SHAPING SMART MOBILITY FUTURES
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Preface

By the beginning of 2018, we were leading a number of research projects affiliated to the Swedish Knowledge Centre for Public Transport (K2). All the projects in one way or another focussed on the governance of smart mobility. Being engaged in these projects, we saw a need for contemplating these issues in another way than allowed by academic journal papers or presentations at conferences, seminars, and workshops. Editing an anthology like this book was an attractive opportunity, as it provided a possibility for showing the complexity of the issue and the diversity of perspectives.

The result is this book. During the spring of 2019, we invited potential chapter authors to a seminar at K2 in Lund, Sweden to be held in September 2019. This seminar provided a valuable opportunity to discuss ideas, and drafts of all chapters were critically reviewed. Some of the chapters were authored by researchers involved directly in the above-mentioned research projects. Other chapters were penned by members of scientific advisory groups connected to these projects. And a third group of chapters were written by other colleagues involved in similar research projects.

We would like to express our gratitude to all chapter authors for their engagement in this project, as well as to colleagues at the K2 Centre, as this has formed an inspiring environment for the work. The research projects making this book possible were funded by the Swedish Energy Agency, The Swedish Innovation Agency (Vinnova), and The Swedish Knowledge Centre for Public Transport (K2).

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Lund, Sweden, January 2020
Alexander Paulsson and Claus Hedegaard Sørensen
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Chapter 1

Smart Mobility and Policy Instruments: Broadened Definitions and Critical Understandings

Alexander Paulsson and Claus Hedegaard Sørensen

ABSTRACT

The point of departure of this book is that smart mobility will only be developed in a desired direction and fulfil societal objectives if it is steered in that direction. The market, left to itself, will most certainly not deliver on these objectives. This message has been conveyed extensively in recent literature, but this book aims to take this discussion one step further by focussing on what governance of smart mobility looks like today and in the future. In this introductory chapter, the authors provide a framework of different understandings of policy instruments, how they are selected, developed and used. After the array of policy instruments within the transport sector has been extensively discussed, the authors turn to discussing a broader understanding of policy instruments found within political science and political sociology. In doing so, this book contributes to the critical scholarship on policy instruments, while exploring the why, the how and the what of policy instruments in relation to smart mobility. The chapter closes with a brief introduction to the structure of the book as well as a description of the content of each chapter.

Keywords: Smart mobility; policy instruments; governance; transport policy; political objectives; sustainable mobility

Introduction

In recent years, the advent of autonomous vehicles, the roll-out of electrification and the introduction of shared mobility solutions have influenced the
public debate as well as academic conferences and publications within the field of mobility and transport. While these developments differ in terms of both technologies and business models, the notions of ‘smart mobility’ and ‘smart transport’ are increasingly applied as synonyms of mobility and transport futures. Included in smart mobility futures are, for example, autonomous and connected vehicles, shared platform-based mobility such as car-sharing, bike-sharing, ride-sharing, combined mobility like Mobility as a Service, as well as electrification (Papa & Lauwers, 2015). The term ‘smart’ is currently used in connection with a multitude of devices (smart phone, smart television and smart card), and “‘smart’ is the order of the day’ as one author stressed (Lyons, 2018, p. 2). There is considerable political and industry-related enthusiasm for this development (Fagnant & Kockelman, 2015; Herrmann, Brenner, & Stadler, 2018; Seba, 2014). However, public debate and academic publications to an increasing extent stress that smart mobility might also be counterproductive, for example, regarding sustainability, congestion, attractiveness of cities, etc. (Docherty, Marsden, & Anable, 2018; Marsden & Reardon, 2018; Schiller, 2016). It is indeed contestable whether ‘smart mobility’ really is smart.

Landmark studies within the field include several transport model studies focussing on specific cities carried out by International Transport Forum. Studies have been conducted for Lisbon, Auckland, Helsinki, and Dublin (International Transport Forum, 2017a, 2017b, 2017c, 2018) and have inspired similar studies in other cities (COWI & PTV, 2019). The main conclusion from these studies is that sharing is necessary to achieve societal objectives using new technologies, and sharing in combination with public transport can contribute to reducing the number of cars, traffic volume, parking spaces, congestion, pollution, CO₂ emissions, etc. Though the studies have been criticised for applying unrealistic assumptions (Docherty et al., 2018), the studies have both inspired and prompted public authorities (COWI & PTV, 2019) and corporations (e.g. Pietzsch, 2018) to launch initiatives on shared and combined mobility.

