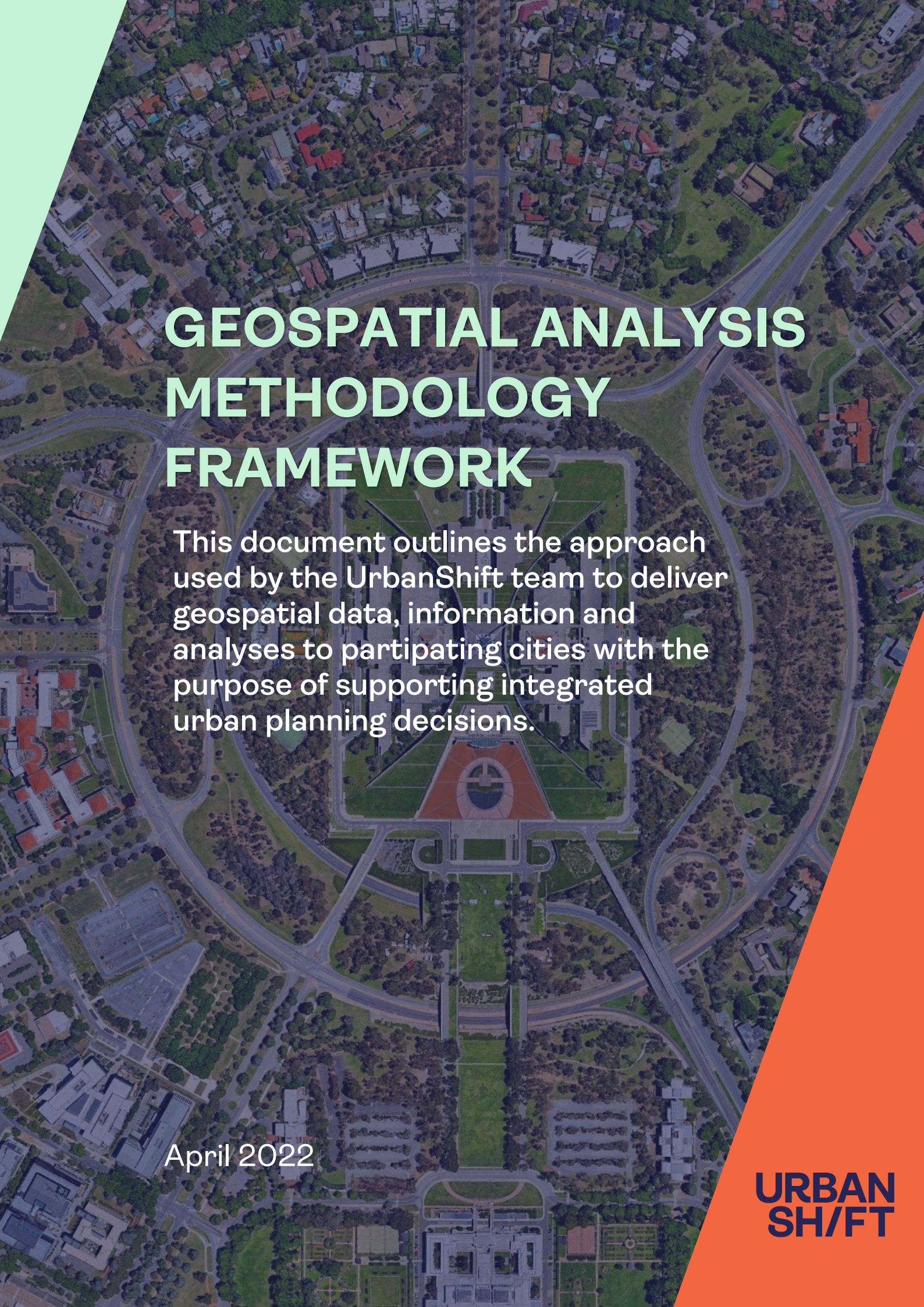

GEOSPATIAL ANALYSIS METHODOLOGY FRAMEWORK

This document outlines the approach used by the UrbanShift team to deliver geospatial data, information and analyses to partipating cities with the purpose of supporting integrated urban planning decisions.

April 2022

URBAN SH/FT

INTRODUCTION

ABOUT URBANSHIFT

UrbanShift is a global program that supports cities to adopt integrated approaches to urban development, shaping low-carbon, climate-resilient communities where both people and planet can thrive.

