$

For bus terminals, we use the standard of one terminal per 120 buses borrowed from the Transit Capacity and Quality of Service Manual.[16]

$$C_i^{Bus\ Terminal} = (Bus\ Terminals\ Required - No.of\ Existing\ Terminals) \times C^{Bus\ Terminal}$$

Operation, Maintenance and Administration (OMA)

We evaluated the OMA budgets of several cities that have a well-functioning bus system to derive the average operation and maintenance cost per bus, as well as the average administration cost of the transit authority per bus. This helped us effectively rescale OMA costs to cities with different population sizes.

$$C_i^{PublicTransitO\&M} = Annual\ Operating\ Cost\ Per\ Bus \times No.of\ Buses + Maintenance\ Cost\ Per\ Bus\ \times No.of\ Buses$$

Planning and Road Safety

We follow the guidance, acquired through our expert consultations, that the typical cost of development of developing a Sustainable Urban Mobility Plan (SUMP) for small to medium cities is USD 100,000 and for large cities is USD 350,000.

$$C_i^{Planning} = if\ \{pop_i \geq 100{,}000;\ C_i^{SUMP} = 350{,}000_{USD\ 2019} | pop_i < 100{,}000;\ C_i^{SUMP} = 100{,}000_{USD\ 2019}\}$$

We also apply a 10% blanket cost buffer to the total cost (per similar expert guidance) to account for additional spending on road safety infrastructure and soft inputs, such as driver training programs and citizen awareness campaigns.

$$C_i^{Safety} = 10\% \times C_i^{TOTAL}$$

[15] Atlas of Urban Expansion (2016). Retrieved from: https://bit.ly/2lGAPa8

[16] Transit Capacity and Quality of Service Manual (2017). Transportation Research Board. Retrieved from: https://bit.ly/2GPtlJx

Affordability

Lastly, we account for any subsidies that may be required for the lowest quintile of the population by income level. We use the general principle that the transportation cost burden should not exceed more than 20% of monthly household income, which we received in our expert consultations.

$$C_i^{Subsidy} = 0.2 \times No.of\ Households_i \times [Household\ Income_i^{lowest\ quintile} - (2 \times C_i^{trip} \times Avg.HH\ Size_i \times 30)]$$

Assumptions Made

While each city has different characteristics (based on terrain, layout, and other factors), we make the following assumptions in order to arrive at our cost estimates:

- On average, the composition of the length of arterial/sub-arterial, collector and local roads for all cities is the same. We assume that a typical city has roughly 15% arterial and sub-arterial roads, 10% collector roads and 75% local roads. We also assume no variation in the design of these roads based on city type. This may or may not be true. For instance, cities that experience low to no rainfall do not require their roads to include storm-water drainage features, which may lower the costs of construction.
- Any repaving of roads would be done in the first year and the road system would not require repaving until 2030. Repair and upkeep would be covered in the yearly road maintenance costs.
- We assume that by providing adequate buses in a public transport system, people would switch their preferences from other modes of transport. In order to establish the baseline costs, we also assume that buses are sufficient as the only mode of public transport for a city. This is not true. We acknowledge the need for advanced transit systems like a Bus Rapid Transit (BRT) or Mass Rapid Transit Systems (MRTS) for larger cities. However, the design of such systems is highly variable and to create a one-size-fits-all costing methodology would be very inaccurate.
- For bus stops, we assume that having a transit authority would ensure a fair and equitable distribution of transit stops in order to maximize public transportation coverage. We also assume that the city is uniformly dense and that all urbanized areas require public transport access.
- In order to derive standard Operation, Maintenance and Administration costs, we use functioning transit systems in other developing cities, such as Mumbai's BEST company, to benchmark average costs to population size. There may be some variation in this cost based on country context, which includes technical capacity, institutional efficiencies, and other variables.
- We use a flat 10% of the total cost as a guideline investment figure for road safety. This may also vary based on several local factors, such as literacy levels and citizen respect for local laws. We also acknowledge that the cost of developing a SUMP may vary based on the complexity of the planning and design processes that would be required for a city.
- For our affordability calculations, we only consider the bottom quintile of the population. It is possible that more households than just the bottom 20% by income require a subsidy, depending on the level of inequality in the city.
- Lastly, we assume that adjustments by Purchasing Power Parity (PPP) and Consumer Price Indices (CPI) are sufficient to translate costs between cities and countries.

Interlinkages with Other Thematic Areas

A significant effect of a sustainable urban transportation system, which we do not explicitly capture in any of our costing methodologies, is on urban ambient air quality (PM2.5/PM10). We assume that the cost of improving air quality in cities is made implicit by purchasing better public transport infrastructure (e.g., hybrid and electric buses)

and promoting trip shifts to public transport over time. This means that if public transport were to shift to electric, we would need supporting investments into energy security as well.

Typical Data Sources

We used national population censuses and other estimates from representative household surveys for data on population, household size, and income. For costs, we used project and operational budget documents from other similar countries and transferred them to local contexts using Purchasing Power Parity (PPP) and Consumer Price Index (CPI) conversion factors.

For development standards, we used information and opinions gathered through our expert interviews and publications from think tanks and multilateral institutions, such as the Partnership on Sustainable Low Carbon Transport (SloCaT), Codatu, the Inter-American Development Bank (IADB), and the World Bank.

Solid Waste Management

Solid waste management is a critical component of achieving sustainability in urban communities, especially due to rapid population growth and the increase in waste generated per person associated with economic growth. Most landfill sites in developing countries—if they have not already reached full capacity, which is the case for many—are not constructed or operated as sanitary landfills where waste decomposes to biologically and chemically inert materials while being isolated. Waste inadequately disposed results in serious problems, including the contamination of ground water and the deterioration of air quality. Collection coverage is another major challenge, as uncollected waste usually ends up blocking urban drainage systems and may cause fatal problems, including flooding.

For the purpose of this study, we define solid waste as municipal solid waste, including construction and health waste. SDG 11 specifies the indicators for solid waste management as the collection of urban solid waste and adequate final discharge. Following SDG 11, we define that a solid waste management system in urban areas should:

1. Have the capacity to provide 100% coverage for waste collection;
2. Dispose of collected waste using adequate methods and tools minimizing environmental damage.

Logical Explanations and Formulas

Projecting Waste Generated Per Capita for Future Years

While we typically know the current waste generated per capita, it is crucial to project waste per capita in the future, as research shows that waste per capita increases significantly with economic growth. Following the waste generation projection methodology published by the World Bank in their *What A Waste 2.0 (2018)* report, we calculate the projected waste beyond the years when data are available as:

$$Projected\ Waste\ Per\ Capita_{TargetYear} = \frac{Proxy\ Waste\ Per\ Capita_{TargetYear}}{Proxy\ Waste\ Per\ Capita_{BaseYear}} \times Actual\ Waste\ Per\ Capita_{BaseYear}$$

Where,

Proxy waste generated per capita in year *i*, denoted by $Proxy\ Waste\ Generation\ Per\ Capita_i$, is calculated as:

$$Proxy\ Waste\ Per\ Capita_i = 1647.41 - 419.73\ ln(GDP\ per\ capita_i) + 29.43\ ln(GDP\ per\ capita_i)^2$$

Through expert consultations we concluded that, although cities should pursue efforts to reduce, reuse and recycle, a baseline scenario for urban solid waste management requires sanitary landfills and safe disposal. Therefore, we exclude the cost of recycling and incineration as alternate methods of waste disposal in our methodology.

Baseline Cost Estimation for Waste Management

Sanitary Landfill

Sanitary landfills, different from dumpsites, are modern engineering sites where waste is isolated from the environment until it decomposes into harmless materials. According to the *Decision-maker's Guide to Solid Waste Landfills* by the World Bank (2010), a sanitary landfill should at minimum meet the following conditions:

A. Full or partial hydrogeological isolation: If a site cannot be located on land, which naturally contains leachate security[17], additional lining materials should be brought to the site to reduce leakage from the base of the site (leachate) and help reduce contamination of groundwater and surrounding soil. If a liner (soil or synthetic) is provided without a system of leachate collection, all leachate will eventually reach the surrounding environment. Leachate collection and treatment must be stressed as a basic requirement;
B. Formal engineering preparations: Designs should be developed from local geological and hydrogeological investigations. A waste disposal plan and a final restoration plan should also be developed.
C. Permanent control: Trained staff should be based at the landfill to supervise site preparation and construction, the depositing of waste and the regular operation and maintenance.
D. Planned waste emplacement and covering: Waste should be spread in layers and compacted. A small working area which is covered daily helps make the waste less accessible to pests and vermin.

Based on desk research and expert opinion, we found that many existing landfills either do not meet the above conditions or have reached their full capacity. Therefore, we prescribe the construction of *sanitary* landfill and use the costs for the same in our methodology.

The cost of waste disposal through sanitary landfill includes both the fixed cost of site construction, denoted by C^{Infra}, and operation cost in year *i*, denoted by C_i^{Op}. We estimate the fixed cost component as the amount of additional sanitary landfill capacity in tons that cities would need to build, based on the projected waste generation from 20019 to 2030.

$$C^{Infra} = \frac{\sum_{i=2019}^{2030} Pop_i \times Projected\ Waste\ Per\ Capita_i - Existing\ Landfill\ Capacity}{Capacity\ Per\ Sanitary\ Landfill} \times C^{PerLandfill}$$

We calculate the operating cost of landfills using an operating cost per ton estimate from other sanitary landfill projects.

[17] Leachate security prevents water from percolating through a solid container and leaking its contents.

$$C_i^{Op} = C_i^{OpPerTon} \times Pop_i \times Projected\ Waste\ Per\ Capita_i$$

Collection and Transportation

We also include the cost of safe collection and transportation of waste from source to disposal site, which we calculate using the following formula:

$$C_i^{Collect} = Pop_i \times Projected\ Waste\ Per\ Capita_i \times C_i^{CollectPerTon}$$

Note: We do not calculate the area for development as landfill infrastructure by city. Instead, we pool waste generated by all cities to determine the total landfill capacity required. This is because cities often share landfills for waste disposal. This is particularly common with small and medium-sized cities. Megacities, on the other hand, may have several landfill sites dedicated to one city.

Assumptions Made

For the purpose of this study, we made the following assumptions in calculating the estimated cost of solid waste management:

- While some cities have alternative waste disposal methods (e.g., incineration, recycling, or composting), which can be more environmentally friendly or energy efficient, this methodology aims to establish a baseline cost, as many countries either cannot afford advanced technology or do not have adequate implementation capacity. We assume that sanitary landfills will sufficiently help cities sustainably dispose all of their solid waste in the most affordable way.
- We assume that adjustments by Purchasing Power Parity (PPP) and Consumer Price Indices (CPI) are sufficient to translate costs between cities and countries.

Interlinkages with Other Thematic Areas

SDG 11 also specifies air quality as one of the indicators for urban waste management, which is not specifically included in the methodology. However, the measures proposed in Transportation will encourage most people switch to public transportation that mostly relies on hybrid buses, which will largely reduce emissions. In addition, by switching from regular dumpsites to sanitary landfills, the hazardous gases released from landfills will be contained to a minimal level. We assume that these changes are sufficient to help cities achieve good ambient air quality.

Typical Data Sources

We used national population censuses and other estimates from representative household surveys for data on population. We took the current waste generation data from the website 'Waste Atlas,' which compiles solid waste data from various sources.[18] We used GDP per capita from the World Development Indicators. For costs, we used estimation from the World Bank and budget documents from other similar countries, and transferred them to local contexts using PPP and CPI conversion factors.

[18] For further information, see: http://www.atlas.d-waste.com/

Green Public Spaces

Universal access to safe, inclusive, and accessible public spaces is a key component for maintaining a high quality of life in cities. These are also the key elements of urban public space that SDG 11 emphasizes cities need to ensure in their planning.

We adopt a simple approach to determining the cost of providing sufficient public open space. We use the public space per capita design standard from the National Institute of Health (US) to determine how much space should be available in a city based on its population. Then, we determine how much vacant land costs in the city, on average, and then use the unit cost of development of a safe, inclusive and accessible public space from a best practice project to determine the total resource requirement.

Logical Explanations and Formulas

Using population growth rates, we project annual need for public spaces.

We then calculate the cost of providing public spaces using the following formula:

$$C_i^{Public\ Space} = \sum_{i=2019}^{2030} [(Population_i \times Per\ Capita\ Public\ Space\ Design\ Standard - Existing\ Area\ of\ Public\ Spaces)] \times [(Average\ Cost\ of\ 1\ SqKm\ of\ Vacant\ Land + Cost\ of\ Developing\ 1\ SqKm\ of\ Vacant\ Land\ Into\ Public\ Space)]$$

We also include the cost of operating and maintaining these open spaces, along with any administrative costs through benchmarking to similar costs recorded in a comparable city's budget document.

Assumptions Made

We assume that the NIH standard for public space is valid in other countries, since basic human needs for green public space should not change across borders. We also assume that cost estimates of developing vacant land into safe, inclusive, and accessible green public spaces can be translated to other countries using PPP conversions.