A Need for Governance?

Based in the modelling studies mentioned above as well as several real-world pilots and tests, an emerging body of literature has stressed the need for governance of ‘smart’ mobility, not least during the transition process (Docherty et al., 2018; Finger & Audouin, 2018; Marsden & Reardon, 2018). Docherty et al. (2018) have argued that smart mobility can only be developed in a desired direction and fulfil societal objectives if it is steered in that direction. The market, left to itself, will most certainly not deliver on these objectives. Finger and Audouin (2018) as well as Lyons (2018) have stressed a need to align smart mobility with the sustainability paradigm. Docherty et al. (2018) have also argued that there is, in the transport sector, a tradition for public sector involvement that should be applied to govern the transition, while Reardon and Marsden (2018) express an urge to use the current window of opportunity for deliberate considerations and debates on societal goals, suggesting a need for cautiousness before entering into possible, disruptive societal changes.
This book is written and published in a time of climate crisis that probably represents one of the biggest global challenges in the history of mankind. A huge gap exists between, on the one hand, how scientists within the climate field express the need for policy initiatives at all levels of society (Lenton et al., 2019), and on the other hand, the actually implemented policy initiatives, which so far seem insufficient. When it comes to transport and mobility, smart mobility is often envisaged as a solution that enables highly mobile societies with a limited carbon footprint, because mobility is expected to be electrified, shared and more efficient (Seba, 2014). For that reason, achieving smart mobility is often expressed as a goal on its own, and some of the literature on smart mobility is focussed on how to introduce and implement smart mobility solutions, thus overcoming legal obstacles and popular resistance (Bjelfvenstam, 2018; Herrmann et al., 2018). However, the chapters in this volume do not subscribe a priori to this optimistic approach to smart mobility, since smart mobility might also have undesired and unintended consequences. When governance and policy instruments are analysed in this volume, the ambition is not to discuss how to implement smart mobility in the most efficient way, but rather to discuss how smart mobility can be governed so that broader sustainability goals or other societal goals are achieved.

The demand for governance and policy instruments in relation to the smart mobility transition is strongly linked to societal goals introduced in recent years at various levels of society. The 17 Sustainable Development Goals are one example (Hildebrandt, 2016; United Nations, 2019) highlighting global ambitions to combat poverty and climate change and to establish wealthy and more equal societies. The Sustainable Development Goals are inspiring national and local public authorities as well as corporations, which in some cases even adopt the SDGs in their vision and mission statements (Ali, Hussain, Zhang, Nurunnabi, & Li, 2018). At the national level, transport policy objectives are established in many countries, including ambitions regarding climate, safety, accessibility, environment and growth (Sørensen & Gudmundsson, 2010). Within other sectors, overarching goals are formulated which also aim to impact decisions within the field of transport. At the regional and municipal levels, a similar trend is observed, a remarkable example being the cities gathered in networks like C40 and ICLEI to achieve climate and sustainability goals (C40, 2019; ICLEI, 2019).

What is a Policy Instrument?

Despite the assumption that political involvement is necessary, surprisingly little is said in the literature about what such governance would look like. Policy instruments are one way that governance is carried out or achieved, and as such, are often imbued with a means-end rationality. While policy instruments are often designed to achieve specific objectives, policy instruments may also be developed and used for fulfilling a wide range of other objectives. The characteristics of the objective generally influence how the policy instrument is designed and implemented (Edmondson, Kern, & Rogge, 2018; Rogge & Reichardt, 2016). Also, the context of a specific policy instrument matters (Sørensen & Paulsson, 2019, in press). For example, during times of relative stability, policy instruments may
build on previously implemented instruments, become institutionalised and even mainstream, as it were. During times of rapid transition or unexpected and disruptive socio-technological change, newly designed policy instruments may become obsolete and older instruments may turn out to be counter-productive. In short, both the speed and the direction of socio-technological changes may impact which policy instruments are regarded as suitable and relevant for achieving the desired objectives (see, e.g., Stead & Vaddadi, 2019). In fact, the choice of instrument generally reflects the political and administrative elites’ ideas about the relationship between the governing and the governed (Gössling & Cohen, 2014). Since the choice and design of policy instruments are shaped by political and administrative elites’ ideas as well as broader socio-political developments, policy instruments are often highly politicised (Howlett, 2009; Howlett & Ramesh, 1993; Stead, 2018).