We engage with more than 23 cities across nine countries, providing our stakeholders with the knowledge, tools and training they need to make evidence-based decisions and shift towards a more sustainable, inclusive urban future.

UrbanShift is funded by the Global Environment Facility (GEF) and led by the UN Environment Programme (UNEP), in partnership with the World Resources Institute (WRI), C40 Cities, ICLEI – Local Governments for Sustainability, the UN Development Programme (UNDP), the World Bank and the Asian Development Bank (ADB).

OUR GEOSPATIAL OFFER

Each of UrbanShift's participant cities have unique goals and challenges; they also have unique data and decision-making processes. The program aims to support and enhance local processes and the cities' use of data by providing:

- Global datasets for local application
- Customizable analyses in thematic areas relevant to multiple cities
- Guidance and technical assistance to amplify local data collection and governance practices

These outputs can provide foundational data or enhance use of existing data for strategic planning analyses, particularly valuable for cities where relevant data were previously absent, unavailable, or insufficient. The analyses can also offer a starting point for conversation with stakeholders to improve upon open-source datasets and produce additional analyses in alignment with goals of the UrbanShift Child Projects. Finally, the outputs will deepen the spatial understanding of UrbanShift cities and will be used in the creation of knowledge-building activities and products, such as the UrbanShift Labs and City Academy.

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THE NEED FOR GEOSPATIAL DATA

Spatial information is essential to understanding most strategic urban planning challenges, including those of keen interest to many UrbanShift cities. Land restoration requires information on the location of degradation and restoration opportunities. Mitigating greenhouse gas (GHG) emissions requires information on the types and locations of emissions sources, especially if there are to be addressed in a way that also addresses local air pollution. Protecting biodiversity requires information on the locations of habitats for critical species.

Furthermore, many strategic planning challenges and solutions relate to the interaction between multiple systems within a city at sites within the city. For instance, land restoration may reduce GHG emissions and provide habitat for species, but the balance of benefits will be different depending on the specific intervention and its locations. Without adequate information about the characteristics and locations of each challenge, it can be difficult to identify appropriate solutions.

> Spatial information makes a challenge tangible and personal. Being able to communicate about a problem with reference to a specific place where someone lives or visits regularly can increase both attention to and investment in solving a problem.

ADVANTAGES & LIMITATIONS OF OPEN, GLOBAL DATA

The past few years have seen the beginning of a revolution in remote sensing, crowdsourced data, cloud computing and machine learning – technologies that are quickly generating new insights about the Earth and its urban areas. For the first time, we have access to globally standardized, open source, continually updated datasets and methods to help answer important questions about how we live and the impacts of our present and future activities, from the neighborhood scale to the continent scale. It also means that information that had not been previously collected or made public through local methods can be generated through alternative means. Moreover, utilizing open-source data increases the feasibility of repeating analyses in the future and replicating the approaches for additional cities.

However, global data used for local analyses has its drawbacks: it could give the impression of completeness while not being relevant at the scale of the desired analysis, or it could be missing important contextual details. Local data poses its own problems: it is limited in scope, can introduce bias to an analysis, and is often difficult to access. Ultimately, decisions about the most appropriate data for a local challenge need to be made by or with local stakeholders. **For this reason, methods with flexible data input sources are critical.**

REPLICABLE & COMPARABLE METHODS OF ANALYSIS

In addition to enhancing the availability of relevant data, UrbanShift's geospatial framework emphasizes the development of flexible and replicable methods to generate insights for local, national and global stakeholders. These methods can be applied in multiple cities with global or local data and used to produce analyses that are comparable within or between cities.

Our approach is also conducive to training urban practitioners on how to utilize the data for decision-making, and, to some extent, updating the analyses themselves and integrating local data into global data analyses. Through the course of UrbanShift's geospatial work, we will use these transferable methods to produce baseline indicators comparable between all UrbanShift cities; and thematic assessments to analyze the most critical local questions, as identified by the cities themselves.

SHARED KNOWLEDGE & GOVERNANCE OF DATA

Finally, our approach recognizes shared knowledge as a primary goal of UrbanShift, with data as a means of achieving this goal. We aim to clarify the most important urban sustainability questions in each participating city and then identify methods to best address them; these methods will obviously require data, but many will also require healthy communication between stakeholders and a mutual commitment to resolving the questions.

To create a shared body of knowledge about urban problems and solutions, shared governance of critical data is essential. We also aim to support data governance practices in each city through UrbanShift's other knowledge-building activities, such as the Labs and City Academy.

