NEED FOR SPEED
TOWARDS URBAN PLANNING FOR RAPID
TRANSITIONING TO SUSTAINABLE PERSONAL
MOBILITY

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ABSTRACT

The Paris Agreement, the recent Special Report from the Intergovernmental Panel on Climate Change, and the Sustainable Development Goals are examples of United Nations’-facilitated calls for urgent climate action and more generally for a rapid transition of society towards sustainability. Since urban personal mobility is a significant contributor to society’s current sustainability challenges, and considering current trends of population growth and urbanisation, there is a strong need to develop enhanced support for urban planning for rapid transitioning to sustainable personal mobility.

This thesis is part of a wider effort to develop methodological support for such planning and action. The aim of the thesis is to provide a partial foundation for that wider effort by: (i) identifying and organising prominent research themes related to the above topic; and since previous research points to benefits of a transdisciplinary, multisectoral and multicultural approach, (ii) exploring and addressing the complexity of co-production processes in such contexts; and (iii) analysing the appropriateness of some prominent planning approaches for the desired planning support.

The aim is pursued through a systematic literature review, including bibliometric analyses, and two empirical case studies, including workshops, interviews, field studies and feasibility studies. One of the case studies included participants from several countries in the Southern Baltic region and the other case study tested the usefulness of different planning approaches in the local context of Kisumu, Kenya and Gothenburg, Sweden, respectively.

The thesis provides a map of some prominent research themes and discusses their relevance to the field of urban planning for rapid transitioning to sustainable personal mobility. The analysis of the identified themes and their development over the past ten years shows that there has been a shift in mobility planning from ‘predict and provide’ towards participatory visionary approaches. This, in turn, has led to new challenges, related to, for example, epistemic communities, language and culture. Furthermore, it is seen that sustainability considerations have become increasingly pronounced in the urban mobility planning literature. However, different dimensions of sustainability are often considered individually (e.g. the ecological and social dimensions) and co-ordinated approaches to sustainable mobility planning are virtually lacking.

At the methodological level, the thesis provides a preliminary conceptual framework for analysing complexity in co-production processes with regard to epistemic communities, language and culture, as well as a discussion of the usefulness of four specific planning approaches for the desired planning
support, namely the backcasting, transdisciplinary co-production of knowledge, foresighting and SymbioCity approaches.

The overall conclusion is that there is a need for research that would show how mobility actors can contribute to resolve pressing issues related to climate change fast enough without compromising other aspects of sustainability, including how temporary trade-offs can be addressed in a strategic way.

**Keywords:** personal mobility, urban planning, rapid transition, sustainability
THESIS DISPOSITION

This compilation thesis includes an overview part and the following papers. The papers have been reformatted from their original publication to fit the format of this thesis. The content remains unchanged.

Paper A


Paper B


Paper C

OTHER PUBLICATIONS

LIST OF ABBREVIATIONS AND ACRONYMS

CO₂e – carbon dioxide equivalents

EC – European Commission

EU – European Union

FSSD – Framework for Strategic Sustainable Development

GHG – greenhouse gas(es)

IPCC – Intergovernmental Panel on Climate Change

ISUD – Integrated Strategic Urban Development

IT – information technology

MCA – multi-criteria analysis

MAMCA – multi-actor multi-criteria analysis

MLP - multi-level perspective

MUF – Mistra Urban Futures

NTSA – National Transport and Safety Authority

OECD – Organisation for Economic Cooperation and Development

PRISMA – preferred reporting items for systematic reviews and meta-analyses

RQ – research question

SACCO – Savings and Credit Co-operative

SAP - strategy as practice

SDGs – Sustainable Development Goals

SHN - sustainable household nutrition
SLR – systematic literature review
SRC – Stockholm Resilience Centre
SUMP – sustainable urban mobility plan
SWOT – strengths, weaknesses, opportunities and threats
UK – United Kingdom
UN – United Nations
UN DESA – United Nations Department of Economics and Social Affairs
UN-HABITAT – United Nations Human Settlements Programme
USB – universal serial bus
WS - workshop
## CONTENTS