The ambition of this book is to take the call for governance of smart mobility one step further by considering the policy instruments used today and the instruments that might be used in shaping smart mobility futures, thus enabling them to meet the societal objectives like tackling the ongoing climate crisis and achieve the goal of sustainable mobility. As of today, policy instruments used in the transport sector include, but are not limited to, a range of taxes and fees, as well as legislation on traffic and vehicles that includes parking restrictions and land-use planning. In futures of smart mobility, some of these policy instruments might be weakened as the technology makes them either obsolete or redundant. For example, autonomous cars presumably would not have to care about parking restrictions, because they can continue circulating or park outside the city centre. With changing ownership structures and shared forms of mobility solutions, some taxes on vehicle ownership and fuel consumption may prove to be weak instruments to shape travel behaviour. Yet, other policy instruments might be strengthened as the socio-technological changes are more aligned with the objectives of the instruments, for example, taxes or fees based on kilometres travelled. There might also be completely new forms of instruments emerging from the socio-technological changes that public authorities may try to use, or they might want to recalibrate current policy instruments due to the emergence of smart mobility. We see this focus on policy instruments as a new topic within the literature on smart mobility, since it goes beyond the plain call for governance to secure public values.

A framework is developed below to gain an overview of the policy instruments presently used in the transport sector. However, we want to stress that in this book, there is no normative standpoint as regards certain types of policy instruments, nor do we endorse a certain type of knowledge or framework about policy instruments. Instead, the point of departure is broad, and we suggest that policy instruments should be understood as ‘techniques of governance that, one way or another, involve the utilization of state authority or its conscious limitation’ (Howlett, 2005, p. 31). Rather than resorting to functionalist explanations of policy instruments, that is, as rational tools used by governments to achieve clearly defined objectives, we include a range of conceptualisations, from economics and political science to sociology. In doing so, we contribute to the literature
Smart Mobility and Policy Instruments

by problematising the definition of policy instruments and how they develop, operate and impact their target audience.

In light of such a broad understanding and the multitude of conceptualisations included in this book, we will first discuss policy instruments and instrument categorisations applied within the field of transport, and we will then turn to more recent research, advocating a broader understanding of policy instruments.

Policy Instruments Used to Govern Transport

In the transport sector, the discussion on policy instruments remains vivid and the debated socio-technological changes associated with smart mobility, as well as the policy ambitions to reach the climate goals, has brought to light the need to consider the importance and effectiveness of the policy instruments used in the sector. Therefore, we will now discuss the instruments in use. The purpose of these instruments is often to steer the development towards societal objectives, for example, reducing travel demand, shifting travel from car to walking, cycling and public transport, as well as developing or using more energy-efficient fuels.

As discussed above, the purpose of using policy instruments is to influence the decisions and behaviours of a subsector of society or a predefined target group in order to achieve certain intended effects. In the transport sector alone, there is a plethora of instruments. According to one estimate, there are up to 60 different types of instruments in this sector (Institute for Transport Studies, 2009). Because of this multitude and lack of overview, there have been several attempts to categorise the policy instruments used in the transport sector. Santos, Behrendt, and Teytelboym (2010) divide instruments for sustainable road transport into three categories: physical instruments, soft instruments and knowledge as an instrument. Physical instruments include policies that affect the built environment and infrastructure, for example, raising land and capacity for the construction of roads. Soft tools and knowledge aim to change behavioural patterns through targeted information and marketing, as well as norms and standards.