The last assumption that we made is that an equitable distribution of public spaces throughout the city would occur if a city has a planning department and a well-designed master plan. These costs are excluded in our costing here but would be accounted for in the Urban Governance and Planning costs.

Interlinkages with Other Thematic Areas

Developing sufficient green open spaces would support cities in reducing their carbon footprint and improving ambient air quality. Green spaces provide much needed carbon sinks as well as air purification. The cost of improving urban air quality is also implicit in the cost of creating sufficient green public spaces in cities.

Typical Data Sources

We identified national Housing and Population Censuses as the best sources of information on the population, household sizes, and their living conditions. We mined urban master plans for data on existing area of public spaces in cities to determine how much new land would need to be developed into public spaces.

For data on land prices, we used various local real estate websites.

Urban Governance and Planning

Targets 11A and 11B of SDG 11 emphasize the need to support positive economic, social, and environmental links between urban, peri-urban, and rural areas by strengthening national and regional development planning. They also require that cities implement urban and regional development plans that set forward integrated policies for inclusion, resource efficiency, mitigation and adaptation to climate change, and resilience to disasters.

A city's planning department typically undertakes the master planning process through a series of consultations with technical experts, policy professionals, non-governmental organizations, civil society actors, and other relevant stakeholders. This process culminates in a 10- or 20-year plan for the city's sustainable growth and management. Our methodology mandates that every city should have a planning department and a master plan that ensures that development is integrated, comprehensive in its vision, sustainable, resource efficient, socio-economically inclusive, and just. We arrived at this requirement in our costing through a series of consultations with technical experts, chief planners, and urban managers. Without this administrative institution, it would be difficult to achieve the softer objectives of many dimensions of sustainable urban development. For example, a city that has a large open space in its center may meet its adequate open space requirements, but this space may not be accessible to all its residents. A range of small, medium and large open spaces that are distributed uniformly throughout all neighborhoods is a better way to achieve both adequacy and accessibility attributes. This is something a planning department would ensure through better, inclusive urban design planning.

We could not find any standards on what an effective planning and urban governance institution for cities should look like. Therefore, we took the approach of searching for global best practices and using a city's operating budget as well as the one-time cost of its master plan development as a benchmark. We consulted the former Chief Town Planner of the City of Medellín, Colombia to learn about their operating expenses and suggested baseline costs for planning and governance, which we translated to other countries. Medellín is widely considered a success story of proper governance and planning through strong local institutions transforming a city towards a sustainable future.

Logical Explanations and Formulas

$$C^{Gov.\&\,Planning} = Annual\ Operating\ Budget\ of\ the\ Planning\ and\ Citizen\ Engagement\ Department$$

$$of\ a\ Comparable\ Bestpractice\ City + One\ Time\ Cost\ of\ Developing\ a\ 20\ Year\ Master\ Plan$$

Assumptions Made

A planning department and a master plan does not guarantee successful implementation—other factors like corruption could pose additional challenges.

We assumed that by benchmarking to the budgets of best practice cities, cities would be able to recruit sufficient skilled technical personnel locally.

Interlinkages with Other Thematic Areas

Governance and planning are linked to all thematic areas.

Typical Data Sources

To find regional best practice cities, we consult urban planning literature and various quality-of-life rankings (e.g. "100 best places to live") that reputable institutions like the World Economic Forum publish. We look at the highest-ranking cities that are comparable in size and are in the region. Then, we research their budget documents to derive the cost values.

III. COUNTRY BRIEFS

In this section, we provide some topline cost estimates for each country, as well as details on specific contextual changes we made to our methodology.

BOLIVIA

GDP (2017): USD 37.51 Billion

Population (2017): 11.05 Million

Total Cities: *Unknown*

Study Sample: 20

Large (1 Million and above persons)	Santa Cruz de la Sierra
Medium (100,000 – 1 Million persons)	El Alto, La Paz, Cochabamba, Oruro, Sucre, Tarija, Potosi, Sacaba, Quillacollo, Montero, Trinidad
Small (Less than 100,000 persons)	Riberalta, Warnes, La Guardia, Viacha, Yacuiba, Colcapirhua, Tiquipaya, Cobija

Note: This classification is based on the estimated population of Bolivian cities in 2019. Several cities graduate from lower tiers to higher tiers in our calculations during the 2019-2030 period.

About 70% of the population of Bolivia resides in urban areas,[19] of which over 50% are in the four largest cities: Santa Cruz de la Sierra, El Alto, La Paz, and Cochabamba. The country's population tripled in the last 50 years and has maintained a steady growth rate of roughly 1.5%. Meanwhile, the urban population growth has stayed close to 2% (WDI 2018).

Table 1 shows the annuitized average cost to achieve SDG 11 for Bolivia's small, medium, and large cities for the Housing, Transportation, Solid Waste Management, Public Space, and Urban Governance and Planning thematic areas.

[19] The World Bank's *World Development Indicators 2018* (WDI 2018).

Table 1: Average Annual Cost for Small, Medium and Large Cities in Bolivia (Millions 2019 USD)

City Size		Small	Medium	Large
Population		<100K	100K-1Mil	1Mil +
Average Annual Cost by City Type	Housing	$18.81	$79.50	$308.73
	Transportation	$29.13	$62.90	$259.98
	Solid Waste	$0.63	$3.49	$14.54
	Public Space	$4.36	$40.40	$47.81
	Governance & Planning	$1.36	$4.66	$13.60
TOTAL		$54.29	$190.94	$644.66

Source: AidData.

We share a detailed methodology by thematic area in separate documents. However, we needed to make several contextual adjustments for Bolivia to overcome data constraints and other challenges. Following are the specific assumptions and adjustments that we made to contextualize our general methodology to Bolivian cities.

HOUSING

Since the last census in Bolivia was conducted in 2012, we projected all city populations using 2012 as base year and a flat national population growth rate of 1.5%. We used a similar approach to determine the number of households that need their current housing units upgraded to meet adequacy standards and the annual growth in the number of households that would demand additional new housing stock.

We were unable to find the market price of a typical (affordable) adequate housing unit for all Bolivian cities. However, we did find it for some. We used the average value of the market prices as a 'best guess' for cities where we could not find data. This was also the case for average monthly rent data for adequate housing units.

TRANSPORTATION

In our desk research, we found that most cities in developed countries have a similar distribution of road types. We applied the same distribution to determine the required length of each type of road for Bolivian cities. We acknowledge that this assumption may not lead to accurate cost estimates because terrain type and traffic volumes, among other factors, may have implications on what type of road may be prevalent in which city. We also borrow road maintenance costs from the World Bank's estimates for the Latin America and Caribbean region ($655/Km). This may be different for Bolivia.

We assume no buses exist in cities where we could not find bus fleet data. This is likely not the case. Most Bolivian cities have an informal system of minibuses ("micros") and private buses that serve as ad-hoc public transport. For other cities, where necessary, we adjust the number of minibuses to equate to full-size buses by using the capacity ratio of 0.2. Similarly, where we were unable to find information on the number of formal (articulated) bus stops and bus terminals, we assume that there are no formal bus stops and bus terminals in the city.

We do not adjust the cost of a new hybrid bus and the cost of developing an urban mobility plan, since the cost of both is standard internationally.

SOLID WASTE MANAGEMENT

Bolivia's Ministry of Environment and Water proved to be a good source of data for per capita waste production. Consistent with the assumptions of our general methodology, we only cost for sanitary landfills and do not account for any recycling programs that cities may be interested in implementing. We translated the cost of constructing and operating a sanitary landfill using US Environmental Protection Agency guidelines and the Purchasing Power Parity between the US and Bolivia. We borrowed the cost of waste collection and landfill per ton from the Inter-American Development Bank's *Solid Waste Management in Latin America and the Caribbean 2010* report and adjust it to 2019 prices.

PUBLIC SPACES

We used the US National Institute of Health's design standards for how much public space should exist in a city, based on its resident population size. Our methodology required an assessment of the cost of vacant land in each city. For this data, we used various local real estate websites and attempted to find several vacant lots for sale outside of the city center and take their simple average. We used the average value of vacant land across all cities where we found data as an approximate value of vacant land for cities where we did not find this data. Though this approach may lead to some inaccuracies at the city level, we think that the error is low when aggregating the total cost of providing adequate public space in cities to the national level.

GOVERNANCE AND PLANNING

For this section, we apply typical budget values and plan development costs that technical experts shared with us during our consultations. We did not have a better alternative.

General Discussion on Limitations

This methodology provides a good starting point for a discussion of how much resources are needed and how much are currently available for mobilization towards achieving SDG 11. However, our estimates can be improved through better data. Without knowing the realities on the ground, it is difficult to determine needs accurately, which is a challenge cutting across all the SDGs. As the 'Data for Development' discussions, led by the global statistical community, materialize in building greater monitoring capacities in developing countries, the accuracy of this 'Counting the Costs' methodology would increase.

In addition to bridging the data gaps in official statistics, there is some amount of ground truthing that would be required to accurately determine the costs of achieving SDG 11. For example, we use real estate websites to find the average cost of vacant land in cities with only partial success. The cost of vacant land is contextual. In some cities, there are sufficient vacant land or agricultural land that could be converted for public use. In other cities, governments would need to employ eminent domain to acquire already developed land for public uses such as green spaces or transportation corridors. We do not distinguish between these two cases. Local knowledge and context would help improve these estimates substantially.

Another example of localization of this methodology is updating the underlying costs to account for the differences in terrain, climate, and other location characteristics. Providing green public spaces in drier cities is a much more expensive endeavor than it is for cities where natural irrigation is better. Similarly, the costs of construction of transportation infrastructure and the costs of waste management will likely also vary.

Systems that are widely accepted as best practices for sustainable urbanization often do not yet exist in developing countries. This is the case for the public transportation systems in many Bolivian cities. As discussed earlier in the transportation section, a system of private minibuses and taxi buses currently provide good public mobility to city dwellers. However, for sustainable growth of Bolivian cities, planned transit systems are required.

Finally, our costing is the first step in assessing the total resources necessary to achieve the bottom-line of SDG 11. As our project progresses, we intend to develop decision support tools that help municipalities optimize their resource allocation to maximize their progress towards various targets of the SDGs. Currently, our work is limited to only five thematic areas and does not include other important costs, such as those associated with the energy demands of growing cities, urban resilience to climate change and disasters, and urban heritage conservation. We

also do not analyze the costs and benefits of those development strategies that are beyond the baseline scenarios, such as recycling for waste management and mass-transit for transportation. These will be incorporated in future iterations of our methodology, along with discussion on ways in which public costs could be lowered by utilizing innovative financing mechanisms such as 'Urban Park Conservancies' and Public-Private Partnerships.

COLOMBIA

GDP (2017): USD 331 Billion

Population (2018): 49.65 Million

Total Cities: 1119

Study Sample: 47

Large (1 Million and above persons)	Bogotá, Medellín, Cali, Barranquilla
Medium (100,000 – 1 Million persons)	Bucaramanga, Cartagena, Cucuta, Pereira, Santa Marta, Ibague, Pasto, Manizales, Villavicencio, Neiva, Armenia, Valledupar, Monteria, Sincelejo, Popayan, Tunja, Riohacha, Florencia, Quibdo, Arauca, Yopal, Leticia, San Andres, San Jose del Guaviare, Mocoa, Puerto Carreno, Inirida, Mitu, Cartago, Ipiales, Bello, Buenaventura, Sogamoso
Small (Less than 100,000 persons)	El Banco, Arjona, Sabanalarga, Chiquinquira, Pamplona, Guapi, Ocaña, Honda, Campoalegre, El Carmen de Bolivar

Note: This classification is based on the estimated population of Colombian cities in 2019. Several cities graduate from lower tiers to higher tiers in our calculations during the 2019-2030 period.

About 81% of the population of Colombia resides in urban areas,[20] of which 18% live solely in the largest and capital city: Bogotá. The country's population more than doubled in the last 50 years, despite growth rates declining by 1.8% until 2013. However, since 2013, population growth rates are increasing, with urban population growth increasing from 1.4% to 1.9% in 2018 (WDI 2018).

Table 1 shows the annuitized average cost to achieve SDG 11 for Colombia's small, medium, and large cities for the Housing, Transportation, Solid Waste Management, Public Space, and Urban Governance and Planning thematic areas.

[20] The World Bank's *World Development Indicators 2018* (WDI 2018).

Table 1: Average Annual Cost for Small, Medium and Large Cities in Colombia (Millions 2019 USD)

City Size		Small	Medium	Large
Population		<100K	100K-1Mil	1Mil +
Average Annual Cost by City Type	Housing	$15.44	$107.30	$1,324.57
	Transportation	$19.26	$202.17	$1,503.96
	Solid Waste	$0.38	$2.91	$49.68
	Public Space	$2.79	$26.81	$217.05
	Governance & Planning	$1.09	$3.71	$10.88
TOTAL		$38.96	$342.89	$3,106.14

Source: AidData

We share the detailed methodology by thematic area in separate documents. However, we needed to make several contextual adjustments for Colombia to overcome data constraints and other challenges. Following are the specific assumptions and adjustments that we made to contextualize our general methodology to Colombian cities.