1 INTRODUCTION 1

1.1 Sustainability challenges in urban personal mobility 1

1.2 Aim and guiding research questions 2

1.3 Scope 3

2 BACKGROUND OF THE FIELDS 5

2.1 Urban planning 5

2.2 Sustainability 8

2.3 Personal mobility 10

2.4 Approaches to change 11

3 RESEARCH DESIGN 13

3.1 Outline of the research design 13

3.2 Methodology 14

3.2.1 Exploratory research 15

3.2.2 Case studies 15

3.2.3 Validity 16

3.3 Research approach 17

3.3.1 Situating the research – transdisciplinary research 17

3.3.2 Ethics of empirical studies and research bias 18

3.3.3 Reflexivity 18

3.3.4 Co-production and co-creation 19

4 SUMMARY OF APPENDED PAPERS 21

4.1 Paper A 21

4.2 Paper B 22
## MAIN FINDINGS AND DISCUSSION

### 5.1 Prominent research themes in personal mobility planning

- **5.1.1 Planning**
- **5.1.2 Process monitoring and evaluation**
- **5.1.3 Policy development and governance**
- **5.1.4 Transitions**
- **5.1.5 Sustainability**

### 5.2 Organisation of personal mobility planning in society

### 5.3 Sustainability in personal mobility planning

### 5.4 Temporal dimension in personal mobility planning

- **5.4.1 Urgency of change**
- **5.4.2 Perception of time**
- **5.4.3 ‘Economic’ versus ‘social’ time**
- **5.4.4 Travel time**
- **5.4.5 Time in relation to languages**

### 5.5 Validity considerations

## CONCLUSIONS AND FUTURE STUDIES

### 6.1 Concluding remarks

### 6.2 Future studies

## REFERENCES

- **PAPER A**
- **PAPER B**
- **PAPER C**
1 INTRODUCTION

This chapter outlines the general context for this thesis and describes the challenges that led to the problem statement. It also sets out the aim, research questions and scope of the thesis.

1.1 Sustainability challenges in urban personal mobility

The Paris Agreement (United Nations, 2015a), the recent Special Report on 1.5°C from the Intergovernmental Panel on Climate Change (IPCC, 2018), and the Sustainable Development Goals (SDGs) (United Nations, n.d.), which are part of Agenda 2030 (United Nations, 2015b) are examples of United Nations’-facilitated (UN) calls for urgent climate action and more generally for a rapid transition of society towards sustainability.

Urban personal mobility is a significant contributor to society’s current sustainability challenges and considering current trends of population growth and ongoing urbanisation, this is further emphasized.

For example, the IPCC Special Report (IPCC, 2018, p. 17) states that:

“Pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems (high confidence)”.

Furthermore, current research suggests that anthropogenic impact is one of the largest contributors to climate change (Pachauri et al., 2015), and according to Eurostat (European Commission, 2017), 23.5% of the greenhouse gas (GHG) emissions in the 28 European Union (EU) countries, expressed as carbon dioxide equivalents (CO₂e), come from the transport sector. Other important transport-related impacts involve emissions of particles and acidifying substances as well as depletion of scarce resources and natural productive surfaces (Ny et al., 2017). Ny and colleagues (2017) also conclude that transport system development also risks contributing to social sustainability challenges, for example, if the decision-making in development processes leads to structural obstacles to people influencing their situation. In development processes, often only certain categories of people benefit, while the rest are left behind. For example, when decision-makers incentivise motorised public transport development to increase accessibility to the cities in the countries of global South, the non-motorised
mobility of the poorest of the poor becomes more difficult (Parnell, 2016; Simon, 2016). Addressing these aspects in a co-ordinated and strategic way is a part of the complex challenge related to sustainable personal mobility.

Personal mobility is typically an important subject for urban planners, but it is also an outcome of transport planning, which deals with policy demands and transport management (Hull, 2005). Much of the mobility planning takes place in the context of urban planning, but it is also affected by national policies, such as policies on transport, land-use and spatial planning. Therefore, mobility planning is a complex process that involves many influential actors and issues that need to be taken into consideration. Sustainability considerations add to the complexity.