The distinction between hard and physical instruments on the one hand and soft and ‘non-physical’ instruments on the other is relatively established in the transport sector, but the analytical value of the distinction can be discussed. Policies that directly intend to steer behavioural patterns in a desired direction, such as information campaigns or marketing, are obviously non-physical. But measures aiming to change behaviour often also involve changes in the physical environment. Pedestrian crossings, speed bumps or other measures in the physical infrastructure are some examples of this. Transforming and changing the built environment and thereby increasing accessibility is a ‘physical’ policy instrument. At the same time, such instruments operate in a context where administrative or non-physical measures are inter-dependent. Pedestrianisation and car-free zones are two such policies often used by cities promoting sustainable mobility. Changing the use of road space so that buses and tramways are prioritised over cars are similar examples of cities promoting sustainable forms of mobility (Petterson-Löfstedt & Sørensen, 2019, in press). Such changes are primarily based on administrative decisions but also include changes both in the production of urban space and
more specifically in the use of existing road space. In short, administrative policy instruments and interventions in the physical and built environment often interact with each other.

In the transport sector, it is also common to distinguish between financial, administrative and informative instruments (Dickinson & Wretstrand, 2015). We will therefore briefly discuss and contextualise these categories below.

**Financial instruments** are based on financial incentives as well as monetary costs and benefits. Behaviour is affected to the extent that actors are motivated by or place monetary value on their behaviours and decisions. Because actors attribute different values to costs and benefits, for example, depending on relative budgetary constraints and priorities, the effects of financial policy instruments are highly differentiated. Fees, taxes and subsidies are prominent and common instruments (Frey, 2003). Fees, taxes and subsidies have the potential to manage behaviour as well as to finance and internalise costs associated with the use of the transport system (Nash & Matthews, 2013). However, the introduction of fees, taxes and subsidies affect different groups in different ways. For households with relatively high incomes, the effects may be marginal, while the effects for households with lower incomes will be comparatively substantial. Governments also use various forms of subsidies in the transport sector to promote certain desired behaviours and decisions (Notteboom, 2013).

**Administrative instruments** are instruments based on the ability of public actors to impose restrictions, requirements, certifications, permits or formal decisions. Administrative instruments include everything from legislation and regulations to policies and recommendations. Examples of administrative instruments in the road infrastructure network are speed restrictions and parking restrictions. Failure to comply with legislation and regulations can result in financial penalties, such as fines, as well as administrative penalties, such as suspension of permits and prohibitions. Failure to comply with policy usually causes suspension of permits or certifications (e.g. Dowling, 2018; Rodrigue, 2013).

**Informative instruments** refer to instruments intended to influence behaviour and traffic flows through knowledge, communication and nudging. **Mobility management** is an example of a policy instrument that incorporates informational elements. In practice, mobility management may be about informing and planning for a more efficient private car use, to encourage car users to share rides or vehicles, or use public transport or cycle and walk. Mobility management is the instrument that requires the smallest interventions to potentially influence the mobility practices and behaviours and so optimise the capacity of the transport system. However, it is an instrument that may lead to controversies, not least because it can be perceived to put individual liberty and freedom of movement into question (Hrelja, Isaksson, & Richardson, 2013). Intelligent transport systems (ITS), which are already in use in several places, are expected to grow in usage because of the roll-out of automated and connected vehicles (see Hopkins & Schwanen, 2018; Janecki, 2011).

In addition to these three categories of instruments, there is a fourth policy instrument: **research and development**. Research, development and demonstration projects are ways of ‘correcting’ market failures, since the market produces too
little knowledge and innovation when left to its own devices. Knowledge about the effects of new technology and innovations is often seen as a prerequisite for being able to achieve different environmental goals in the long term. This justifies the use of public funds to steer knowledge development in a desirable direction through pilot experiments, test beds or earmarked research funding.

Governments at various levels – be it national, federal, regional or local – are all involved in governing the transport sector using different policy instruments. Cities are central to the transport system as they accommodate loads of cars and freight trucks, but cities are also innovative when it comes to policies curbing car use. With the help of land-use policy and traffic strategies, cities are trying to steer urban mobility in a sustainable direction, not least by combining ‘physical’ instruments with changes in the built environment. According to a study by Grazi and van den Bergh (2008), land-use policy is a superior policy instrument, as it sets out the material framework and the possible effects of the other policy instruments: whether they are financial, administrative and/or informational policy instruments.