HOUSING

We use 2018 as the base year, when the most recent Colombian population census was conducted, and project population in future years using a flat national urban population growth rate of 1.5%.[21] We use a similar approach to determine the annual growth in the number of households that would demand additional new housing stock.

The per capita income of the lowest quintile of the population was calculated using income data from the Large Integrated Household Survey (GEIH 2019) conducted by DANE in 2019. The survey contained data on 14 out of our 47 sample cities. For the remaining cities, we used average values for the small, medium, and large cities derived from the 14 cities in the LIHS.

To determine the number of houses that need to be upgraded to adequate standards, we use the qualitative housing deficit values from the Housing Deficit (*Deficit de Vivienda*) statistics compilation, released in 2008 by DANE. We project the quantitative deficit using the urban population growth rate and assuming no change in the average household size in future years.

The market price of both purchasing and renting an affordable, adequate housing unit was taken from www.numbeo.com and validated using other local real estate websites. The unit cost of improving slum dwellings in-situ was borrowed from the case of PRIMED (*Programa Integral de Mejoramiento de Barrios Subnormales en Medellín*) in Medellín.[22]

TRANSPORTATION

In our desk research, we found that most cities in developed countries have a similar distribution of road types. We applied the same distribution to determine the required length of each type of road for Colombian cities. We acknowledge that this assumption may not lead to accurate cost estimates because terrain type and traffic volumes, among other factors, may have implications on what type of road may be prevalent in which city. For instance,

[21] We use the average urban population growth rate for the past 10 years from the WDI database.
[22] Retrieved from: http://www.globalurban.org/GUDMag07Vol3Iss1/Betancur.htm#_ftn3

some cities in Colombia have such steep terrain that cable car is used to reduce time by up to 2 hours, compared to terrestrial transportation. Similarly, some cities may employ transportation via boat or ferry, if possible. These modes of transportation are comparable to the efficiency of standard bus transportation (compared to rapid transit such as Bus Rapid Transit or Light Rail Transit) and the effects of these existing modes of transportation was not considered.

We also borrow road maintenance costs from the World Bank's estimates for the Latin America and Caribbean region ($655/Km). This may be different for Colombia.

We assume no buses exist in cities where we could not find bus fleet data. This is likely not the case. Most Colombian cities have an informal system of minibuses ("micros") and private buses that serve as ad-hoc public transport. For other cities, where necessary, we adjust the number of minibuses to equate to full-size buses by using the capacity ratio of 0.2. Similarly, where we were unable to find information on the number of formal (articulated[23]) bus stops and bus terminals, we assume that there are no formal bus stops and bus terminals in the city. We do not adjust the cost of a new hybrid bus and the cost of developing an urban mobility plan since the cost of these two is standard internationally.

City development plans, where available, provided the majority of our information on city area, existing road lengths and conditions, urban surface area, standard bus fleet numbers, and operating municipal bus terminals. This information was supplemented with data gathered from various news releases and transportation agency websites. In some cases where road statistics were unavailable, approximations were made using satellite data such as Google Earth Pro and Natural Earth Data. In cases where even this was not possible, we used state-level statistics[24] to estimate city-level data. We also used state-level data to estimate the length of unpaved roads in cities. Google Maps was also used to manually count the number of functioning bus terminals for many smaller cities where this information was not readily available. Due to the uncertainty of the safety accessibility features of existing bus stops in Colombian cities, we assumed that there were no articulated bus stops, except for where we found data indicating as such.

We used www.numbeo.com to retrieve the cost of trips made by public transport. Operating costs for transportation systems were contextualized using Mumbai's BEST transportation agency's reported costs and adjusted for the price differentials between Colombia and India.

We do not adjust the cost of a new hybrid bus and the cost of developing an urban mobility plan, since the cost of both is standard internationally.

SOLID WASTE MANAGEMENT

Consistent with the assumptions of our general methodology, we only cost for sanitary landfills and do not account for any recycling programs that cities may be interested in, or already are, implementing. We translate the cost of constructing and operating a sanitary landfill using US Environmental Protection Agency guidelines and the Purchasing Power Parity (PPP) between the US and Colombia. We borrow the cost of waste collection and landfill per ton from the Inter-American Development Bank's *Solid Waste Management in Latin America and the Caribbean 2010* report and adjust it to 2019 prices.

We used the *Departamento Administrativo de Planeación's* website for information on per capita waste generation and projected future waste generation rates using GDP growth rate.[25] Information on existing landfill capacity was difficult to find in PGIRS reports and development plans, so it was assumed to be zero in all cities as a conservative measure. The annual administrative, operations, and maintenance costs per ton were estimated from the German Environment Agency's *Best Practice Municipal Waste Management: Information pool on approaches towards a sustainable design of municipal waste management and supporting technologies and equipment (2018*), and the cost per ton of waste collection was calculated from the IDB's *Solid Waste Management in Latin America and the*

[23] An articulated bus stop has sufficient safety and accessibility features like lighting, seats and wheelchair ramps.
[24] See: Colombia Ministerio de Transporte, Oficina Asesora de Planeación, Grupo Planificación Sectorial Transporte en Cifras: Estadísticas 2012, pp. 34
[25] For further information on projected rates of waste generation, see World Bank's *What a Waste 2.0* report.

Caribbean 2010 report. The cost of vacant lots on the periphery of the city[26] was found using various local real estate websites and converted to 2019 USD per hectare. For cities where this data was unavailable, we used the average cost of vacant land from other cities.

GREEN PUBLIC SPACES

We use the US National Institute of Health's design standards for how much green public spaces should exist in a city, based on its resident population size. Existing areas under green public space use were retrieved from city development plans where available. For cities where no plans existed, we assumed current available green public space to be 0 in order to arrive at a conservative estimate of the costs.

Our methodology required an assessment of the cost of vacant land in each city. For this data, similar to solid waste, we used various local real estate websites to find several vacant lands for sale outside of the city center but sufficiently close to residential areas and took their average. We use the average value of vacant land across all cities where we found data as an approximate value of vacant land for cities where we did not find this data. Though this approach may lead to some inaccuracies at the city level, we think that the error is low when aggregating the total cost of providing adequate public space in cities to the national level.

Park development and maintenance costs were taken from the State of Colorado[27] and operations costs were calculated using the operational cost sections of the budget of The Institute of Urban Development of Medellín (IDU).[28] We acknowledge that costs to construct and maintain parks may vary, but these data are not readily available for projects in Colombia. We therefore adjusted US-based estimates using PPP.

GOVERNANCE AND PLANNING

For this section, we applied typical budget values and plan development costs that technical experts shared with us during our consultations for Colombia. We did not have a better alternative.

General Discussion on Limitations

This methodology provides a good starting point for the discussion on how much resources are needed and how much is currently available for mobilization towards achieving SDG 11. However, our estimates can be improved through better data. Without knowing what the realities on the ground are, it is difficult to determine needs accurately, which is a challenge cutting across all the SDGs. As the 'Data for Development' discussions, led by the global statistical community, materialize in building monitoring capacities in developing countries, the accuracy of 'Counting the Costs' would increase.

In addition to bridging the data gaps in official statistics, there is some amount of ground truthing that would be required to accurately determine the costs of achieving SDG 11. For example, we use real estate websites to find the average cost of vacant land in cities with only partial success. The cost of vacant land is highly contextual. In some cities, there are sufficient vacant land or agricultural land that could be converted for public use. In other cities, governments would need to employ *eminent domain* to acquire already developed land for public uses such as green spaces or transportation corridors. We do not distinguish between these two cases. Local knowledge and context would help improve these estimates substantially.

Another example of localization of this methodology is updating the underlying costs to account for the differences in terrain, climate and other location characteristics. Providing green public spaces in drier cities is a much more expensive endeavor than it is for cities where natural irrigation is better. Similarly, costs of construction of transportation infrastructure and costs of waste management will likely also vary.

Systems that are widely accepted as best practices for sustainable urbanization often do not yet exist in developing countries. Public transportation system in many Colombian cities is such a case. As discussed earlier in the

[26] This was done in order to find cheap land that would be suitable for landfill.

[27] See: http://www.civilresources.com/dacono/PDFs/Plan/Upload21508/appendixD.pdf

[28] See: Instituto de Desarrollo Urbano (2018). Presupuestos de Rentas e Ingresos.

transportation section, a system of private minibuses and taxi buses currently provide good public mobility to city dwellers. However, for sustainable growth of Colombian cities, planned transit systems are required. We did not find cost data on transport for major cities in Colombia and had no choice but to use Mumbai, India as a developing country example of a well-functioning transportation system in a low-middle income country. If there are other examples from the region that are contextually more comparable, replacing our costs borrowed from Mumbai with this example may increase the accuracy of cost estimates. Similarly, costs for other inputs such as developing one hectare of green public space should also be replaced with more comparable cases where possible.

Lastly, our costing is the first step in assessing the total resources necessary to achieve the bottom-line of SDG 11. As our project progresses, we intend to develop decision support tools that help municipalities optimize their resource allocation to maximize their progress towards various targets of the SDGs. Currently, our work is limited to only five thematic areas and does not include important costs such as those associated with Energy demands of growing cities, or urban resilience to climate change and disasters, or urban heritage conservation. We also do not analyze the costs and benefits of those development strategies that are beyond the baseline scenario such as recycling for waste management and mass-transit for transportation. These will be incorporated in future iterations of our methodology, along with discussion on ways in which public costs could be lowered by utilizing innovative financing mechanisms such as 'Urban Park Conservancies' and Public-Private Partnerships.

INDIA

GDP (2017): USD 2.597 Trillion

Population (2018): 1.353 Billion

Total Cities: 4000+

Study Sample: 42

Large (1 Million and above persons)	Mumbai, New Delhi, Bangalore, Hyderabad, Chennai, Kolkata, Jaipur, Lucknow, Bhopal, Patna, Srinagar, Aurangabad, Ranchi, Raipur, Chandigarh, Jullundur, Bhubaneswar
Medium (100,000 – 1 Million persons)	Thiruvananthapuram, Dehradun, Dispur, Kurnool, Agartala, Aizawl, Imphal, Pondicherry, Gandhinagar, Bhiwani, Sirsa, Simla, Shillong, Jorhat, Gangtok, Port Blair, Kohima, Silvassa
Small (Less than 100,000 persons)	Tezpur, Karur, Sopore, Itanagar, Daman, Panaji, Kavaratti

Note: This classification is based on the estimated population of Indian cities in 2019. Several cities graduate from lower tiers to higher tiers in our calculations during the 2019-2030 period.

Only 34% of the population of India resides in urban areas,[29] of which 6% live in the largest cities: Mumbai and New Delhi. The country's population has doubled in the last 40 years, and the urban population has doubled in the past 30 years. Population growth rates over the past 30 years have been generally decreasing; the urban and general population growth rates peaked at 3.96% and 2.33% in 1970. However, the over the past ten years the urban and general population growth rates are 2.37% and 1.19%, respectively (WDI 2018).

Table 1 shows the annuitized average cost to achieve SDG 11 for India's small, medium and large cities for Housing, Transportation, Solid Waste Management, Public Space, and Urban Governance and Planning thematic areas.

[29] The World Bank's World Development Indicators 2018 (WDI 2018).

Table 1: Average Annual Cost for Small, Medium and Large Cities in India (Millions 2019 USD)

City Size		Small	Medium	Large
Population		<100K	100K-1Mil	1Mil +
Average Annual Cost by City Type	Housing	$4.67	$16.28	$397.27
	Transportation	$9.38	$42.74	$626.01
	Solid Waste	$1.17	$9.30	$167.26
	Public Space	$17.82	$72.66	$817.37
	Governance & Planning*	$0.84	$2.81	$8.22
TOTAL		$33.88	$143.78	$2,016.14

Source: AidData

We share the detailed methodology by thematic area in separate documents. However, we had to make several contextual adjustments for India to overcome data constraints and other challenges. Following are the specific assumptions and adjustments that we made to contextualize our general methodology to Indian cities.

HOUSING

We use 2011 as the base year, when the most recent Indian population census was done, and project population in future years using a flat national urban population growth rate of 2.3%[30]. We use a similar approach to determine the annual growth in the number of households that would demand additional new housing stock.

The per capita income of lowest quintile of population was calculated using income data from the India Human Development Survey-II (IHDS-II)[31] conducted in 2012, adjusted for inflation. To determine the number of houses that need upgraded to adequate standards, we project values from the 2011 housing census assuming the same proportion of households are living in inadequate housing conditions today as in 2011.

We took the market price of both purchasing and renting an affordable and adequate housing unit from www.numbeo.com and validated using other local real estate websites. Further, we derived the unit costs of improving slum dwellings in-situ from multiple slum redevelopment project costs, cited from research articles and appraisals of Basic Services to the Urban Poor (BSUP) and Integrated Housing and Slum Development Programme (IHSDP) projects by the Building Materials & Technology Promotion Council, of the Ministry of Housing and Urban Affairs of the Government of India. If a slum redevelopment project was unavailable for a city, an averaged value of other cities was used.