Based on the above, there is a strong need to develop enhanced support for urban planning for rapid transitioning to sustainable personal mobility. Since previous work (e.g. Borén and Ny, 2018) points to benefits of a transdisciplinary, multisectoral and multicultural approach, the support should address the complexity of co-production processes and provide guidance for co-ordinated planning and action across disciplines and sectors (Robèrt et al., 2017).

### 1.2 Aim and guiding research questions

This thesis forms part of a wider effort to develop methodological support for urban planning for rapid transitioning to sustainable personal mobility. The aim of the thesis is to provide a partial foundation for that wider effort by (i) identifying and organising prominent research themes related to the above topic; (ii) exploring and addressing the complexity of co-production processes in multidisciplinary, multisectoral and multicultural contexts; and (iii) analysing the appropriateness of some prominent planning approaches for the desired planning support.

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1 Co-production of knowledge is here defined as a “collaboratively based process, where different actors and interest groups come together with researchers to share and create knowledge that can be used to address the sustainability challenges being faced today, and increase the research capacity to contribute to societal problem-solving in the future” (Polk and Kain, 2015, p. 2).
The following research questions (RQs) were elaborated to guide the work:

**RQ1** What are some prominent research themes in relation to urban planning for rapid transitioning to sustainable personal mobility, and how could these be organised in relation to the goal of such planning?

**RQ2** What could be some important elements of a methodological support for co-production processes in multidisciplinary, multisectoral and multicultural contexts aiming at urban planning for rapid transitioning to sustainable personal mobility?

**RQ3** What are some prominent planning approaches, and what are some major advantages and challenges of these, in relation to the goal of urban planning for rapid transitioning to sustainable personal mobility?

These RQs are in some cases further elaborated into more specific sub-questions in the appended papers.

### 1.3 Scope

This thesis focuses on urban planning processes for sustainable personal mobility.

Urban planning is defined as “the planning and regulation of building, development, reconstruction, etc., in an urban area” (Oxford Dictionaries, n.d.). Mobility planning is a sub-set of this.

To cast a wide net in the literature searches and include publications using many different understandings of the concept of sustainability, no particular definitions of sustainability are used as exclusion criteria. However, some definitions are given in chapter 2 as a general background.

Mobility is defined as “the ability to move or be moved freely and easily” (Oxford Dictionaries, n.d.). Mobility is about people, but to emphasize that, the term ‘personal mobility’ is often used in this thesis. Mobility is slightly different than transport, which means to “take or carry (people or goods) from one place to another by means of a vehicle, aircraft or ship” (Oxford Dictionaries, n.d.). Thus, the scope of the thesis includes not only motorised and non-motorised transport of people, but also walking. However, it excludes transport of goods. Furthermore, the focus is mainly on mobility on land, since air and sea transport are often excluded from the urban planning scope.
The topic of this thesis relates to many sectors besides transport, such as energy and industry. These other sectors are not studied at any detailed level but only in an overall way as relevant for the aim of the thesis. For example, energy considerations are often part of the discussion around fuels for motorised means of transport.

The primary intended audience for this thesis is researchers and practitioners working with urban personal mobility planning and transition studies, as well as with co-production processes.
2 BACKGROUND OF THE FIELDS

This chapter provides further background of the key fields coming together in this thesis.

2.1 Urban planning

The term planning means different things to different people (Mintzberg, 1994, pp. 5-15). An integrated definition suggested by Mintzberg (1994, p. 12) is related to strategy development: “Planning is a formalised procedure to produce an articulated result, in the form of an integrated system of decisions”. This is the definition used in this thesis.

Until the 1990s, urban planning had two main modes (Wolfram, 2018). The first had a visionary approach for radical societal change, which deals with integration of ideologies and norms. The other mode is “planning as a regulatory and technocratic practice” (Wolfram, 2018, pp. 104-105), which focuses on practical solutions for managing orderly change by means of institutions and professionalisation. Introduction of sustainability thinking into urban planning resulted in questioning of these modes, which led to the development of new modes, such as strategic planning.