The number of policy instruments in the transport sector is impressive, spanning from traffic rules via huge infrastructure investments to land use planning, and the broader scholarly debate on governance and policy instruments is similarly rich and encompasses an extensive literature. Although we do not intend to contribute to the discussion on the categorisation of policy instruments, we believe that we can add perspectives to the discussion by trying to broaden the understanding of policy instruments and by highlighting the limits of such instruments.

Towards a Broader Understanding

The research on policy instruments can be divided into two camps. On the one hand, there is a distinct normative approach that tries to describe how the state, by adopting ‘the right’ policy instruments, could plan, control or steer the development of society or specific subsectors. On the other hand, there is a more descriptive approach that attempts to map the instruments or mechanisms by which the state de facto governs society or aspects of it. In the middle of these lies the pragmatic approach, which aims to describe how the state can steer subsectors of society in certain directions, but doing so based on the policy instruments, tools and mechanisms that are already in use and where the state already possesses the required knowledge and competence. With the book The Tools of Government, Christopher Hood (first edition 1983, second edition 2007 with Margetts) introduced an analytical approach by developing a theoretical framework to understand what policy instruments – or tools – the state uses in governing. This analytical approach consists of four overarching categories of tools: nodality, authority, treasury and organisation.

In addition to Hood’s influential categorisation, there are several later works that summarise and classify various sets of policy instruments. Often, these categorisations are based on the properties of the policy instruments, which can be either hard or soft (measures), push or pull (direction), voluntary or mandatory.
Furthermore, policy instruments may range from financial incentives to administrative carrots and sticks, as well as spatial and physical instruments. In the book *Sticks, Carrots and Sermons*, Bemelmans-Videc and Vedung (2011) suggest that sticks correspond to formal regulations, carrots to financial instruments, while sermons correspond to information. In practice, authorities operating at different levels in the public sector have different access to different instruments (Kassim & Le Galès, 2010). For example, the state often uses taxes as a policy instrument, while it is generally cities and municipalities that employ land use as a policy instrument.

The knowledge production about policy instruments can be roughly divided into two camps as well; these camps have their own literatures and they rarely come into dialogue with each other (Howlett, 2005). Firstly, there is the economics literature on policy instruments. This literature is generally concerned with understanding and developing incentive structures and adapting economic or financial policy instruments to either punish or promote certain types of decisions or behaviours within a specified subsector of society or a clearly defined target group. The cost-effectiveness of certain policy instruments has also become a crucial question for economists. Secondly, there is the political science literature on instruments. Instead of studying what policy instruments lead to, given certain assumptions about decisions, behaviours and welfare effects, political scientists are often interested in how policy instruments are used, and what side-effects they cause. Of course, this is an immensely simplified picture of the two camps of knowledge production and their overarching research interests, but it nevertheless shows the basic features of much of the research that has been and still is produced on policy instruments (see discussion in Howlett, 2005).

During the past twenty years, scholars of policy instruments have also turned their attention to policy instrument selection and how policy instruments are becoming mixed in use (Bemelmans-Videc & Vedung, 2011; Bressers & O’Toole, 2005). Many research projects have been inspired by the observation that when multiple instruments are used at the same time, it tends to lead to knock-out effects or encourage decisions or behaviours that move in opposite directions than what was originally intended. As a result, much of the focus in the political science literature has moved on to finding criteria for selecting and designing ‘the right’ instrument or instrument mixes (see, e.g. Rist, 2011). But the question of the legitimacy of policy instruments has also gained much interest (Wallner, 2008). Research has showed that unless the policy instruments are considered legitimate by the target group or those affected by them, their effect may lead to unintended or even unwanted consequences (Galès, 2010).

While there is critical reflection and critique within these two camps of knowledge production, criticism has also emerged from other disciplines. Political sociologists Lascoumes and Le Galès (2007) have been critical of the assumptions behind much of the political science literature on policy instruments. They summarise the assumptions underlying the research by stating that public policy, in this literature, is primarily conceived as ‘pragmatic — that is, as an apolitical and technical approach to solving problems through instruments’, which in turn are understood as ‘natural’, whereby politicians and policymakers understand them