


# Application of the 15-Minute City Criteria to a Metropolitan Area: A Case Study of the Metropolitan City of Cagliari, Italy

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## ABSTRACT

The climate crisis and the post-pandemic scenario underline the interaction of urban structure and land use organization. The study focuses on the “15-minute city” concept as a significant model for urban adaptation to improve equity, sustainability, and economic vitality. The objectives are to evaluate levels of compliance to 15-minute city criteria of the metropolitan city of Cagliari, in Italy, and to understand relations among access to amenities and mesoscale factors of urban form. The findings underline disparities across the metropolitan area, the emergence of a multi-level structure of metropolitan and local centers, and the significant relation among urban form factors and access to amenities. In particular, R2 values for linear regressions of access to amenities on population density, road intersection density, and local integration range respectively from 0.742 to 0.975, 0.634 to 0.952, and 0.545 to 0.952. The study identifies density, permeability, and centrality as central targets of urban regeneration policies.

## KEYWORDS

Proximity, Access, Built Environment, Urban Area, Place Syntax

## INTRODUCTION

Urban areas are at the core of the climate crisis and a significant arena for addressing climate change (Angel et al., 1998; Bulkeley, 2013; Carter, 2011; Dodman et al., 2012; Gibbs, 1999; Grimm et al., 2008; Hebbert & Jankovic, 2013; Mi et al., 2019; Moraci et al., 2020). Urban areas are responsible, in fact, for more than 60% of global greenhouse gas emissions and the increased consumption of resources and energy. In particular, 78% of global energy consumption is originated from transport, construction, and manufacturing industries based in cities (Allam et al., 2022). The Sustainable Development Goal 11 underlines the need for improving cities’ safety, inclusivity, sustainability, and resilience as a response to the vulnerability of urban areas to climate alterations impacts and to increased pressure on the environment and rising demand for essential services, infrastructure, jobs, land, and affordable housing, determined by global urbanization trends (United Nations Department of Economic and Social Affairs, 2015). Moreover, the COVID-19 pandemic has underlined the

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interdependencies among environment, health, and economy and the severe inequalities in cities, leading to an increasing demand for a just, sustainable recovery (C40 Cities Climate Leadership Group, 2020a, 2020b; Moreno et al., 2021; Olivari et al., 2023; Pozoukidou & Chatziyiannaki, 2021).

As a result, decarbonization, sustainability, resilience, equity, health, and social inclusion emerge as central aspects of urban policies in the context of the climate crisis and the post-pandemic scenario (Allam et al., 2022; C40 Cities Climate Leadership Group, 2020a, 2020b; C40 Cities Climate Leadership Group & C40 Knowledge Hub, 2021; Logan et al., 2022; Murgante et al., 2024a).

In the Italian context, the vulnerability of urban areas to climate alteration impacts spatial inequalities, and the need for reducing energy consumption, air and noise pollution, car dependency, and increasing levels of capacity and safety of transportation systems are central aspects of national policies focused on the transformation of urban areas (Castellari et al., 2014; Italian Ministry of Infrastructure and Transport, 2017; Italian Ministry of the Environment and Protection of Land and Sea, 2024). Within this perspective the “15-minute city” (15MC) concept is identified as a relevant model for adapting cities to the climate crisis and the post-pandemic scenario by numerous municipal institutions and transnational initiatives, including the C40 cities initiative, the cities of Paris, Bogotá, Portland, and Melbourne (C40 Cities Climate Leadership Group, 2020b) and, in Italy, the cities of Milan, Rome, Bologna, Venice, and Palermo (C40 Cities Climate Leadership Group, 2024). The 15MC concept focuses on integrating urban systems' spatial and temporal dimensions. It aims to minimize travel times and promote active travel as conditions for improving individuals' participation in fundamental urban functions, including utilitarian activities, social activities, and recreation (Allam et al., 2022; Moreno et al., 2021).

Benefits related to implementing the 15MC concept include improving individuals' time balance and quality of life, social inclusion, equity, sustainability, and economic vitality, and reducing car dependence, transportation-related costs, soil consumption, energy consumption, and air contamination. In particular, four areas of impact can be identified:

- Social, related to the regeneration of social inclusion and a sense of place;
- Health, via promotion of active mobility;
- Environmental, including reducing carbon emissions, noise pollution, particulate matter emissions, and improving air quality as a result of reduced car dependence;
- Economic, including reduced costs related to road maintenance and public health, reduced household expenses for maintaining private vehicles, increased value of local services, job creation, and support for local businesses (EIT Urban Mobility, 2022; Olivari et al., 2023).

The study focuses on the metropolitan city of Cagliari (MCC) in Sardinia, Italy. The selection of the MCC as the area of study depends on four considerations:

- The vulnerability of the metropolitan area to climate alterations impacts, namely hydrogeological instability, heatwaves, and precipitation scarcity
- Social disintegration resulting from increased poverty, economic stagnation, spatial and inter-generational inequalities, migration, and population aging
- Disparities in levels of spatial and digital connections;
- Persistence of inequalities in conditions of access to services and of a center-periphery model resulting in intense commuting, car dependency, congestion of main road infrastructures, and increasing pollution.

As a result, the 15MC concept represents a relevant model for mitigating the criticalities observed in the MCC. In particular, the relocation and redistribution of urban amenities, the regeneration of urban spaces, the incentivization of active travel solutions integrated into a multi-modal transport

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