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Building sustainable transport futures for the Mexico City Metropolitan Area

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ABSTRACT

The Mexico City Metropolitan Area (MCMA) urgently needs a more sustainable, low-carbon transport system. The objective of this paper is to elicit ways of building sustainable, low-carbon transport futures for such a system. Using stakeholder narratives as basis, this paper identifies the main driving forces shaping sustainable transport futures, develops four plausible transport scenarios for the MCMA; and assesses whether stakeholders frame driving forces in a certain way.

Driving forces stakeholders identified focused especially on cooperation among political entities and negotiation levels with internal transport stakeholders. Further driving forces included regulatory framework of vehicle use, recognition of sustainable transport as political priority, and urban growth and planning. Four scenarios based on political cooperation and internal negotiation were generated using stakeholder narratives. Three stand out: Scenario 1, where both political cooperation and internal negotiation develop positively, leading to low-emission, sustainable transport futures in the city; Scenario 3, the 'worst' scenario, where neither political cooperation nor internal negotiation function, is frequently identified by stakeholders as the way it is now; and Scenario 4 with functioning political cooperation and a lack of internal negotiation is the most unstable scenario and would quickly collapse were it to develop.

Overall, stakeholders framed driving forces as more political than technological (e.g. political cooperation was seen as more relevant than upgrading vehicle technologies). Consensus regarding this reached across institutional stakeholder categories. We found that stakeholders' views gave unique insights regarding how to build sustainable, low-carbon MCMA transport futures, including policy measures and interventions needed. MCMA scenarios developed reveal the need for common political ground as a priority to guide decision making towards sustainable, low-carbon transport futures for the MCMA.

1. Introduction

Urban congestion, rising car dependence, rising air pollution, and corresponding public health challenges in megacities require urgent decisions that incorporate long term planning by a variety of stakeholders to strengthen political acceptability. This paper develops a set of scenarios for the Mexico City Metropolitan Area (MCMA) transport system using the Shell School approach also labelled the "Intuitive Logics School" method (Van der Heijden, 2005; Shell International Ltd, 2003) which is often seen as the gold standard in scenario writing; the method is defined in Section 2. Our analysis uses the involvement of stakeholders to develop four plausible scenarios regarding transport futures and to assess narratives the outcome of which can then be used to guide the decision making of MCMA.

The Mexico City Metropolitan Area (MCMA) faces multiple challenges for its long term sustainability such as high CO_2 emissions (Croci et al. 2010; Vergara and Haeussling, 2007), persistent local air pollution (Perlman and Guadarrama, 2011; Molina et al., 2007), rising car-ownership (SMA and GDF et al., 2006; Lobo et al., 2011), laissez-faire urban planning and growth (Lobo et al., 2011), and a fragmented public transport system (Solís and Sheinbaum, 2013).

This study's main objective is to elicit ways of building sustainable, low-carbon transport futures for the MCMA transport system. In order to do this, it aims 1) to uncover which driving forces stakeholders identify as key to achieve sustainable MCMA transport futures; 2) to build stakeholder-led MCMA transport future scenarios to show how such driving forces impact decisions making and thereby long term sustainability of the transport

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system, especially the level of CO_2 emissions; 3) assesses how stakeholders frame driving forces regarding low-carbon MCMA transport futures and whether this differs depending on the stakeholder group. The former 2 aid in locating starting points for low-carbon policy measures. The latter addresses the challenge of an apparent lack of consensus among the diverse transport stakeholders in the MCMA. Framing refers to the idea that "choices depend in part on the way in which problems are stated" (Thaler and Sunstein, 2009). Here, it denotes the particular 'lens' through which stakeholders perceive problems and corresponding driving forces regarding MCMA transport system futures. It can refer to a particular connotation that is emphasized when discussing a system or concept (e.g. 'health' when discussing sustainability).

We use a grounded-theory and Shell School approach as basis for scenario development and word frequency analysis and statistical significance testing as tools of analysis (see Section 4). To the best knowledge of the authors this is the only MCMA transport sector focused study which uses stakeholder-led identification of driving forces and scenario development following the Shell School approach.

