

# Chapter 9

## Operationalising Sustainability within Smart Cities: Towards an Online Sustainability Indicator Tool

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### ABSTRACT

*Sustainable decision making for strategic planning requires support frameworks which can analyse and interpret the multiple interactions underpinning complex urban environments. Such frameworks are often based on economic measures, consequently there is a need for a decision support framework designed to aid work towards a more holistic view of sustainable urban planning projects. As an initial step towards this framework, the authors aim to devise sustainable energy indicators designed to be flexible enough to address the vast extent of urban sustainability processes. In addition, we examine how these indicators need be designed to reflect the broad range of data sources that reflect the three pillars of sustainability, namely: environmental; economic; and social elements. The indicators have been developed specifically for the European urban environment and can be used both internally, for identification of “hot spots”, and externally, for sustainability reporting and stakeholder engagement.*

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## **INTRODUCTION**

Developing urban sustainability performance indicators will be critical for cities aiming to reach the targets set at the 2015 Paris Climate Conference (COP-21). With the signing of the COP-21 conference agreement world leaders have pledged to keep global temperatures “well below” 2.0°C above pre-industrial times and “endeavour to limit” them even more, to 1.5°C. This will involve limiting the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally. Each country’s contribution to cutting emissions will be reviewed every five years so that objectives may be scaled to the challenge. This paper focuses on the advanced economies of Europe due to the substantial contribution they have to global CO<sub>2</sub> emissions.

It has been argued that traditional measures of urban quality of life and economic performance are inadequate as they fail to ensure a composite analysis of the interdependent systems underpinning urban society. The crossover and interdependence between city systems at a regional and European level is not currently reflected in urban decision-making. This deficiency risks the resilience of urban environments and increases the susceptibility of these centres to the consequences of climate change. It also impedes the ability of these urban centres change and adapt their constituent processes in a sustainable manner. This issue is especially pronounced when it comes to the assessment, measurement and remediation of an urban areas’ practices in relation to the consumption of energy.

Past attempts to answer the rudimentary question of whether a city is successfully becoming more sustainable cannot be adequately determined due in part to divergence on which indicators should be employed. Drawing from this, the question arises: How should these indicators be selected and then how should they be aggregated? The basis of this paper is that, for successful assessment of urban sustainability, the required first step is to put forward a set of multi-dimensional indicators. The use of a multi-criterion framework to make the ‘measurement of sustainability’ operational is discussed here by means of an assessment of key stakeholder perspectives including potential end users, academics, and industry leaders.

The concept of sustainable development is based on the observation that a city’s economy, environment and wellbeing can no longer be separated. Newman and Jennings (2008, p. 264) define sustainable urban ecosystems as ‘systems which are ethical, effective, self-regulating, resilient, self-renewing, and flexible’. Developing from early natural ecosystems our modern urban systems have become more complex with many interrelated structural layers. We adopt the definition of sustainable development put forward by the World Commission on Environment and Development (WCED); “development that meets the needs of the present without compromising the ability of future generations to meet their own needs,” (Brundtland & Mansour,

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