TRANSPORTATION

In our desk research, we found that most cities in developed countries have a similar distribution of road types. We applied the same distribution to determine the required length of each type of road for Indian cities. We acknowledge that this assumption may not lead to accurate cost estimates because terrain type and traffic volumes, among other factors, may have implications on what type of road may be prevalent in which city. The length of existing roads was estimated using the World Bank Indicator "Urban Road Density (KMs per 1,000 Population) (2008)" disaggregated by state and estimated using each city's population from the 2011 census; it was assumed

[30] We use the average urban population growth rate for the past 10 years from the WDI database.
[31] Retrieved from: https://www.icpsr.umich.edu/icpsrweb/DSDR/studies/36151

that no additional roads were added to increase urban road density. Similarly, the percentage of paved urban roads used the World Bank Indicator "% Urban Roads Surfaced (2011)" also disaggregated by state.

We assume no buses exist in cities where we could not find bus fleet data. This is likely not the case. In many small and medium towns in India, informal systems of minibuses currently provided necessary transportation services. India also has many intermediary public transport (IPT) vehicles such as 'autorickshaws' and 'tempos' that support transportation needs of residents. Where we were unable to find information on the number of formal (articulated[32]) bus stops and bus terminals, we assume that there are no formal bus stops and bus terminals in the city. We do not adjust the cost of a new hybrid bus and the cost of developing an urban mobility plan since the cost of these two is standard internationally. Existing fleet information was derived from India's Smart Cities data portal[33], news sources, development plans, and district-level statistical information found on local websites. Little information regarding bus stops and bus terminals was available, but some information was found mainly from development plans and Smart Cities databases. Wikipedia was used as a last resort for all public transportation information. We used www.numbeo.com to retrieve cost of trips made by public transport. Operating costs for transportation systems was contextualized using Mumbai's BEST transportation agency's reported costs.

We do not adjust the cost of a new hybrid bus and the cost of developing an urban mobility plan since the cost of these two is standard internationally.

SOLID WASTE MANAGEMENT

Consistent with the assumptions of our general methodology, we only cost for sanitary landfills and do not account for any recycling programs that cities may be interested in, or already are, implementing. We translate the cost of constructing and operating a sanitary landfill using US Environmental Protection Agency's guidelines and the Purchasing Power Parity (PPP) between the US and India.

The annual administrative, operations, and maintenance costs per ton as well as the collection costs per ton were disaggregated by city size (<0.5 million, 0.1-1.5 million, 1.5 million+) and borrowed from *Improving Management of Municipal Solid Waste in India: Overview and Challenges* published by the World Bank (2006). These prices were adjusted for inflation and converted to USD 2019. We took the per capita annual waste generation values was from the technical annex of the *Sustainable Solid Waste Management in India* (2012) report by Ranjith Annepu from Colombia University. Then, we projected future waste generation rates using the average GDP growth rate[34] for the past 10 years. For cities that did not feature in this technical annex, we took values from http://www.atlas.d-waste.com/. For all others, we filled the blanks with average values of other small, medium and large.

We took information on existing landfills from a combination of the Smart Cities database, city databases, news articles and city development plans. If no information was found for a city, we assumed that no sanitary landfill capacity existed. For vacant land prices, to be used as landfill sites, we searched local real estate websites for parcels on the outskirts of the city[35]. The Annual administrative, operations and maintenance costs per ton were estimated from German Environment Agency's report *Best Practice Municipal Waste Management: Information pool on approaches towards a sustainable design of municipal waste management and supporting technologies and equipment* (2018).

GREEN PUBLIC SPACES

We use the US National Institute of Health's design standards for how much green public spaces should exist in a city, based on its resident population size. Existing area under green public space use was retrieved from the Smart Cities database and supplemented by data from various city development plans. For cities where no plans exist, we assumed current available green public space to be 0 in order to get a conservative estimate of the costs.

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[32] An articulated bus stop has sufficient safety and accessibility features like lighting, seats and wheelchair ramps.

[33] See: https://smartcities.data.gov.in/

[34] For further information on projected rates of waste generation, see World Bank's What a Waste 2.0 Report.

[35] This was done to find cheap land that would be suitable for landfill use.

Our methodology required an assessment of the cost of vacant land in each city. For this data, similar to solid waste, we used various local real-estate websites and tried to find several vacant lands for sale outside of the city center but sufficiently close to residential areas and took their average. We use the average value of vacant land across all cities where we found data as an approximate value of vacant land for cities where we did not find this data. Though this approach may lead to some inaccuracies at the city level, we think that the error is low when aggregating the total cost of providing adequate public space in cities to the national level.

Park development and maintenance costs were taken from State of Colorado[36] and operations costs were calculated using the operational cost sections of the budget of The Institute of Urban Development of Medellin (IDU)[37]. We acknowledge that costs to construct and maintain parks may vary, but these data are not readily available for projects in India. So, we adjusted US-based estimates and values from Medellin, Colombia using PPP.

GOVERNANCE AND PLANNING

For this section, we apply typical budget values and plan development costs that technical experts shared with us during our consultations for India. We did not have a better alternative.

General Discussion on Limitations

This methodology provides a good starting point for the discussion on how much resources are needed and how much is currently available for mobilization towards achieving SDG 11. However, our estimates can be improved through better data. Without knowing what the realities on the ground are, it is difficult to determine needs accurately, which is a challenge cutting across all the SDGs. As the 'Data for Development' discussions, led by the global statistical community, materialize in building monitoring capacities in developing countries, the accuracy of 'Counting the Costs' would increase.

In addition to bridging the data gaps in official statistics, there is some amount of ground truthing that would be required to accurately determine the costs of achieving SDG 11. For example, we use real estate websites to find the average cost of vacant land in cities with only partial success. The cost of vacant land is highly contextual. In some cities, there are sufficient vacant land or agricultural land that could be converted for public use. In other cities, governments would need to employ *eminent domain* to acquire already developed land for public uses such as green spaces or transportation corridors. We do not distinguish between these two cases for Bolivia. Local knowledge and context would help improve these estimates substantially.

Another example of localization of this methodology is updating the underlying costs to account for the differences in terrain, climate and other location characteristics. Providing green public spaces in drier cities is a much more expensive endeavor than it is for cities where natural irrigation is better. Similarly, costs of construction of transportation infrastructure and costs of waste management will likely also vary.

Systems that are widely accepted as best practices for sustainable urbanization often do not yet exist in developing countries. Public transportation system in many Indian cities is such a case. As discussed earlier in the transportation section, a system of private minibuses and taxi buses currently provide good public mobility to city dwellers. However, for sustainable growth of Indian cities, planned transit systems are required. We did not find cost data on transport for major cities in India and had no choice but to use Mumbai's example of a well-functioning transportation system. Similarly, costs for other inputs such as developing one hectare of green public space should also be replaced with more comparable cases where possible.

Lastly, our costing is the first step in assessing the total resources necessary to achieve the bottom-line of SDG 11. As our project progresses, we intend to develop decision support tools that help municipalities optimize their resource allocation to maximize their progress towards various targets of the SDGs. Currently, our work is limited to only five thematic areas and does not include important costs such as those associated with Energy demands of growing cities, or urban resilience to climate change and disasters, or urban heritage conservation. We also do not analyze the costs and benefits of those development strategies that are beyond the baseline scenario such as

[36] See: http://www.civilresources.com/dacono/PDFs/Plan/Upload21508/appendixD.pdf

[37] See: Instituto de Desarrollo Urbano (2018). Presupuestos de Rentas e Ingresos.

recycling for waste management and mass-transit for transportation. These will be incorporated in future iterations of our methodology, along with discussion on ways in which public costs could be lowered by utilizing innovative financing mechanisms such as 'Urban Park Conservancies' and Public-Private Partnerships.

MALAYSIA

GDP (2017): $314.5 Billion

Population (2018): 31.53 Million

Total Cities: *Unknown*

Study Sample: 20

Large (1 Million and above persons)	Kuala Lumpur
Medium (100,000 – 1 Million persons)	George Town, Kota Bharu, Seremban, Kuala Terengganu, Kuantan, Alor Setar, Shah Alam, Kota Kinabalu, Malacca City, Johor Bahru, Kuching, Ipoh
Small (Less than 100,000 persons)	Donggongon, Simpang Empat, Kangar, Cukai, Semenyih, Putrajaya, Victoria

Note: This classification is based on the estimated population of Malaysian cities in 2019. Several cities graduate from lower tiers to higher tiers in our calculations during the 2019-2030 period.

About 76% of the population of Malaysia resides in urban areas,[38] of which almost 8% are in the largest city—Kuala Lumpur. The country's urban population has almost doubled in the past 20 years. Meanwhile, the total population growth rate has stayed close to 1.5% over the past 10 years, compared to the average urban growth rate of 2.4% (WDI 2018).

Table 1 shows the annuitized average cost to achieve SDG 11 for Malaysia's small, medium, and large cities for the Housing, Transportation, Solid Waste Management, Public Space, and Urban Governance and Planning thematic areas.

Table 1: Average Annual Cost for Small, Medium and Large Cities in Malaysia (Millions 2019 USD)

City Size		Small	Medium	Large
Population		<100K	100K-1Mil	1Mil +
Average Annual Cost by City Type	Housing	$0.06	$23.43	$27.48
	Transportation	$16.43	$424.05	$1,617.57
	Solid Waste	$0.18	$3.69	$26.16
	Public Space	$0.09	$58.75	$3,597.22
	Governance & Planning	$1.72	$5.88	$17.37
TOTAL		$18.48	$515.79	$5,285.80

Source: AidData

[38] The World Bank's World Development Indicators 2018 (WDI 2018).

We share the detailed methodology by thematic area in separate documents. However, we had to make several contextual adjustments for Malaysia to overcome data constraints and other challenges. Following are the specific assumptions and adjustments that we made to contextualize our general methodology to Malaysian cities.

HOUSING

General population and household statistics were gathered from 2010 Malaysian Census data; population projections used a flat national urban population growth rate of 2.4%.[39] Using this rate and base year data from the 2010 census, we projected housing data to 2019.

We took the per capita income of the lowest quintile of the population from the *2016 Household Income and Basic Amenities Survey* reports by state and administrative district conducted by the Malaysian Department of Statistics. State values were used to approximate the values of 7 cities not represented in the survey.

The percentage of citizens in need of adequate housing used the state-level percentage of citizens living in urban 'improvised / temporary hut' units derived from the Department of Statistics Malaysia's *e-DataBank 2010* report on total living quarters by type of living quarters.[40] In some instances, we had to distribute state data to cities based on population. The cost of improving slum dwellings in-situ used a value quoted in a news article regarding a pilot scheme by *Iris Corp Bhd* for low-cost housing projects in villages in Malaysia.[41]

TRANSPORTATION

In our desk research, we found that most cities in developed countries have a similar distribution of road types. We applied the same distribution to determine the required length of each type of road for Malaysian cities. We acknowledge that this assumption may not lead to accurate cost estimates because terrain type and traffic volumes, among other factors, may have implications on what type of road may be prevalent in which city. For instance, some Malaysian cities utilize alternative modes of transport such as ferries or require additional infrastructure such as bridges. We did not consider the effects and costs of non-terrestrial public transportation.

Urban road lengths were approximated by scaling the total number of state and federal roads in the city's state, from the *Department of Statistics Malaysia's* Statistics Bulletin of 2019, by the ratio of the city's urban area to the state's total area. This assumes that the distribution of the federal and state highway network is even throughout the entire state, and that federal and state highways pass through the city. It does also not consider the existence of local roads within the city. We used a similar approach to approximate the number of unpaved roads in urban areas. We acknowledge that this is a major limitation of this study. Cost estimates for transportation in Malaysia will improve substantially if data on urban roads becomes available.

We took the cost of maintaining roads from the World Bank's estimates for the Latin America and Caribbean region ($655/Km) and adjusted the costs to Malaysia using Purchasing Power Parity (PPP) ratios. We used a combination of research papers, city government websites (if available), and Wikipedia to compile data on city administrative areas. When no data was available, Google Earth Pro polygons were drawn to approximate urban areas.

In Malaysia, many cities' public bus transportation services are provided by numerous small private bus companies. We approximated operating bus fleets through a combination of sources, such as news releases, the websites of each city's largest known public transportation company, and information of bus routes on various public transportation service websites. We took a similar approach to estimate the number of formal bus stops in cities. In cities where we could not find any data, we assume the number of buses and bus stops to be zero. This is likely not the case, as most of a city's fleet seem to consist of many small private companies that do not have an online presence. Similarly, where we were unable to find information on the number of formal (articulated[42]) bus stops and bus terminals, we assume that there are no formal bus stops and bus terminals in the city.

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[39] We use the average urban population growth rate for the past 10 years from the WDI database.

[40] Retrieved from https://www.dosm.gov.my/v1/index.php?r=column/cthree&menu_id=cEhBV0xzWll6WTRjdkJienhoR290QT09.

[41] Retrieved from https://www.nst.com.my/news/2015/09/iris-tackles-slum-problem-%E2%80%98lego%E2%80%99-housing

[42] An articulated bus stop has sufficient safety and accessibility features like lighting, seats and wheelchair ramps.