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FRAMEWORK

OUPUTS

Geospatial analysis is one of the key activities in UrbanShift's knowledge offer to participant cities. The geospatial team, led by the World Resources Institute (WRI), will work with each city to provide a common set of critical spatial data layers, increase the capacity of urban actors, inform decision-making, and improve data governance more broadly. The spatial layers will also serve as an input for the UrbanShift Labs.

The data-related support provided to the cities will include:

- A suite of global geospatial data layers that may complement and fill gaps in locally available datasets *(see Annex 1)*
- Baseline measurements of indicators for core UrbanShift goals *(see Annex 2)*
- Geospatial analysis on selected thematic areas, helping focus attention on critical problems and solutions *(see Annex 3)*
- Capacity-building and technical assistance on data governance and geospatial data and as part of the UrbanShift City Academy and Labs

TARGET AUDIENCE

The primary audience for the above outputs is technical and leadership staff within local governments and metropolitan areas participating in UrbanShift. Some outputs will be more relevant to urban planners and geospatial specialists, while others will be pertinent to decisionmakers or a more general audience. Certain outputs are also likely to be of interest to local governments and national officials in other countries within the UrbanShift cohort. Finally, the baseline indicators provided will be used for project monitoring purposes and shared with current and potential funders and global urban sustainability stakeholders.

ROLES & REQUIREMENTS

WRI and the UrbanShift regional coordinators will engage with each participating city to understand their data-related needs and identify the most relevant data layers and thematic analyses. The primary mechanisms for engagement are a data needs survey and ongoing conversations between regional coordinators and city staff.

WRI will provide a standard set of critical geospatial data layers and one thematic assessment to each city. Cities will then be asked to correspond with the WRI geospatial team to hone analyses and participate in capacity-building exercises. Assistance on capacity-building and data governance will be delivered through the UrbanShift City Academy and Labs in select cities. Cities will also be expected to share relevant data needs or datasets that they would like to see included in these activities.

GEOSPATIAL DATA & ANALYSIS IN PRACTICE

1. KEY GEOSPATIAL LAYERS

The WRI geospatial team will process, document, store and share a suite of datasets with each UrbanShift city. This common set of critical spatial data layers will be related to themes of sustainable urban development and derived from globally scalable and transferable methods (remote sensing, machine leaning, and crowdsourced data).

The goal of providing these layers is to supplement locally available data – which will particularly be of value in cities with data scarcity – and provide data that is comparable between UrbanShift cities.

The resulting city data stacks will be published under a public and open-source license enabling use and reuse by the city government and other stakeholders. Additionally, we will publish the datasets on a Data Hub, an online platform linked to the UrbanShift website where the data will be organized in accessible and easily navigable formats. We will also support select UrbanShift cities in learning to utilize the Data Hub in their local data governance processes through the Labs, customized thematic analyses, and other forms of technical assistance. The framework for the geospatial layers approach is described in Figure 1.

AUDIENCE

- Government officials and local stakeholders
- Investors and researchers focused on sustainable cities

PROCESS

- Datasets are processed, documented, saved and shared in an open data portal

OUTPUTS

- Area of interest boundary
- A stack of data layers with key spatial information
- Metadata on each data layer
- An online Data Hub where datasets are organized and published

Figure 1: Key Geospatial Layers Framework

In addition to generating data layers *(see proposed themes in Annex 1)*, we plan to work with each city to obtain or develop a relevant "area of interest" boundary or boundaries. These will most likely be city or metropolitan administrative boundaries and may also include sub-district boundaries that allow for intra-city comparisons. An example for the San José region in Costa Rica is provided in Figure 2.

