



Research Agenda



This report, prepared by the United Nations Environment Programme (UNEP) and international experts, presents the findings of an assessment of the methodologies available to understand resource flows and urban metabolism. It is a tool derived from components of current approaches to support cities in understanding their resource flows and guide resource efficiency improvements. The aims of the exercise were to understand the applicability of existing methodologies to the evaluation of urban resource efficiency issues, to identify the gaps in current approaches, and to combine the most relevant and useful elements of what is currently available into a proposal for a practical approach that can be applied to a wide range of city contexts.

The report aims to:

- Provide an overview of methodologies for assessing urban metabolisms, categorized into (1) accounting and assessment approaches, (2) process-based analysis, simulation models, and hybrid methods.
- Look at sustainable city indicator sets from the perspective of developing set of tools to assist city decision makers to improve resource efficiency through infrastructure-related interventions.
- Propose a six-step process to enable cities to learn about and improve their resource efficiency.
- Provide recommendations for refining the proposed process to enhance its relevance across a range of city contexts and improve its chances of adoption.

Key conclusions

Current methodologies for assessing urban metabolisms are difficult for practitioners to translate into remedial actions that improve urban resource efficiency.

Additional key findings

- The dynamics of internal flows and stocks are generally not accounted for in most methodologies.
- Methodologies need to be combined with other tools (or hybridized) to enable explicit decision making and policy formulation.
- Simulation methods offer the most potential to compare optimal interventions in terms of their impact on resources.

City indicator sets reflecting issues of urban resource flows need to be accepted at a policy level if the metabolic assessment methodologies are to be used to analyse cities.

Additional key findings

- Metabolic flows are seldom considered or even mentioned in the predominant conceptions of sustainable cities, and measures of flows are rare.
- The conception of urban resource efficiency in sustainable city indicator sets is quite narrow.
- No indicator addresses these issues holistically.
- An understanding of resource flows is not sufficient to achieve a sustainable city, and this needs to be complemented by social, cultural and political sustainability.

The Data Challenges

One of the **most critical issues** impeding the effective development and use of metabolic flow analysis in a more systematic manner pertains to data collection.

- Lack of city-level data
- Unsuitable data formats
- Incompatible boundary delineations
- Data confidentiality issues
- Lack of data on informal sectors and locations
- Difficulties in capturing data
- Downscaling inaccuracy

The urban resource efficiency toolkit

In order to arrive at a comprehensive and well-conceived strategy for transitioning toward greater resource efficiency, a set of tools based on the most relevant elements of the metabolic assessment methodologies and the sustainable city indicator sets is proposed. These tools should be used to inform long-term (30 year) integrated infrastructure plans for the city. The tools are as follows:

- 1. City Resource Profile Tool:** To assess the city's unique needs, and identify the resources available locally to meet these needs. This can be used to categorize cities for comparison with similar cities.
- 2. Resource Efficiency Baseline Assessment Tool:** To establish the city's baseline resource efficiency level. Cities can get an idea of where they are underperforming and most need to focus their efforts by comparing themselves with similar cities.

- 3. Goal Setting Tool:** To guide the setting of resource efficiency targets, specifying a range of acceptable targets between a minimum 'social foundation' needed for quality of life and a maximum 'environmental ceiling' required to remain within planetary boundaries.
- 4. Infrastructure Option Scoping Tool:** To expose cities to innovative resource-efficient infrastructure alternatives that they might not have considered.
- 5. Infrastructure Strategy Selection Tool:** To assess each infrastructure impact on city resource efficiency to determine an optimal solution.
- 6. Resource Efficiency Performance Assessment Tool:** To identify whether the city's interventions are moving it closer to its goals, and stimulate action if they are moving further away from them, based on quality city-specific data collected at regular intervals.

Recommendations

The proposed set of tools provides a framework that cities can use to facilitate their continued learning about their metabolic flows and related infrastructure options, and should not be viewed strictly as a means of comparison between cities. Following this report, a separate project will need to be established to further refine and develop the tools. To ensure that the tools are relevant across a wide range of contexts, they should be tested in 4 to 6 heterogeneous cities representing the developed and developing world. In addition to setting up this next phase of work, strategic actions should be taken to ensure that the tools will be adopted and used once it is completed.