However, the term strategy can also be seen from different points of view, as a plan, pattern, position or perspective (Mintzberg, 1994, pp. 23-29). The first two of these viewpoints on strategy can be noticed in different forms of strategy, as defined by Mintzberg (1994, pp. 23-25). An outcome of planning is a plan, which can be defined as an intended strategy (Figure 1). Consistency of behaviour over time leads to pattern creation and can be defined as a realised strategy. However, are realised strategies always those initially intended? The strategies that fully followed initial plans can be called deliberate strategies. Nevertheless, in practice, some of the intended strategies never get realised (unrealised strategies). The planning literature does generally recognise these forms. However, another form, an emergent strategy, is not always recognised. An emergent strategy refers to a pattern that was realised, but that was not initially intended. Those are the actions that emerged over time into a pattern. This form of strategy can be observed when decisions are made one after another. Few realised strategies are fully deliberate or fully emergent. Often it is a mix of the two (Mintzberg, 1994).
Different viewpoints on strategy as well as different forms of strategy come from different theories of strategic planning (or schools of thought). Ten different schools of thought were identified by Mintzberg (Mintzberg et al., 2009): design, planning, positioning, cognitive, entrepreneurial, learning, political, cultural, environmental and configurational.

Based on these ten schools (Mintzberg et al., 2009, pp. 5, 368-369), the following explanations of different schools can be given (Table 1):
Table 1: Ten theories of strategic planning. Based on Mintzberg et al. (2009).

<table>
<thead>
<tr>
<th>School of thought</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design</strong></td>
<td>Strategy formation as a process of <em>conception</em>. Internal factors of organisation are used to match the external factors.</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>Strategy formation as a <em>formal</em> process. Realisation of the strategy through a plan.</td>
</tr>
<tr>
<td><strong>Positioning</strong></td>
<td>Strategy formation as an <em>analytical</em> process. Organisation gets the support in strategic positioning within its industry.</td>
</tr>
<tr>
<td><strong>Entrepreneurial</strong></td>
<td>Strategy formation as a <em>visionary</em> process. Strategies are based on a vision created by the organisation’s leader, which comes from personal perspectives.</td>
</tr>
<tr>
<td><strong>Cognitive</strong></td>
<td>Strategy formation as a <em>mental</em> process. Strategies are based on leader’s perceived patterns. The reality is constructed.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>Strategy formation as an <em>emergent</em> process. Strategies emerge step by step through learning about patterns of the leaders and other organisation members.</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>Strategy formation as a process of <em>negotiation</em>. Strategies are created through the process of negotiation within the organisation or between the organisation and external actors.</td>
</tr>
<tr>
<td><strong>Cultural</strong></td>
<td>Strategy formation as a <em>collective</em> process. Strategy is created through cooperative process, reflecting ideologies, narratives and collective cognitive maps.</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td>Strategy formation as a <em>reactive</em> process. Strategy is seen as ecological niches developed in adaptation to external factors. Whereas in the other schools of thought environment is seen as a factor, here it is seen as an actor.</td>
</tr>
<tr>
<td><strong>Configuration</strong></td>
<td>Strategy formation as a process of <em>transformation</em>. Strategy formation is a process of organisational transformation from one decision-making mechanism to another.</td>
</tr>
</tbody>
</table>

For example, in the planning school of thought, an action plan is seen to be produced based on a formal planning process (Steurer and Martinuzzi, 2005), whereas some schools of thought emphasize more informal strategy making (Mintzberg, 1994). However, most schools see participatory processes as necessary for *urban* change. Moreover, the process of outlining pathways or strategic plans may be even more important than the plans themselves. Several examples of participatory processes have been analysed in this thesis (Papers A, B and C).

Another approach that might be particularly useful for participatory planning is called ‘strategy as practice’ (SAP) (Jarzabkowski and Paul Spee, 2009; Kornberger and Clegg, 2011; Whittington, 1996). This approach aims to
connect academics and practitioners and focuses on how strategies are created in practice. In the context of urban planning, this approach could become a means of learning, experimenting and mediating, and a platform for problematising futures (Kornberger and Clegg, 2011).