We used www.numbeo.com to retrieve cost of trips made by public transport; an average value was used to approximate cost of public transportation trips for cities not represented. Operating costs for transportation systems was contextualized using Mumbai's BEST transportation agency's reported costs and adjusted for the price differentials between Malaysia and India.

Except for four cities that had published planning documents containing public transportation information, bus terminals were estimated using Google Map searches for bus terminals within each city's urban area. Finally, we did not adjust the costs of a new hybrid bus and the cost of developing an urban mobility plan, since both are standard internationally.

SOLID WASTE MANAGEMENT

Consistent with the assumptions of our general methodology, we only cost for sanitary landfills and do not account for any recycling programs that cities may be interested in implementing. We translate the cost of constructing and operating a sanitary landfill using US Environmental Protection Agency guidelines and the Purchasing Power Parity (PPP) between the US and Malaysia. Waste collection cost on a per household basis ($5.27) was found in the 2012 report *Solid Waste Management in Malaysia: The Way* Forward produced by the Director General of Malaysia's National Solid Waste Management Department. Furthermore, waste disposal and operation costs per ton ($10.76) used the operating expenditure value quoted in the 2017 report *State of the 3Rs in Asia and the Pacific* published by the Institute for Global Environmental strategies (IGES) and the United Nations Centre for Regional Development (UNCRD).

Information regarding per capita waste generation was mainly taken from an appendix in the 2003 report *Solid Waste Management in Kuching* prepared by COWI, DANWASTE, Chemsain Consultant Universiti Putra Malaysia and Daya Rancang; averages for small, medium, and large cities were used to fill data gaps for the 11 cities that were not covered in the report. We projected waste generation to future years, including 2019, by using GDP growth rates.[43]

A literature review found that most Malaysian landfills are full to overflowing, and that many are solely dumpsites rather than sanitary landfills. Lists of state waste management facilities provided by the *National Solid Waste Management Department*'s statistics[44] showed that many states had no sanitary landfills at all. For cities that were in states containing sanitary landfills, we consulted a series of academic papers to determine current sanitary landfill capacities.

Cost of vacant land on the periphery of the city[45] was found using various local real estate websites and converted to 2019 USD per hectare. For cities where this data was unavailable, we used the average cost of vacant land from other cities.

GREEN PUBLIC SPACES

We used the US National Institute of Health's design standards for how much public spaces should exist in a city, based on its resident population size. Existing area under green public space use was retrieved from city development plans, where available. Information on public space was only available for a few cities that had master plans containing information on existing public space. The average proportion of open space in known urban areas was used to approximate the existing public open space in other cities.

Our methodology required an assessment of the cost of vacant land in each city. Like the solid waste methodology, we used various local real estate websites to compile the cost of vacant lands for sale outside of the city center and used separate averages for small, medium, and large cities to fill data gaps in other cities of similar size for which we could not find data. Though this approach may lead to some inaccuracies at the city level, we think that the error is low when aggregating the total cost of providing adequate public space in cities to the national level.

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[43] For further information on projected rates of waste generation, see World Bank's What a Waste 2.0 Report.

[44] Retrieved from https://jpspn.kpkt.gov.my/resources/index/user_1/Sumber_Rujukan/statistik/Kelantan.pdf

[45] This was done in order to find the cheap land that would be suitable for landfill.

Park development and maintenance costs were taken from State of Colorado[46] and operations costs were calculated using the operational cost sections of the budget of The Institute of Urban Development of Medellín (IDU)[47]. We acknowledge that costs to construct and maintain parks may vary, but these data are not readily available for projects in Malaysia. So, we adjusted estimates from other countries using PPP.

GOVERNANCE AND PLANNING

For this section, we apply typical budget values and plan development costs that technical experts shared with us during our consultations. We did not have a better alternative.

General Discussion on Limitations

This methodology provides a good starting point for the discussion on how much resources are needed and how much are currently available for mobilization towards achieving SDG 11. However, our estimates can be improved through better data. Without knowing what the realities on the ground are, it is difficult to determine needs accurately, which is a challenge cutting across all the SDGs. As the 'Data for Development' discussions, led by the global statistical community, materialize in building greater monitoring capacities in developing countries, the accuracy of our 'Counting the Costs' methodology would increase.

In addition to bridging the data gaps in official statistics, there is some amount of ground truthing that would be required to accurately determine the costs of achieving SDG 11. For example, we use real estate websites to find the average cost of vacant land in cities with only partial success. The cost of vacant land is highly contextual. In some cities, there are sufficient vacant land or agricultural land that could be converted for public use. In other cities, governments would need to employ eminent domain to acquire already developed land for public uses such as green spaces or transportation corridors. We do not distinguish between these two cases. Local knowledge and context would help improve these estimates substantially.

Another example of localization of this methodology is updating the underlying costs to account for the differences in terrain, climate and other location characteristics. Providing green public spaces in drier cities is a much more expensive endeavor than it is for cities where natural irrigation is better. Similarly, the costs of construction of transportation infrastructure and costs of waste management will likely also vary. Transportation in Malaysia is a particularly tricky subject to cost, since many cities have complex multi-modal systems, including waterways.

Lastly, our costing is the first step in assessing the total resources necessary to achieve the bottom-line of SDG 11. As our project progresses, we intend to develop decision support tools that help municipalities optimize their resource allocation to maximize their progress towards various targets of the SDGs. Currently, our work is limited to only five thematic areas and does not include other important costs, such as those associated with the energy demands of growing cities, urban resilience to climate change and disasters, and urban heritage conservation. We also do not analyze the costs and benefits of those development strategies that are beyond the baseline scenario, such as recycling for waste management and mass-transit for transportation. These will be incorporated in future iterations of our methodology, along with discussion on ways in which public costs could be lowered by utilizing innovative financing mechanisms, such as 'Urban Park Conservancies' and Public-Private Partnerships.

[46] See: http://www.civilresources.com/dacono/PDFs/Plan/Upload21508/appendixD.pdf

[47] See: Instituto de Desarrollo Urbano (2018). Presupuestos de Rentas e Ingresos. This source was used and converted to costs in Malaysia because no similar information was found for Malaysia.

SWEDEN

GDP (2017): 538 billion USD

Population (2018): 10,230,185

Total Municipalities: 290

Study Sample: 290

City Size	Number of Cities
Large (1 Million and above persons)	0
Medium (100,000 – 1 Million persons)	18
Small (Less than 100,000 persons)	272

Note: This classification is based on the estimated population of Swedish cities in 2018. None of the cities makes the threshold of 1 million. Based on projection by Sweden Statistics, Stockholm will graduate from medium tier to higher tier in our calculations during the 2019-2030 period.

According to the *Sustainable Development Report* published by Sustainable Development Solutions Network, Sweden is close to fully achieve the goals specified in SDG 11 and has been making progress at an increasing speed. Cities in Sweden operate at standards that are much higher than in the baseline proposed for other countries in our study. As such, Swedish cities face a different set of challenges and contribute their resources to different areas. Thus, we chose to look at Swedish cities as examples of success and review current municipal expenditures in each thematic area, instead of how much the baseline approach would cost.

These numbers in Sweden may not be comparable to other countries, as they strive to tackle different challenges. For instance, a significant proportion of the estimated cost sin other countries are hard costs such as infrastructure while Sweden allocates many resources to "soft" areas, such as governance, democracy and behavioral change. Though not entirely comparable, we present expenditures of Swedish cities to highlight a scenario where cities continue to work with different challenges in advanced stages of their pursuit to achieve SDG 11 and New Urban Agenda.

Over 87% of the population of Sweden resides in urban areas.[48] Projected population growth in Sweden is different from other countries in our study. While populations in other countries are expected to double in a few decades, Sweden's population will grow slowly in some cities and decrease in others. Sweden Statistics projects that the number of residents in Sweden, both born in and outside of the country, will reach 11.1 million by 2030.

To compare Sweden with other countries in our study, we examined municipal expenditure in similar thematic areas: Housing, Transportation, Solid Waste Management, Public Space, and Urban Governance and Planning. Table 1 shows the cost breakdown by each thematic area.

[48] Source: Sweden Statistics (2018)

Table 1: Expenditure Breakdown by Sector for All Cities in Sweden (Millions of USD 2019)

Thematic Area	2016	2017	2018	Annual Average
Housing	$135.30	$127.35	$120.12	**$127.59**
Governance and Planning	$80,026.43	$82,057.11	$81,759.06	**$81,280.87**
Transportation	$756.80	$812.87	$792.69	**$787.45**
Public Space	$15,658.17	$15,658.60	$15,658.98	**$15,658.58**
Waste Management	$468.50	$426.66	$546.92	**$480.69**
TOTAL	$ 97,045.21	$99,082.58	$98,877.78	**$98,335.19**

Source: Sweden Statistics and AidData

We further derive the annuitized average expenditure to achieve SDG 11 for cities in different sizes. Table 2 provides the results.

Table 2: Average Annual Expenditure by City Type in Sweden (Millions of USD 2019)[49]

City Size	Housing – public cost	Governance and Planning	Transportation	Public Space[50]
Medium	$3.24	$1,692.98	$13.93	$202.32
Small	$0.27	$194.14	$2.03	$44.95

Source: Sweden Statistics and AidData

To further showcase the efforts that Swedish cities have made with the above resources, the following section provides some context and examples of activities by municipalities.

HOUSING

We took the public cost of housing from the municipalities' cost of social housing contribution that Sweden Statistics publishes. It usually entails a housing compensation from local governments to individuals with financial difficulties (e.g., the unemployed and single parents). This subsidy is similar to how we calculate public expenditures required by governments to make housing affordable in other countries, with a slight difference in the approach that Swedish municipalities take in determining eligibility to receive benefits that extend beyond just income.

TRANSPORTATION

Transportation priorities in Swedish municipalities are not entirely focused on building infrastructure. Rather, significant portions of transportation expenditures are earmarked to increasing walking and biking as modes of transport for all seasons, and to optimize traffic management through implementation of new technologies under

[49] Expenditure in Waste Management is not available at the municipality level.

[50] Due to lack of data on expenditure in public space, numbers are estimated based on stock of public green space and average maintenance cost.

smart-cities programs. This is a clear indication of the difference in baselines to achieve SDG 11 for developed and developing countries.

SOLID WASTE MANAGEMENT

Sweden adopts a more complex and advanced approach to waste management than developing countries. The priority of waste management in Sweden lies first in prevention and reuse. The five hierarchical waste management steps proposed by the Swedish government are reduce, reuse, recycle; energy recovery; and, lastly, landfill. Investments are made in areas such as improving the accessibility of recycling centers, sorting food waste, and public education in waste recycling and reduction.

GREEN PUBLIC SPACES

The current stock of public space in Sweden is more than the minimum amount required by the standards we use for other countries. Therefore, the overall expenditures in green public space are likely a function of just the cost of their maintenance and operation. Due to a lack of data on actual public expenditure in green space maintenance, we estimate this expenditure using the amount of existing green space in urban areas and an average of the cost of operation and maintenance values we have used in our study.

GOVERNANCE AND PLANNING

Data on governance and planning costs are sourced from municipalities' total operation costs from Sweden Statistics. Cities in Sweden contribute significantly more to governance and planning compared to the baseline set for other countries in our study. With these additional resources and efforts, Swedish municipal governments are able to achieve many goals beyond the baseline. For example, they maintain good records of data collection at the household level, publish audited reports annually, and host regular discussions on important decisions.

COTE D'IVOIRE

GDP (2018): $43 Billion

Population (2018): 25.07 Million

Total Cities: *Unknown*

Study Sample: 25

Large (1 Million and above persons)	Abidjan
Medium (100,000 – 1 Million persons)	Yamoussoukro, Korhogo, Man, Divo, Gagnoa, Soubre, Abengourou, Agboville, Dimbokro, Bouafle, Bondoukou, Seguela, Odienne, Guiglo, Toumodi, Aboisso, Bouake, Daloa, San-Pedro, Grand Bassam, Dabou, Ferkessedougou, Sassandra
Small (Less than 100,000 persons)	Touba

Note: This classification is based on the estimated population of Cote d'Ivorian cities in 2019. Several cities graduate from lower tiers to higher tiers in our calculations during the 2019-2030 period.

About 51% of the population of Cote d'Ivoire resides in urban areas,[51] of which about 40% live solely in the largest city and economic capital: the port town of Abidjan. The country's urban population growth rate has been roughly 1 percentage point higher than the national population growth rate, due to migration to urban areas such as Abidjan for employment. In fact, as of 2018, the national and urban population growth rates were 2.6% and 3.5%, respectively. Cote d'Ivoire's GDP (in constant 2010 USD) has almost doubled since 2011 from $23.8 billion to $42.4 billion (WDI 2018).

However, these are national level data. Sub-national information in Cote d'Ivoire is extremely difficult to obtain. The only city for which we could find any data was the capital, Abidjan.[52] We were able to extract some information from the 2014 Census abstracts, but access to city level data from the Census required permissions which we were unable to obtain. As a result, we did not have sufficient information to apply our methodology to estimate the cost of achieving SDG 11 in cities in Cote d'Ivoire.