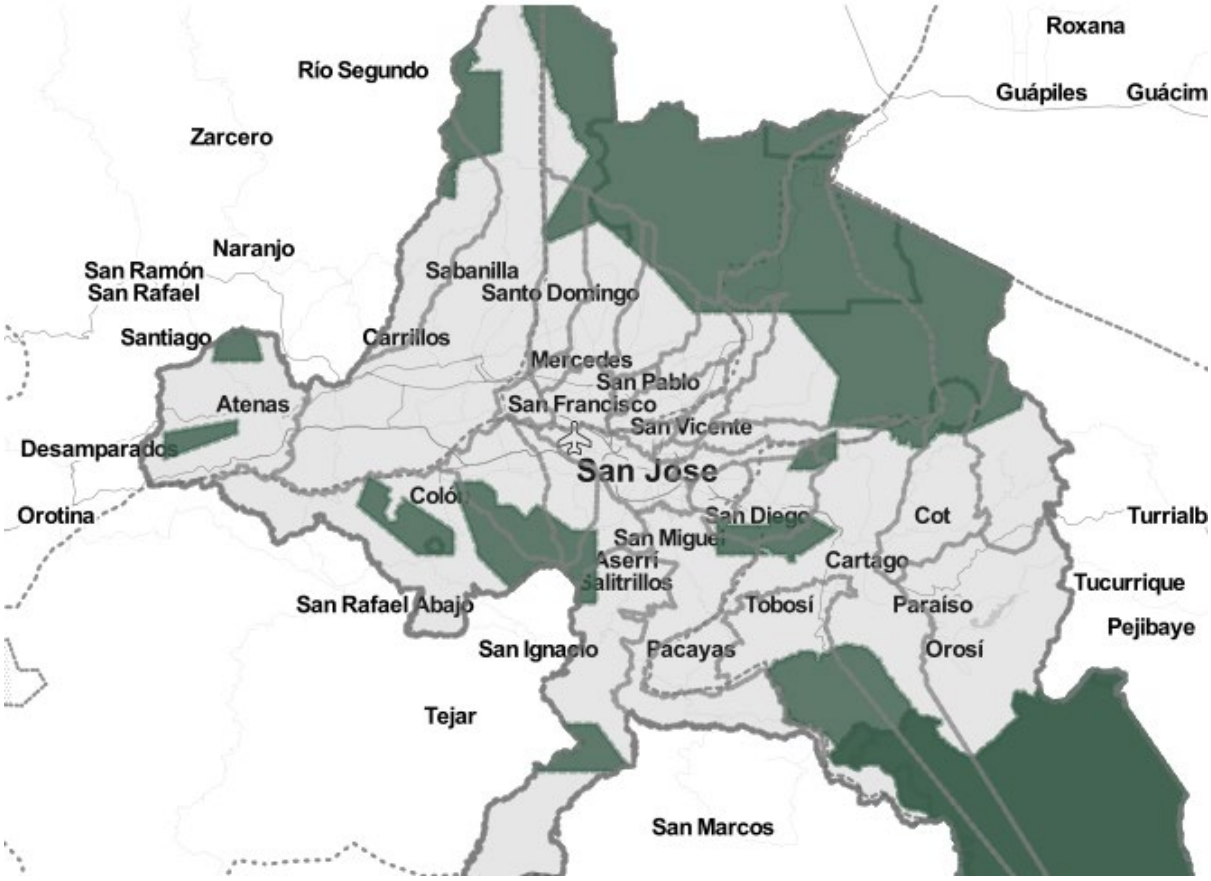


Figure 2: Municipal boundaries (grey lines) and protected areas (green areas) for the San José region.

2. BASELINE INDICATORS

To help understand the status of sustainability in UrbanShift cities and identify existing and potential challenges, we aim to measure key baseline indicators using comparable approaches. The indicators selected will establish global targets and objectives aligned with three of the Global Environment Facility's focal areas for its current investment cycle (GEF-7): **biodiversity, climate change and land degradation.**

We may also include measurements aligned with other global objectives, such as the urban targets of the Sustainable Development Goals (SDG 11). The starting list of indicators are included in Annex 2. Data to measure these indicators will be primarily derived from global open-source datasets and the resulting analyses and their specific input datasets will be published openly.

The objective of these indicators is to assess the status and trends of change within each city, providing information to distinguish patterns within and between cities and assist in detecting problems and defining solutions. The results will be disseminated to local and national governments, the UrbanShift global team and implementing agencies to help them gain a better understanding of the cities' capacity, opportunities and needs as it relates to sustainability. We will update these measurements at least once before the end of the program to assess any changes.

The framework we are using for baseline indicators is described in Figure 3, and an example baseline indicator output is provided in Figure 4.

