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Applying the 'Backcasting' method to achieve sustainable mobility: the case of Niteroi

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Abstract

The city of Niterói is the former capital of the state of Rio de Janeiro. In 2013, the municipal administration recognised that transport trends were not sustainable and that the existing policy framework seemed unlikely to move society towards more sustainable transport and mobility. A new approach was required for public policies related to land use and transport that would be consistent with the broad definition of sustainable development. Therefore, the 'backcasting' method was used to develop policies and strategies to achieve the desired performance targets.

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Keywords: backcasting; sustainable mobility; land use planning; developing countries.

1. Introduction

The city of Niterói is the second wealthiest city in the Rio de Janeiro metropolitan area and is the former capital of the state of Rio de Janeiro. After construction of the Rio-Niterói Bridge, Niterói and other municipalities on the Metropolitan East Side experienced intense urbanisation in the form of car-based suburbs. At present, this trend has forced these municipalities to address transport-related challenges, such as increasing motorisation, vehicle-kilometres travelled (VKT), and traffic congestion. These changes increase greenhouse gas (GHG) emissions and commuting time, amongst other urban diseconomies.

In 2013, the Niterói municipal administration recognised that transport trends were not sustainable and that existing policy frameworks appeared unlikely to move society towards more sustainable transport and mobility. A new

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approach was required for public policies related to land use and transport that would be consistent with the broad definition of sustainable development. In Brazil, transport planning has traditionally been a field of traffic engineers and modellers who focus on quantitative modelling and forecasting, although in practice transport planning grapples with different types of uncertainties, especially those related to travel behaviour and mode share.

Forecast methodologies are based on extrapolating past or current trends into a forthcoming stage, which creates conventional future images based on a worsened state that extends the timeline from the past into the future (Herce, 2009; Hickman and Banister, 2014). Problems also arise from the lack of historical data, the use of different contextual data (e.g., proxies or data with different levels of disaggregation), and informality. Due to social inequality, Brazil has a significant number of unregistered or undeclared dwellings and jobs in the urban informal sector. Even official data might lack adequate registration information, including information relating to formal jobs. For instance, a spatial job concentration can be detected in a region (e.g., a cluster of headquarters that represents corporations' registry addresses), but the activity actually takes place in a different part of the city (e.g., suburban factories where employees really work). The data needed to determine a high-quality origin–destination (OD) matrix is not accurate enough to be useful.

Due to these problems, forecasting methods can be very unreliable, especially in long-term planning. Furthermore, forecasting approaches are not suited to situations where trend breaks are required, such as the shift towards the sustainable mobility agenda (Hickman and Banister, 2014). Therefore, a new planning package has been initiated to define performance criteria and planning goals, in which the 'backcasting' method has been used to develop policies and strategies to achieve the desired targets. This study documents the current planning results, which have involved public participation mechanisms.

2. Relation with urban form

2.1. Urbanisation background

The process of urbanisation, i.e., the global shift from primarily rural to more urban societies, is increasing at an unprecedented rate and scale (UN DESA, 2014). Urbanisation includes processes that involve transitions and demographic (Dorélien et al., 2013), economic (Davis and Henderson, 2003), and/or physical transformations in the landscape (Seto et al., 2011). Between 1950 and 2014, the world's urban population increased from 746 million to 3.9 billion. Continued population growth and urbanisation are projected to add 2.5 billion people to the world's urban population by 2050 (UN DESA, 2014). Most of Latin America's medium and large cities have experienced rapid growth over the past few decades. A pervasive spatial expansion has been observed, in which most cities expand at rapid rates and exhibit lower population densities (Inostroza et al., 2013). This expansion has a direct impact on mobility patterns, and Brazil tends to be the most car-oriented country among the BRICs with a potential long-term level of automobility that falls between that of Germany and Australia (Kuhnimhof et al., 2013).

When well integrated with transport investment, urban planning is critical in terms of permitting greater usage of public transport, creating an environment that is conducive for pedestrians and cyclists, favouring more localised trip patterns (Hickman et al., 2013), and fostering the development of social sustainability (Kamruzzaman et al., 2014). The United Nations Human Settlements Programme (UN-Habitat) shows that more sustainable transport options are part of the urban sustainability agenda. For the first time, human settlements and urban areas are specifically addressed in an accepted chapter of the Assessment Report (AR) of the Intergovernmental Panel on Climate Change (IPCC). Based on the fifth version of the assessment (AR5), high-confidence evidence demonstrates that both short- and long-term transport mitigation strategies are essential to realise substantial GHG reductions. These measures could overcome barriers to low-carbon transport options and help avoid future lock-in effects that result, for example, from the slow turnover of vehicle stock and infrastructure and the expanding urban sprawl.

This approach attempts to balance transport supply and demand and to combine sustainable practices with high-quality transport accessibility in a way that substantially reduces the environmental impact that is associated with car-based suburban development (Herce, 2009; Cervero and Sullivan, 2011; Santos et al., 2013). Therefore, transportation and land use planning must change to address the provision of a transport infrastructure that incorporates a land occupation model that integrates urban space and activity locations. The aim is to shorten the distances travelled by car and to reduce urban sprawl, the need to travel in cities, energy consumption, VKT, GHG emissions (Banister,