We consulted colleagues at the World Bank's country office, as well as urban specialists at the Asian Development Bank's headquarters in Abidjan on potential ways of collecting the necessary city-level information. However, these conversations did not lead us toward finding any usable information. We therefore dropped Cote d'Ivoire from our study.

[51] The World Bank's World Development Indicators 2018 (WDI 2018).

[52] The Abidjan city master plan was the only source of reliable information we could find.

IV. DISCUSSION

The first lesson learned through this study is that costs are contextual. No one size fits all and translating a standard methodology to different countries requires significant adjustments to which inputs to consider. While there are commonalities, no one size fits all.

Secondly, the baselines for least developed, developing and developed countries are very different. This was illustrated by the case of Sweden, where expenditures are geared towards advanced sustainability objectives, such as bike lanes and digital infrastructure for smart cities. In contrast, developing countries are working towards creating basic bus services for their urban citizens. Meanwhile, least developed countries lack basic records and data on public services and, therefore, do not have actionable plans to achieve established targets.

Thirdly, the total required investments for achieving SDG 11 get higher as cities grow, mainly because of the total population. Many cities in our sample will transition in size from small to medium or medium to large over the next decade. Tables 2 and 3 illustrate the jump in costs between medium and large cities on a yearly basis. To maximize the 'economies of scale' that sustainable urbanization offers in terms of dollars needed per capita to provide basic services, housing, transport etc., making strategic investments now in transitioning cities (those moving from small to medium and from medium to large) is essential. Investments should still be made in large cities before the situation worsens further.

Table 1: Estimated Average Annual Cost for Achieving SDG 11 in Small Cities (Millions of USD)

Average Annual Cost for Small Cities (<100k Inhabitants)							
	Sample Size (Cities)	Housing - Public Cost	Transport	Solid Waste	Public Space	Governance and Planning	Total
Bolivia	8	$ m 18.81	$ m 29.13	$ m 0.63	$ m 4.36	$ m 1.36	**$ m 54.29**
India	7	$ m 4.70	$ m 9.38	$ m 1.69	$ m 17.82	$ m 0.84	**$ m 34.43**
Malaysia	7	$ m 0.06	$ m 16.43	$ m 0.18	$ m 0.09	$ m 1.72	**$ m 18.48**
Colombia	18	$ m 15.44	$ m 19.26	$ m 0.38	$ m 2.79	$ m 1.09	**$ m 38.96**

Table 2: Estimated Average Annual Cost for Achieving SDG 11 in Medium-Sized Cities (Millions of USD)

Average Annual Cost for Medium-Sized Cities (100k – 1 Million Inhabitants)							
	Sample Size (Cities)	Housing - Public Cost	Transport	Solid Waste	Public Space	Governance and Planning	Total
Bolivia	11	$ m 79.50	$ m 62.90	$ m 3.49	$ m 40.40	$ m 4.66	**$ m 190.95**
India	18	$ m 16.28	$ m 42.74	$ m 9.30	$ m 72.66	$ m 2.81	**$ m 143.79**
Malaysia	12	$ m 23.43	$ m 424.05	$ m 3.69	$ m 58.75	$ m 5.88	**$ m 515.80**
Colombia	25	$ m 107.30	$ m 202.17	$ m 2.91	$ m 26.81	$ m 3.71	**$ m 342.90**

Table 3: Estimated Average Annual Cost for Achieving SDG 11 in Large Cities (Millions of USD)

Average Annual Cost for Large Cities (>1 Million Inhabitants)							
	Sample Size	Housing - Public Cost	Transport	Solid Waste	Public Space	Governance and Planning	Total
Bolivia	1	$ m 308.73	$ m 259.98	$ m 14.54	$ m 47.81	$ m 13.60	**$ m 644.66**
India	17	$ m 397.28	$ m 626.01	$ m 167.26	$ m 817.37	$ m 8.22	**$ m 2016.14**
Malaysia	1	$ m 27.48	$ m 1617.58	$ m 26.16	$ m 3597.22	$ m 17.37	**$ m 5285.81**
Colombia	4	$ m 1324.57	$ m 1503.96	$ m 49.68	$ m 217.05	$ m 10.88	**$ m 3106.14**

Lastly, in some exploratory evaluations of the City of Santa Cruz in Bolivia, we found a large gap between what we estimated to be the resource needs and the current municipal revenues. The total general revenue of Santa Cruz is Bs 3,503,624,177.85 (USD$507 million).[53] Our estimated requirement of annual resources for Santa Cruz is USD$878.34 million. According to the 2018 Santa Cruz budget, two thirds of the total revenues are spent on infrastructure, environment, administration etc. The other one third is spent on programs for human development. This implies that there is roughly a deficit of USD$540 million (Bs 3,733,583,560) annually which would need to be offset through inter-governmental transfers (federal support) or through innovative financing mechanisms. We saw similar trends in other countries, which leads us to think that the focus of financing sustainable development in cities should shift from increasing public revenues and spending to innovative policies that unlock privately held capital towards targeted investments in a well-regulated environment.

As we continue to refine and expand our methodology, we plan to share additional evidence to guide the formation of better policies that accelerate the pursuit of urban sustainability.

[53] See page 183 of Rendición Publica de Cuentas Final 2018 de Santa Cruz. Available at: https://bit.ly/2MJjMzA

V. ANNEX: INTERVIEW GUIDES

EXPERT CONSULTATION GUIDE: HOUSING

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

1. Adequate Housing (Including Slums and Informal Settlements)

Definition: *Adequate housing* is defined within the Global Strategy as meaning: adequate privacy, adequate space, adequate security, adequate lighting and ventilation, adequate basic infrastructure and adequate location with regard to work and basic facilities-all at a reasonable cost.

Definition: UN-HABITAT defines a *slum* household as a group of individuals living under the same roof in an urban area who lack one or more of the following:

1. Durable housing of a permanent nature that protects against extreme climate conditions.
2. Sufficient living space, which means not more than three people sharing the same room.
3. Easy access to safe water in sufficient amounts at an affordable price.
4. Access to adequate sanitation in the form of a private or public toilet shared by a reasonable number of people.
5. Security of tenure that prevents forced evictions.

Definition: Informal settlements are:

1. areas where groups of housing units have been constructed on land that the occupants have no legal claim to, or occupy illegally;
2. unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing).

Proposed Costing Approach: Number of households that are living in sub-standard conditions, multiplied by the cost of an adequate house. Cost of an adequate house could be estimated by the market price of the cheapest planned 'low-income' dwelling unit in the city.

Assumptions: All slums and informal settlements are inadequate housing. Cost of retrofitting (upgrading) an inadequate dwelling unit is the same as the cost of a new adequate dwelling unit.

2. Affordable Housing

Definition: Personal or household costs associated with housing should be at such a level that the attainment and satisfaction of other basic needs are not threatened or compromised. Housing subsidies should be available for those unable to obtain affordable housing, and tenants should be protected from unreasonable rent levels or rent increases. In societies where natural materials constitute the chief sources of building materials for housing, steps should be taken by States to ensure the availability of such materials.

Proposed Costing Approach: This could be looked at using the 30% of income on rent criteria. What is the gap between 30% of income for the bottom 25% population and the lowest (cheapest) rent on planned housing, multiplied by number of households.

Assumptions: 30% of income is the threshold of affordability for households to spend on adequate housing. By providing subsidies to bridge the gap between the minimum rent of an adequate dwelling unit and 30% of average income of the poorest 25% of the population, everyone will be able to afford adequate housing.

3. Access to Housing for All

Definition: Access seems to imply that there is an adequate supply of affordable housing commensurate with demand AND that the housing is available to anyone without discrimination AND that the housing is located in such a way that geographically is where people need it to be AND that there is accommodation for those with physical disabilities.

Proposed Costing Approach: To be Determined

Assumptions:

4. Safe Housing

Definition: "Safe" housing seems to imply that: the housing that is available is structurally sound (as in meeting acceptable planning/building codes), as well as located in an area that is physically secure for the house dwellers both in terms of environmental impact and human security.

Proposed Costing Approach: To be Determined

Assumptions:

5. Basic Services

Definition: Access to Water and Sanitation, Urban Waste Management, Mobility and Energy

Proposed Costing Approach: We divide the costing for this into four components:

1. Number of households who do not have access to potable water and sanitation multiplied by cost of provision of water and sanitation per dwelling unit. *This would be included in the cost of providing adequate housing, and would not be explicitly calculated here.*
2. Amount of waste generated per capita multiplied by the total population, multiplied by the cost of safe management of solid waste per kilogram.
3. Average KWH energy consumed per capita multiplied by the cost of energy generation per KWH.

4. Cost of providing access to public transport to those households that are not within 1km of a bus stop. *This would be included in the cost of providing access to public transport.*

Assumptions: All adequate housing require provision of formal water and sanitation services. All urban dwelling units are electrified, or have negligible cost of electrification (connecting to the grid).

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified seven concepts that directly relate to urban housing: Housing access for all, Adequate housing, Safe housing, Affordable housing, Basic services, Slum and Informal settlements.

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

Adequate Housing

For this set of questions on adequate housing, we have an approach that we shared with you previously. However, we would like to receive your inputs independent of our identified approach. This would be an opportunity for us to revisit and refine our understanding of adequate housing so that we capture the costs of delivery more accurately and in line with the spirit of SDG 11 and the NUA.

- In your experience, how would you define adequate housing as a concept that is universally applicable?
    - Based off this definition, how would you measure adequacy of housing in the context of your work?
- In your opinion, what are some of the assumptions that we are making to measure this concept at scale?
- Once we have determined the amount of adequate housing required in a city, using the above definition, how do you think we should translate that into the cost of delivering adequate housing for all?
    - Are there any assumptions involved in this translation?
- Are there any other thoughts you have on the topic of adequate housing that you think we should be aware of?

Affordable Housing

Similar to the previous topic, we shared an approach with you on affordable housing. Please answer the next set of questions on affordable housing from your own experience.

- In your opinion, how would you define affordable housing in practice?
    - Does the term affordable housing imply that the house is also adequate?
    - How do you think one can measure whether housing is affordable or not?

- What are some of the assumptions that we need to make in order to measure the current amount of affordable housing at the city level, and the associated gap?
    - For calculating the gap (affordable housing shortage), would it be reasonable to only look at the lowest quartile of households by income as they are the most vulnerable?
- Once we have determined the amount of affordable housing required, using the information above, how do you think we should translate that into the cost of delivering affordable housing for all (or the target population in need)?
    - What do you think are some assumptions that would have to be made in this cost determination?
- Are there any other thoughts you have on the topic of affordable housing that you think we should know?

For the two concepts we discussed, we had some understanding of the concept, and how to go from definition to measurement, to cost. The next two concepts have been a bit more difficult to define and quantify.

Access to Housing

The next topic that we would like to discuss is access to housing.

- In the context of SDG 11, what does access to housing mean in practical terms?
- If we think of 'access' as a multi-faceted concept, what dimensions do you think are important to consider?
    - Affordability (economic access)
    - Physical/Distance (proximity access)
    - Are there any other dimensions to access?
- How do you think we should measure access to housing?
    - If there is no good way to explicitly measure the access gap, are there any good implicit (proxy) measures?
- How would we translate this into the cost of providing access to housing?
    - What are some of the assumptions that are implied in this costing approach?

Safe Housing

The next topic is safe housing.

- What does 'safe' mean when it comes to housing?
    - Are there different dimensions to safety? If yes, what are they?
- What could be a possible way to measure safety of housing and determine the gap in safe housing?
    - If there are no direct measures, are there any good proxy measures that could be used instead?
- For providing safety, how do you think we could go from this needs assessment to determining the cost of provision?
    - What are some assumptions that would need to be made?
- Could safety be assumed if housing is adequate? If that is the case, then would costing adequate housing be sufficient to also include the cost of safe housing?
- Are there any other thoughts on this topic that you think we should know?

Basic Services

Switching gears a bit, the last topic we want to speak about the topic of basic services.

- In the context of urban housing, how would you define basic services?
    - In your experience, what are some of the different dimensions of basic services?
- Is the concept of basic services intertwined with the concept of adequate housing?
    - What are some potential divergences that we should be mindful of?

- What do you think would be a feasible approach to measure access to basic services, and subsequently the gap?
    - What assumptions do you think have to be made while estimating this gap?
- How would we translate this into a cost of providing basic services to all?
    - Are there any assumptions here that you could think of?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding basic services?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: URBAN GOVERNANCE

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

6. Inclusive Urbanization

Definition: Not excluding people from urban politics, spaces, markets and services based on their identity.

Proposed Costing Approach:

Assumptions:

7. Sustainable Urbanization

Definition: Promote and enable the long-term well-being of people and the planet, through efficient use of natural resources and production of wastes within a city region while simultaneously improving its livability, through social amenities, economic opportunity, and health, so that it can better fit within the capacities of local, regional, and global ecosystems

Proposed Costing Approach:

Assumptions:

8. Participatory Settlement Planning and Management

Definition: Emphasizes involving the entire community in the strategic and management processes of urban planning; or, community-level planning processes in urban areas.