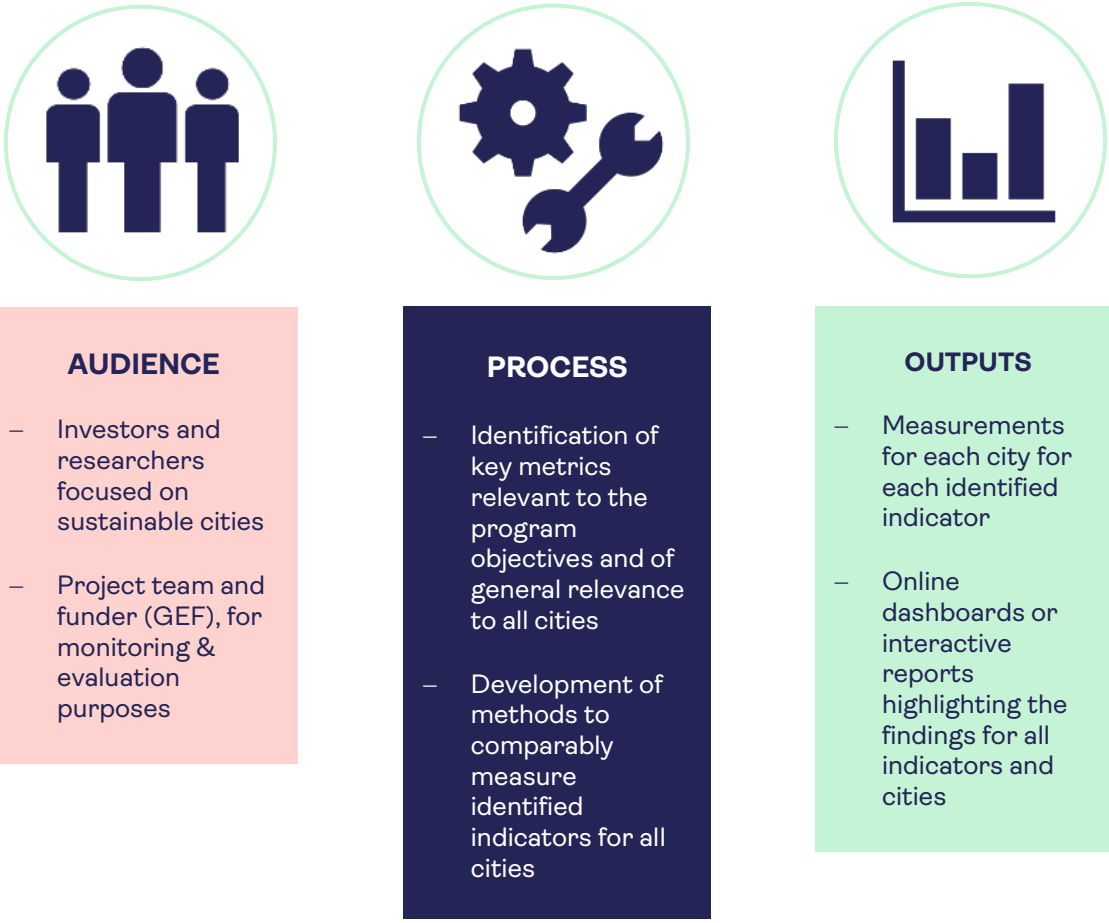


Figure 3: Baseline Indicators Framework

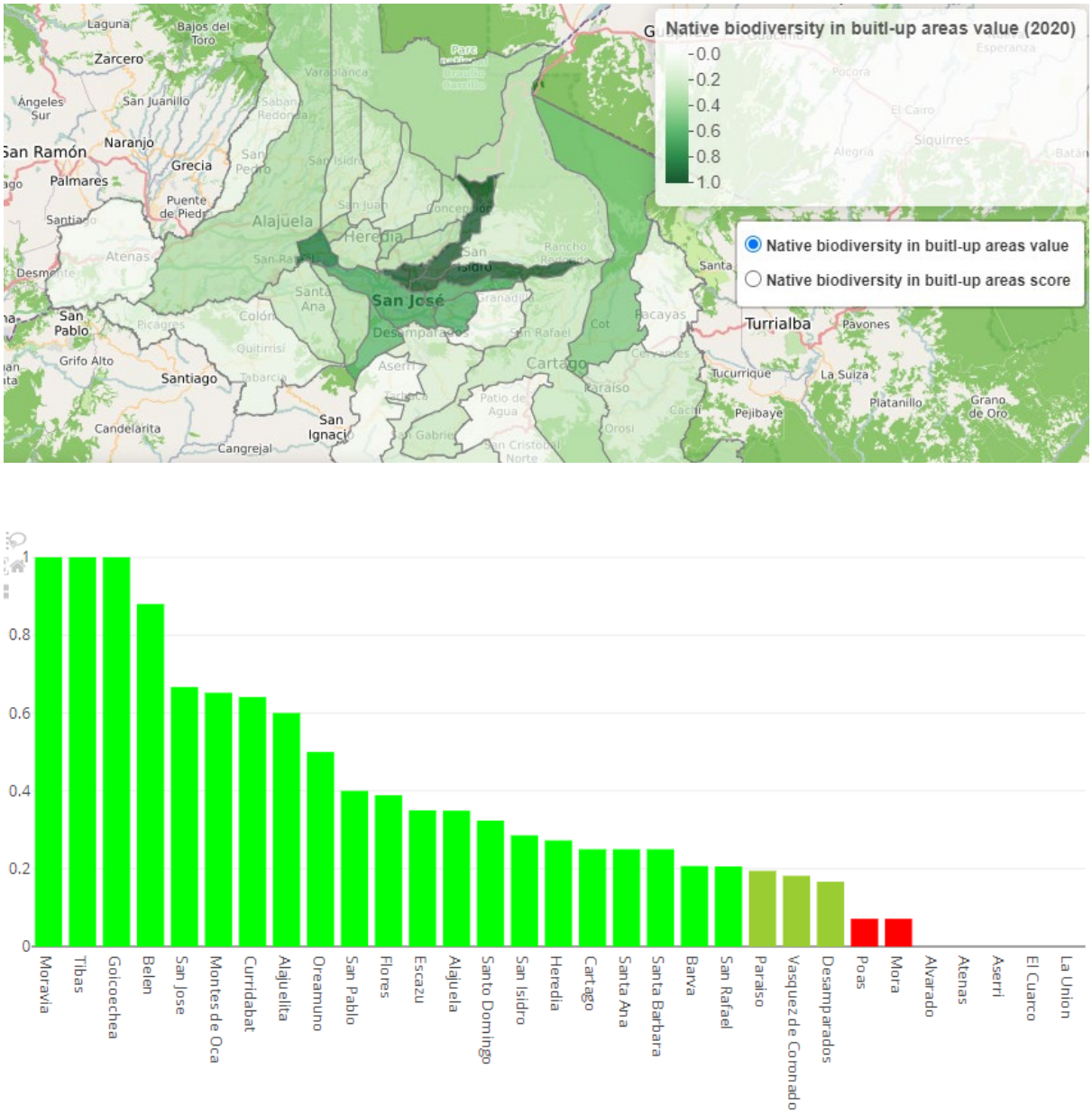


Figure 4: Baseline for native biodiversity of bird species in built-up areas for municipalities in the San José region, presented as a map and a chart.

3. THEMATIC ANALYSES

The geospatial team will aid UrbanShift cities in answering questions that are most important for their project priorities. Our approach consists of assessing the data needs of each participating city and developing or adapting analysis methods that respond to core local issues and offer contextual information on related themes.

We will produce at least one thematic analysis for each participating city. This thematic analysis will first be developed using methods and data that are common to all cities, as multiple cities may be interested in similar themes *(see Annex 3 for seven general themes, based on a preliminary scan)*. Then, as desired by the cities and as data and resources allow, the analyses will be updated to make use of the most relevant, readily available data, which may come from local sources. A survey distributed to cities and consultations with their regional coordinators will further refine the most vital questions and themes for each city.

The thematic analyses will also be a means to provide capacity-building support to cities on the use of geospatial data. The UrbanShift team will advise on integration of the findings into local engagement and decision-making processes. We will also provide support on running the analyses themselves, enabling cities to update the analyses as new data becomes available. The framework for thematic analyses is diagramed in Figure 5.