Section 2 introduces the literature on scenario thinking and the various methods used to develop scenarios. Section 3 describes empirical studies on MCMA; Section 4 elicits the methods used to build the scenarios and to uncover the driving forces; Section 5 describes the results, and Section 6 introduces policy implications and theoretical contributions. Section 7 concludes.

2. Scenario-planning

While the term 'scenario' is generally not clearly defined and used differently in different contexts, in the scenario planning context it is defined as a strategic perspective on the given system/organization into its possible futures (Van der Heijden, 2005). In this section we discuss the three main approaches to transport scenarios, namely explorative, forecasting and backcasting (or anticipative) methods. Classifications for scenarios approaches do not always fall neatly into one camp: the same author can be classified into different categories (see for instance Bradfield in Table 1) and other types of classification exist (see for example Hirschhorn in Section 2.1). Bradfield et al. (2005) point out that there is a lack of consensus on the framework for writing scenarios and a diversity of characteristics, methods and principles.

Table 1 below provides a typology of scenario methods, their main differences and corresponding authors. Some of these approaches can be combined with each other. Explorative scenarios often concern studies of socio-economic shifts, tend to be value neutral and assume the future is open (see Section 2.1); forecasting scenario approaches use positivistic thinking (in contrast to the other approaches which can include non-linear elements) and make use of econometric models (see Section 2.2); backcasting approaches concern the identification of a preferred future where steps are traced back to the present (see Section 2.3).

2.1. Explorative scenario studies

A vast number of authors and schools fall into the category of explorative scenario studies: Hirschhorn (1980), Popper (2002), Schwartz (1991), Taleb (2010), Koomey (2000), Kahn and Wiener (1967), Van der Heijden (2005), Frommelt (2008), Ralston and Wilson (2006), Shell International Ltd. (2003); Schoemaker (1995), Bandhold and Lindgren (2003), Godet (2000), Lindblom (1959) and Robinson, 1982) to name a few.

Hirschhorn differentiates between state and process scenarios. In the former, the scenario is described without formulation of how one might arrive at that future; in the latter such a formulation is given. In contrast to the classification in Table 1, Hirschhorn (1980) uses four subcategories for scenarios: idealization, prophetic, simulation and developmental.

Popper (2002), Schwartz (1991), Taleb (2010) and Koomey (2000) reject the notion of predicting the future based on historical laws of destiny, since "no society can predict, scientifically, its own future states of knowledge" (Popper, 2002). According to Schwartz scenario planning helps identify driving forces and elaborate alternative configurations of those forces. Scenarios then use these driving forces to develop plausible narratives of alternative futures which provide an array of choices that perform better in the uncertain future. Taleb makes two arguments against using history as a guide for predicting

Table 1
A typology of scenarios. Source: Banister and Hickman (2013) adapted by authors.

Measure	Explorative/Generic	Forecasting	Backcasting
Philosophy	Uncertainty. Possible futures.	Justification as the context. Causality determinism.	Discovery as the context. Causality and intentions.
Perspective	Driving forces. Emerging megatrends. Alternative combinations of forces.	Dominant trends. Likely futures. Possible marginal adjustments. Focus on adapting to trends.	Societal problems in need of a solution. Desirable futures. Scope of human choice. Strategic decisions. Retain freedom of action.
Approach	Explorative alternative scenarios. Neutral position regarding scenarios.	Extrapolate trends into future. Sensitivity analysis.	Define interesting futures. Analyze consequences and conditions for these futures to materialize.
Method and technique	Stakeholder workshops. Strategic conversations. Intuitive scenarios.	Various econometric models. Mathematical algorithms. Trend Impact Analysis. Cross Impact Analysis.	Partial and conditional extrapolations. Normative models. System dynamic models. Delphi methods. Expert judgement.
Examples	Bradfield et al.; Hirschhorn; Popper, Schwartz; Taleb; Koomey; Ralston and Wilson; Bandhold and Lindgren; Godet; Lindblom; Kahn and Wiener; Schoemaker; van der Heijden; Shell; Kahn; Lempert et al.; Elzen et al.	Bradfield et al.; Huss-Honton; ECMT. Sims et al.; World Energy Council (WEC).	Robinson; Banister and Hickman; Goodings-Zegras; Tuominen et al.; Hojer.