Proposed Costing Approach:

Assumptions:

9. Integrated Settlement Planning and Management

Definition:

Proposed Costing Approach:

Assumptions:

10. Sustainable Settlement Planning and Management

Definition:

Proposed Costing Approach:

Assumptions:

11. Land Consumption Rate vs. Population Growth Rate

Definition: The ratio of new land that is developed to the increase in population.

Proposed Costing Approach: This is just a monitoring instrument with no achievement guidelines. Hence, there is no costs associated with this.

Assumptions:

12. Support positive economic, social and environmental links between urban, peri-urban and rural areas

Definition:

Proposed Costing Approach:

Assumptions:

13. Strengthen National and Regional Development Planning

Definition:

Proposed Costing Approach:

Assumptions:

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified eight concepts that directly relate to urban governance: Inclusive urbanization, sustainable urbanization, participatory settlement planning and management, integrated settlement planning and management, sustainable settlement planning and management, land consumption rate to population growth rate (ratio), supporting urban/peri-urban-rural link, and national development planning

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

The topics that we shared with you earlier see to be quite difficult to define and quantify. We would like your inputs on each of them.

Inclusive Urbanization

- In your experience, how would you define inclusive urbanization as a concept that is universally applicable?
    - Based off this definition, how would you measure inclusive urbanization in the context of your work?
- In your opinion, what are some of the assumptions that we are making to measure this concept at scale?
- How do you think we should translate this into the cost of delivering on inclusive urbanization?
    - Are there any assumptions involved in this translation?
- Are there any other thoughts you have on the topic of sustainable transportation that you think we should be aware of?

Sustainable Urbanization

- In your opinion, how would you define sustainable urbanization in practice?
    - How do you think one can measure whether transportation is accessible to all or not?
- What are some of the assumptions that we need to make in order to measure the current amount of transportation access at the city level, and the associated gap?
- Once we have determined the amount of inputs required, using the information above, how do you think we should translate that into the cost of delivering transportation access for all (or the target population in need)?
    - What do you think are some assumptions that would have to be made in this cost determination?
- Are there any other thoughts you have on this topic that you think we should know?

The next three topics are about settlement planning and management.

Participatory Settlement Planning and Management

- What does 'participatory' mean when it comes to settlement planning and management?
    - Is this an aspirational concept or can it be measured?
- If it is a measurable concept, how might one measure it?
    - What are some assumptions that would need to be made?
- How could we translate this into a cost?
    - If there is no direct costing approach that seems feasible, is there a percentage that the city planning budget could be increased by, to ensure citizen participation?
- Are there any other thoughts on this topic that you think we should know?

Integrated Settlement Planning and Management

The next topic is integrated settlement planning and management.

- What does 'integrated' mean when it comes to settlement planning and management?
    - How is it different from 'participatory settlement planning and management'?
    - Is this an aspirational concept or can it be measured?
- If it is a measurable concept, how might one measure it?
    - What are some assumptions that would need to be made?
- How could we translate this into a cost?
    - If there is no direct costing approach that seems feasible, is there a percentage that the city planning budget could be increased by, to ensure integrated settlement planning?
- Are there any other thoughts on this topic that you think we should know?

Sustainable Settlement Planning and Management

The next topic is sustainable settlement planning and management.

- What does 'sustainable' mean when it comes to settlement planning and management?
    - How is it different from 'participatory settlement planning and management'?
    - Is this an aspirational concept or can it be measured?
- If it is a measurable concept, how might one measure it?
    - What are some assumptions that would need to be made?
- How could we translate this into a cost?
    - If there is no direct costing approach that seems feasible, is there a percentage that the city planning budget could be increased by, to ensure sustainable settlement planning?
- Are there any other thoughts on this topic that you think we should know?

The next three concepts are unclear in their achievement criteria.

Land Consumption Rate vs. Population Growth Rate

To our understanding, this is a very subjective variable with no aspirational value. So this shouldn't be a part of this costing study.

- How would you interpret this ratio?

- Is there any aspect of this that requires costing?
    - What about data collection for monitoring the rate of land consumption and population growth rate?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding this ratio?

Support positive economic, social and environmental links between urban, peri-urban and rural areas

Now, we would like to speak about Supporting Urban/Peri-Urban/Rural Link

- What does this mean in terms of SDG-11?
    - What does supporting positive urban/peri-urban/rural links look like from a city's perspective?
- How would you measure the cost of 'supporting urban/peri-urban/rural link'?
- What would be some assumptions that we would have to make in this costing?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding road safety?

Strengthening National and Regional Development Planning

The last topic we want to speak about is Strengthening National and Regional Development Planning

- This seems like an institutional reform and capacity development idea.
- How would we translate this into a cost of strengthening national and regional development planning?
    - Are there any assumptions here that you could think of?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding this topic?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: PUBLIC SPACE & RECREATION

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

14. Universal Access to Green and Public Spaces

Definition: Every household has a green or public space within 1km walking distance.

Proposed Costing Approach:

Assumptions:

15. Safe Green and Public Spaces

Definition: Green and public spaces are provided in locations that ensure the safety of users through adequate public exposure or installation of security cameras.

Proposed Costing Approach:

Assumptions:

16. Inclusive Green and Public Spaces

Definition: Green and public spaces are physical spaces designed for all user groups, regardless of gender, race, ethnicity, age or socio-economic level.

Proposed Costing Approach:

Assumptions:

17. Accessible Green and Public Spaces

Definition: Green and public spaces that are designed to be usable by all people, including people of all ages and persons with disabilities.

Proposed Costing Approach:

Assumptions:

18. Green and Public Space Needs of [Women, Children, Older Persons, Persons with Disabilities]

Definition:

Proposed Costing Approach:

Assumptions:

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified five concepts that directly relate to Environment, Public Space & Recreation: Universal Access to Green and Public Spaces, Safe Green and Public Spaces, Inclusive Green and Public Spaces, Accessible Green and Public Spaces, Green and Public Space Needs of [Women, Children, Older Persons, Persons with Disabilities].

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

Most of the topics that we shared with you earlier see to be quite difficult to define and quantify. We would like your inputs on each of them.

The next four topics are about green and public spaces.

Universal Access to Green and Public Spaces

- How would you define universal access in practice?
    - How do you think we could measure the universal access gap?
- What are some of the assumptions that we need to make for this measurement approach?
- How would you determine the cost of providing universal access to green and public spaces?
    - Are there any underlying assumptions in this costing approach?
- Are there any other thoughts you have on this topic that you think we should know?

Safe Green and Public Spaces

- What does 'safe' mean when it comes to green and public spaces?
    - Are there different dimensions to safety? If yes, what are they?
- What could be a possible way to measure safety of green and public spaces, and the gap in safety?
    - If there are no direct measures, are there any good proxy measures that could be used instead?
- For providing safety, how do you think we could go from this needs assessment to determining the cost of provision?
    - What are some assumptions that would need to be made?
- Are there any other thoughts on this topic that you think we should know?

Inclusive Green and Public Spaces

- How would you define the term 'inclusive' green and public spaces in practice?
- How would you say we can measure the inclusivity gap?
- What are some assumptions underlying this approach to measuring the inclusivity gap?
- How would you measure the cost of bridging this gap?
- Are there any other thoughts on this topic that you think we should know?

Accessible Green and Public Spaces

- How would you interpret this ratio?
- Is there any aspect of this that requires costing?
    - What about data collection for monitoring the rate of land consumption and population growth rate?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding this ratio?

The last topic is about needs of various groups from green and open spaces.

Green and Public Space Needs of [Women, Children, Older Persons, Persons with Disabilities]

- How would you define the needs of the following groups with regards to green and public spaces:
    - Women
    - Children
    - Older Persons
    - Persons with Disabilities
- Are these needs quantifiable, in that a gap could be determined?
    - What are some underlying this gap assessment?
- What would be a good approach to determining the cost of bridging these gaps?
    - Are there any underlying assumptions in this costing approach?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding road safety?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: TRANSPORTATION

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

19. Sustainable Transportation

Definition: Sustainable transport system is defined as one that:

- allows the basic access and development needs of individuals, companies and societies to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations;

- is affordable, operates fairly and efficiently, offers choice of transport mode, and supports a competitive economy, as well as balanced regional development;

- limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and, uses non-renewable resources at or below the rates of development of renewable substitutes while minimizing the impact on the use of land and the generation of noise.

Proposed Costing Approach: Cost of replacement of all buses with electric buses, and adding new buses based on a bus per 1000 population ratio. This ratio would be compared to a benchmark set by analyzing a developed country with high public transport rating (e.g. Sweden).

Assumptions: If the number of buses is increased to match developed country standards, it will be done in a manner that ensures equitable coverage for all.

Buses will operate at affordable rates for all.

Switching to an electric bus fleet limits the emissions and waste to sustainable levels.

20. Transportation Access for All

Definition: Availability of a transit stop within 1km of residence.

Proposed Costing Approach: Cost of provision of sufficient number of buses to operate in the city such that there is a transit stop within 1 km of all dwelling units. *This is included in the sustainable transportation costing.*

Assumptions: Buses, if provided, will be routed to maximize geographic coverage.

21. Safe Transportation

Definition: Safe transportation implies the use of structurally sound buses, functioning traffic signals and adequate safety equipment/devices at transit stops and stations. This also includes appropriate training of drivers.

Proposed Costing Approach: Cost of providing training to drivers of buses as a percentage of the total public transport budget. *Structurally sound buses are included in the 'sustainable transportation' costing.*

Assumptions: By having structurally sound buses and trained drivers, we would ensure safety of public transportation.

22. Affordable Transportation

Definition: The extent to which the financial cost of journeys put an individual or household in the position of having to make sacrifices to travel or the extent to which they can afford to travel when they want to.

Proposed Costing Approach: The amount of money spent by the lowest quartile of households beyond 20% of their monthly income on transportation.

Assumptions: Spending 20% of the household income on transportation is acceptable. Households that are not in the lowest quartile can afford to spend more than 20% of their income on transportation.

23. Road Safety

Definition: Methods and measures used to prevent road users from being killed or seriously injured.

Proposed Costing Approach: Number of road accidents per 100,000 at the national level, multiplied by the amount of money spent on road safety programs over the past 5 years per unit drop in the number of road accidents.

Assumptions: Road safety spending in the national budget (Ministry of Transport) captures all sub-national spending.

24. Needs of [vulnerable, women, children, disabled and older persons]

Definition: The needs of these groups include:

- Effective policing
- Community awareness raising
- Station and route planning
- Physical retrofitting of the transit network with accessibility features such as wheelchair ramps
- Incorporation of information and communication devices/services in the transit system

Proposed Costing Approach:

Assumptions:

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified six concepts that directly relate to transportation: Transportation access for all, safe transportation, affordable transportation, sustainable transportation, road safety, and needs of [vulnerable, women, children, disabled, older persons].

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

Sustainable Transportation

For this set of questions on sustainable transportation, we have an approach that we shared with you previously. However, we would like to receive your inputs independent of our identified approach. This would be an opportunity for us to revisit and refine our understanding of sustainable transportation so that we capture the costs of delivery more accurately and in line with the spirit of SDG 11 and the NUA.

- In your experience, how would you define sustainable transportation as a concept that is universally applicable?
    - Based off this definition, how would you measure sustainable transportation in the context of your work?
- In your opinion, what are some of the assumptions that we are making to measure this concept at scale?
- Once we have determined the amount of inputs required in a city to achieve sustainable transportation, using the above definition, how do you think we should translate that into the cost of delivering the required inputs?
    - Are there any assumptions involved in this translation?
- Are there any other thoughts you have on the topic of sustainable transportation that you think we should be aware of?

Transportation Access for All

Similar to the previous topic, we shared an approach with you on transportation access for all. Please answer the next set of questions from your own experience.

- In your opinion, how would you define transportation access for all in practice?
    - How do you think one can measure whether transportation is accessible to all or not?
- What are some of the assumptions that we need to make in order to measure the current amount of transportation access at the city level, and the associated gap?
- Once we have determined the amount of inputs required, using the information above, how do you think we should translate that into the cost of delivering transportation access for all (or the target population in need)?
    - What do you think are some assumptions that would have to be made in this cost determination?
- Is there a standard on the population of a city and the need to graduate from buses to a metro rail system?

    - If so, what are the design principles of a Mass Rapid Transit System?
- Are there any other thoughts you have on this topic that you think we should know?

Safe Transportation

The next topic is safe transportation.

- What does 'safe' mean when it comes to transportation?
    - Are there different dimensions to safety? If yes, what are they?
- What could be a possible way to measure safety of transportation and determine the gap in safe transportation?
    - If there are no direct measures, are there any good proxy measures that could be used instead?
- For providing safety, how do you think we could go from this needs assessment to determining the cost of provision?
    - What are some assumptions that would need to be made?
- What aspects of safety are included in the idea of sustainable transportation?
- Are there any other thoughts on this topic that you think we should know?

Affordable Transportation

The next topic is affordable transportation.