AUDIENCE

- Government officials
- Local stakeholders

PROCESS

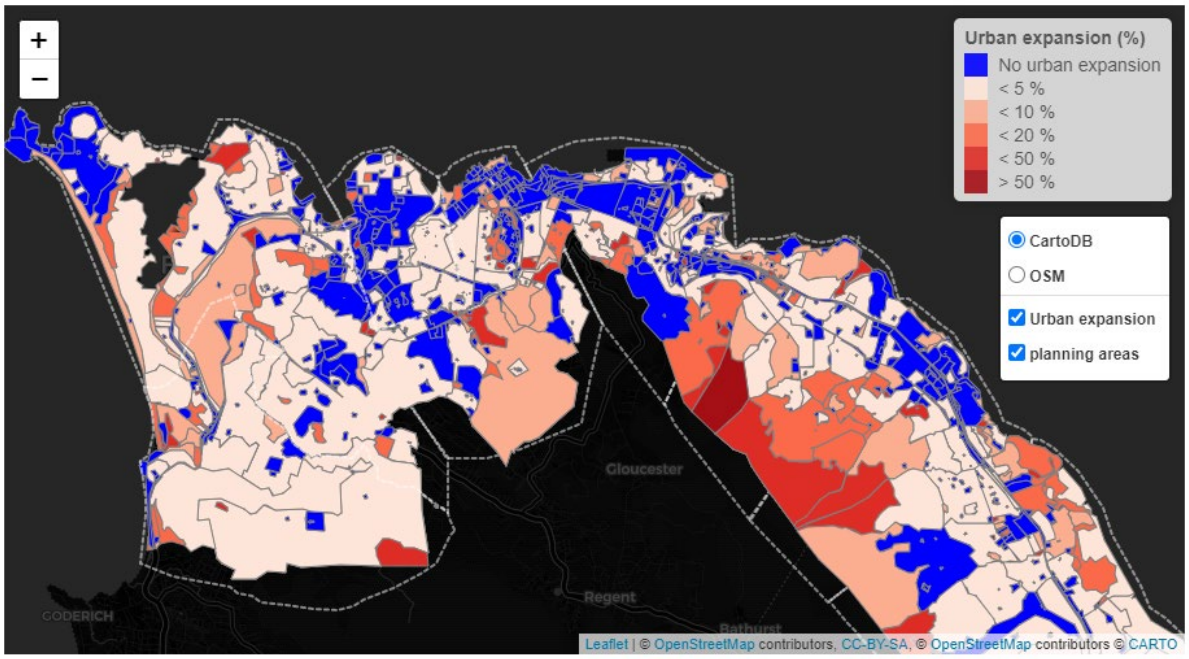
- Assessment of city data and analysis needs through survey and consultations by regional coordinators
- Development of analyses responsive to themes and questions identified by multiple cities

OUTPUTS

- Analyses related to one or more priority theme for each city, which may consist of statistics, maps, or tools
- Capacity-building and technical assistance on use of the analyses
- Integration of analyses or findings as an input to UrbanShift Labs

Figure 5: Thematic Analyses Framework

Thematic analyses and their input data may be utilized as an input for the UrbanShift Labs as well, especially those Labs focused on strategic urban planning and data governance. These analyses may be helpful in framing, diagnosing, or providing context for an array of local challenges that the Labs will serve to address. Other cities within the UrbanShift countries that participate in the Labs may face similar challenges and thus benefit from learning about the analyses. An example of a thematic analysis output from Freetown, Sierra Leone is provided in Figure 6.



Land use class	Average Urban expansion 2016-2021 (%)
Waterbody, River, Creek - WA	28.09
Woodland, Forest - FO	18.39
Urban Agriculture - UA	14.30
Coastal Wetland, Mangrove - CW	4.35
Residential, low density - RE-L	3.92
Residential, medium density - RE-M	2.63
Civic and Culture - CI	1.84

Figure 6: Map and table outputs from thematic analysis of urban expansion by planning area and land use for Freetown, Sierra Leone.

ANNEXES

ANNEX 1: Preliminary list of key geospatial layers

- Land cover (e.g., built-up/impervious, vegetation, trees, water)
- Topography
- Population density
- Built-up density
- Land use (e.g., residential, commercial, industrial, vacant, agriculture)
- Administrative boundaries
- Amenities/service locations (e.g., jobs, health care, recreation)
- Roads
- Transit stops, routes and service
- Buildings and other infrastructure
- Emissions of air pollutants
- Natural hazards

ANNEX 2: Proposed baseline indicators

- Land restoration
- Greenhouse gas emissions
- Biodiversity

ANNEX 3: Preliminary list of thematic assessment topics

- Climate and air pollution emissions mitigation
- Accessibility to urban services
- Urban expansion and land development
- Climate hazards, vulnerability, risks and adaptation
- Nature-based solutions
- Biodiversity
- Social, gender and environmental equity

ANNEX 4: Datasets & methods

- All datasets will be published on a Data Hub, where the data will be organized in accessible and easily navigable formats: http://datahub.shiftcities.org.
- Methods for individual datasets, indicators, and analyses will be documented on GitHub: https://github.com/wri/cities-urbanshift.

QUESTIONS?

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