- How would you define the term 'affordable transportation' in practice?
- How would you say we can measure the affordability gap?
    - Is it sufficient to measure it for the bottom quartile of the population?
- What are some assumptions underlying this approach to measuring the affordability gap?
- How would you measure the cost of bridging this gap?
    - Would a direct benefits transfer work in this case?
- Are there any other thoughts on this topic that you think we should know?

Switching gears a bit, the next two topics we want to speak about have been a bit more difficult to define and quantify.

Road Safety

First is the topic of road safety.

- How would you define road safety?
    - What are the different dimensions of road safety?
- How would you measure the cost of providing ensuring road safety in urban areas?
- What would be some assumptions that we would have to make in this costing?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding road safety?

Needs of [vulnerable, women, children, disabled and older persons]

The last topic we want to speak about the topic of 'needs of…….'.

- What do you think are the needs of:
  - Vulnerable
  - Women
  - Children
  - Disabled
  - Older persons
- How do you think we can measure the extent to which these needs aren't being met?
  - If there isn't a direct measure, what would be a good proxy measure to determine this needs gap?
- How would we translate this into a cost of meeting these needs?
  - Are there any assumptions here that you could think of?
- Do you think we should be aware of anything else, that we haven't spoken about already, regarding this topic?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: WASTE MANAGEMENT AND AIR QUALITY

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

25. Air Quality

Definition: Mean levels of PM2.5 and PM10 particles[54].

Proposed Costing Approach: The cost of reducing current annual mean levels of PM2.5/10 to acceptable annual levels of 10micrograms per m^3/20micrograms per m^3, as directed by the WHO guidelines.

Assumptions:

26. Per Capita Environmental Impact of Cities

Definition: The amount of negative externalities generated per capita by urban dwellers including air pollution, solid waste and other outputs with significant environmental degradation.

Proposed Costing Approach:

Assumptions:

27. Municipal Waste Management

Definition: Common solid waste generated by households on a daily basis.

Proposed Costing Approach: Cost of safe collection and disposal of one kilogram of municipal waste multiplied by the per capita waste generation per year.

Assumptions: Municipal fees charged for waste management implies safe and sustainable disposal.

[54] Though Air Quality includes ozone, Sulphur dioxide and other pollutant levels, SDG11 focuses on PM2.5/10 only.

28. Other Waste Management

Definition: All other waste that is generated in cities that is not municipal waste, and may require special disposal techniques.

Proposed Costing Approach:

Assumptions:

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified four concepts that directly relate to urban governance: Air Quality, Per Capita Environmental Impact of Cities, Municipal Waste Management, and Other Waste Management.

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

Air Quality

The definition and the aspirational levels of air pollution are clear. However, it is unclear to us on how to quantify the cost of achieving those levels of air quality.

- What do you think are the most cost effective ways of improving air quality?
- How could one measure the amount of inputs required to improve air quality by a certain amount?
    - In your opinion, what are some of the assumptions that we are making in this regard?
- Once we have the amount of input required, given a set of assumptions, what do you think is a good way to determine its cost?
- Are there any other thoughts you have on the topic of air quality that you think we should be aware of?

Per Capita Environmental Impact of Cities

There are many different dimensions of environmental impact. It is unclear which ones are to be considered for this SDG 11 target (11.6).

- In your opinion, what are the most important measurable environmental impacts of cities in practice?
    - How do you think one can measure these impacts?
    - Are there any assumptions involved in measuring each of these impacts?
- What do you think is an aspirational level of environmental impact that can be used for a costing exercise?
    - If there isn't an aspirational value, is there an alternate way to determine how much input should go into reducing the per-capita environmental impact of cities?
- Are there any other thoughts you have on this topic that you think we should know?

The next two topics are about waste management.

Municipal Waste Management

- How do you define municipal waste in practice?
    - Are there different types of municipal waste (e.g. recycling, landfill etc.)?
- How would you quantify the amount of waste generated (of different types) in a city per capita?
    - Is there an average value that is used for designing waste management systems?
- What would be a good way to determine the cost of safely managing municipal waste generated by a city?
- Are there any other thoughts on this topic that you think we should know?

Other Waste Management

- What constitutes 'other waste'?
    - Are there any sub-categories of 'other waste'?
- How can we determine how much of each sub-category is generated within a city?
- What would be a good approach to determining the cost of safe management of 'other waste'?
- Are there any other thoughts you have on this topic that you think we should know?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: DISASTER RISK & URBAN RESILIENCE

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

29. Disasters (Including Water Related Disasters)

Definition: A serious disruption, occurring over a relatively short time, of the functioning of a community or a society involving widespread human, material, economic or environmental loss and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Water Related Disasters: Floods, landslides, tsunamis, storms, heat waves, cold spells, droughts and waterborne disease outbreaks.

30. Holistic Disaster Management

Definition: Considering disasters as a whole system, and promoting broader planning and better cooperation among different stakeholders. The stakeholders include agencies and departments from all levels of government as well as private actors such as the utility companies.

31. Protecting the Poor and People in Vulnerable Situations

Definition:

32. Adoption of the Sendai Framework

Definition: Cities and human settlements adopt and implement integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030

33. Critical Infrastructure

Definition: Systems that are so vital to a nation that their incapacity or destruction would have a debilitating effect on national security, the economy, or public health and safety.

Proposed Costing Approach: *This cost would be included within the cost of providing basic services, electrification and other infrastructure.*

Assumptions: By implementing holistic disaster management policies and programs through the adoption of the Sendai Framework, all infrastructure would conform to disaster risk management standards.

Blanket Costing (Items 2-4)

Soft Costs: These costs are diffused and harder to determine. They are often incurred through programs and operations. We propose using the following approach to calculate a blanket cost that should be added to the cost of achieving SDG -11 (targets 11.5 and 11.B)

Approach: Compare to a country who has had the least amount of disaster related losses (but is highly vulnerable) and see how much they spend in their budget on preparedness and risk management. Use this proportion of national budget as a benchmark for other countries.

Use World Risk Index: http://collections.unu.edu/view/UNU:5763#stats

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified five concepts that directly relate to urban governance: Disasters, Critical Infrastructure, Holistic Disaster Management, Protecting the Poor and People in Vulnerable Situations, and Adoption of the Sendai Framework.

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Question on Concept:

The first question we would like to ask is on the concept of disasters in the context of cities.

Disasters (Including Water Related Disasters)

- How would you define disasters?
    - What kind of disasters do cities (in particular) need to be prepared for?
    - Do cities that are not as vulnerable need to also prepare? Which ones?
    - Is there a difference between general preparedness and disaster specific preparedness?
- With the uncertainties posed by climate change, what do you think should be done by cities in general?
- Are there any other thoughts you have on the topic of air quality that you think we should be aware of?

The next question is about critical infrastructure.

Critical Infrastructure

- What constitutes critical infrastructure?

    - Is this concept universal or does critical infrastructure vary by country?
- How would you measure the gap in provision of critical infrastructure?
    - Are there any underlying assumptions in this measurement approach?
- How would you determine the cost of bridging this gap?
    - Are there any assumptions in this costing approach?
- Are there any other thoughts you have on this topic that you think we should know?

The last set of topics are of a softer nature – i.e. seem to be more difficult to measure.

Holistic Disaster Management

- What does SDG-11 mean when it refers to promoting holistic disaster management?
- What are the criteria to determine whether holistic disaster management is being pursued or not?
- Who is responsible for ensuring holistic disaster management? National, state or local government?
- How would you determine the cost of holistic disaster management?
    - Are there any underlying assumptions in this approach?
- Are there any other thoughts on this topic that you think we should know?

Protecting the Poor and People in Vulnerable Situations

- In the context of DRM, what does it mean to protect the poor and people in vulnerable situations?
- Is there a way to measure how many poor and people in vulnerable situations are not protected?
    - What is the criteria to determine whether someone is protected or not?
- How would you determine the cost of providing protection to these people?
    - Are there any assumptions to this approach?
- Are there any other thoughts you have on this topic that you think we should know?

Adoption of the Sendai Framework

- In your experience, is there an added cost burden on cities or other levels of government on implementing the principles of the Sendai Framework?
- What would be a good way to determine this cost burden?
    - Are there any underlying assumptions to this approach?
- Are there any other thoughts you have on this topic that you think we should know?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Thank you for your time and valuable inputs during this interview.

EXPERT CONSULTATION GUIDE: HERITAGE & CONSERVATION

Counting the Cost: Supporting Sustainable Urbanization to Achieve SDG11

Introduction: UN-Habitat's mandate to promote socially and environmentally sustainable cities is critical to achieving the Sustainable Development Goals (SDGs). Yet, in the absence of quantifiable information on the costs to implement SDG 11 (Sustainable Cities and Communities) and realize the New Urban Agenda, it is difficult for leaders to accurately assess what resources are needed or identify shortfalls. Previous attempts to estimate the costs to achieve the SDGs offer important lessons, but none have comprehensively captured the costs to achieve SDG11. To fill the gap, UN-Habitat and AidData, a research lab based at William & Mary (a university in the United States), propose a two-phase effort to develop a systematic and replicable approach to capture both the "hard" and "soft" costs to support sustainable cities in the lead up to 2030.

As part of this project, we are interviewing experts to ensure our methodological soundness. Below, you will find some of the background information for your review prior to the interview.

34. Protect and Safeguard Cultural Heritage

Definition: Protect and safeguard sites of cultural significance.

Proposed Costing Approach:

Assumptions:

35. Protect and Safeguard Natural Heritage

Definition: Protect and safeguard natural sites with cultural aspects such as cultural landscapes, physical, biological or geological formations.

Proposed Costing Approach: Determine the cost of protecting 1 sq. km. of IUCN protected area and multiply that by the total area of IUCN land in cities.

Assumptions:

36. Protect and Safeguard Mixed Heritage

Definition: Sites that have both natural and cultural aspects.

Proposed Costing Approach:

Assumptions:

37. Private Heritage Funding

Definition: Funding mobilized by the private sector for heritage conservation.

Proposed Costing Approach:

Assumptions:

INTERVIEW

There are two parts to the costing: (1) Achieving SDG 11, which is bounded by the targets; and (2) Achieving urban sustainability more broadly (New Urban Agenda).

By breaking down the SDG 11 targets/indicators into key concepts, we have identified four concepts that directly relate to urban governance: Protect and Safeguard Cultural Heritage, Protect and Safeguard Natural Heritage, Protect and Safeguard Mixed Heritage and Private Heritage Funding.

In this interview, we will first discuss the topics of adequate, affordable, access and safe housing, and then speak about basic services.

Context on Interviewee:

Q: Could you tell us a little bit about yourself, your background and your work in the urban space?

Questions on Costing:

The first three topics are about determining the cost of protecting and safeguarding heritage sites.

Protect and Safeguard Cultural Heritage

- In the context of SDG 11, how would you define cultural heritage?
- What do you think is the difference between protect and safeguard in the context of cultural heritage?
- In your professional experience, what do you think is a good way to measure how much cultural heritage needs to be protected and safeguarded?
    - As a follow up to that question, how would you determine (at scale) the level of protection and safeguarding these cultural heritage sites are receiving? Or in other words, the gap in the protection and safeguarding of cultural heritage sites.
- How could one determine the cost of bridging these gaps?
    - In your opinion, what are some of the assumptions that we are making in this regard?
- Are there any other thoughts you have on the topic of air quality that you think we should be aware of?

Protect and Safeguard Natural Heritage

- In the context of SDG 11, how would you define natural heritage?
- What do you think is the difference between protect and safeguard in the context of natural heritage?
- In your professional experience, what do you think is a good way to measure how much natural heritage needs to be protected and safeguarded?
    - As a follow up to that question, how would you determine (at scale) the level of protection and safeguarding these natural heritage sites are receiving? In other words, the gap in the protection and safeguarding of natural heritage sites.
- How could one determine the cost of bridging these gaps?
    - In your opinion, what are some of the assumptions that we are making in this regard?
- Are there any other thoughts you have on the topic of air quality that you think we should be aware of?

The last topic is a bit different from the other three. This set of questions is targeted towards identifying how resource mobilization from the private sector towards conservation and safeguarding of heritage is operationalized. Since our study is directed towards determining the cost of achieving SDG 11, and not where the money comes from, the answers we seek to this question are inconsequential to our research.

Private Heritage Funding

- How would you define private heritage funding?
- Are there criteria for where private funding is allowed versus where only governments should manage heritage sites?
- What are some of the typical private management setups that you see in the conservation and safeguarding heritage space?
- How are privately held heritage sites treated? Should their cost of conservation and safeguarding be considered towards the cost of achieving SDG 11?
- Are there any other thoughts you have on the topic of air quality that you think we should be aware of?

General Closing Questions

Q: Once we have analyzed the information that we gathered during our interaction today, could we follow-up with you via e-mail with any further clarifications that we may need?

Q: Would you like to receive our findings at the end of this study?

Q: Would you know other experts that may also be able to share their thoughts on these questions? We are particularly interested in the costing piece of the puzzle. If so, could you please connect us?

Thank you for your time and valuable inputs during this interview.