Another approach to strategic planning, specifically developed to aid sustainability transitions, is called a ‘framework for strategic sustainable development’ (FSSD) (Broman and Robèrt, 2017). This approach could potentially resolve many of the ‘dilemmas’ discussed above. It includes a principled definition of sustainability (see below), allowing for participatory co-creation of sustainable visions within such boundary conditions for sustainability. It also includes an operational procedure for participatory co-production of strategic plans and emphasizes the necessity to reassess and recreate such plans repeatedly as the detailed contextual conditions change. In any complex endeavour it is impossible to predict change at a detailed level, implying that all detailed plans will not be realised in full. Principle-framed visions and repeated participatory assessment and co-production are then essential elements of strategic planning. The utility of this approach in practice has been demonstrated in many cases, including some urban planning cases (Broman and Robèrt, 2017).

Since this thesis mainly has an exploratory character, all planning approaches were embraced in order to understand them better, as a foundation for choosing one or more of them for future work.

2.2 Sustainability

Sustainability, like planning, can be understood differently by different actors. Some people see it as a policy end-point or as a vision (e.g. Kenworthy, 2006), which allows us to define where we want to be and plan for that rather than base the decisions for development on historical practices and forecasting. Other people, for example, Carr and colleagues (2015), see sustainability as a lens through which to look at social realities, and argue that planners cannot achieve sustainability fully, but only approximately. Carr and colleagues (2015) argue that integrated planning, for example, would create new challenges and only address issues of certain groups of people, flows and spaces.

Perhaps the most widely known definition of sustainability comes from the so-called Brundtland report (UN World Commission on Environment and Development, 1987, p. 16), where sustainable development is seen as development that “meets the needs of the present without compromising
the ability of future generations to meet their own needs”. This has been criticized for, for example, being too vague and not operational enough for practical use (Chasin, 2014; Lozano, 2008; Missimer et al., 2017a).

An attempt to develop a unifying, operational definition of sustainability through an international consensus process among academics and practitioners (Broman et al., 2000; Broman and Robèrt, 2017; Holmberg, 1995; Missimer et al., 2017a, 2017b; Ny et al., 2006; Robèrt, 1992, 1994, 2000; Robèrt et al., 2002) has resulted in the following set of sustainability principles (Broman and Robèrt, 2017, p. 23):

“In a sustainable society, nature is not subject to systematically increasing...

1. ... concentrations of substances extracted from the Earth’s crust [...];
2. ... concentrations of substances produced by society [...];
3. ... degradation by physical means [...];

and people are not subject to structural obstacles to...

4. ... health [...].
5. ... influence [...].
6. ... competence [...].
7. ... impartiality [...].
8. ... meaning-making [...]”.

These principles have been developed with the following in mind: to be unifying across disciplines and sectors and thereby operational for co-ordinated backcasting planning and redesign for sustainability, the principles should be (Broman and Robèrt, 2017, p. 19):

- **Necessary**, but not more to avoid imposing unnecessary restrictions and to avoid confusion over elements that may be debatable;
- **Sufficient**, to avoid gaps in the thinking, i.e., to allow elaboration into second and higher orders of principles from a complete base;
- **General**, to be applicable on any arena, at any scale, by any member in a team and all stakeholders, regardless of field of expertise, to allow for cross-disciplinary and cross-sector collaboration;
- **Concrete**, to actually guide problem solving and innovation, i.e., redesign through step-by-step approaches in real life;
- **Non-overlapping**, to enable comprehension and facilitate development of indicators for monitoring of progress“.
As mentioned above, this set of principles is part of a planning framework for participatory co-production of strategic transitions towards sustainability, allowing for many possible visions within the principled frame of sustainability principles and many possible routes to such visions. This way, it permits, for example, participatory innovation, community development and diverse political, cultural and economic approaches. This harmonises with, for example, the dimensions of sustainability pointed out as essential by Mistra Urban Futures: ecological, socio-cultural, economic and political (MUF, 2015).

On the one hand, sustainability can become a focus for what many actors are trying to achieve. This could create convergence (uniformity) of visions. On the other hand, diverse conceptualisations of sustainability could lead to divergence in planning practice. Both convergence and divergence occur simultaneously in current practice (Harris and Moore, 2015). The tendency to converge around sustainability visions is likely strengthened if principle-based visions are used (Broman and Robèrt, 2017).

In order to cast a wide net in the literature searches of this thesis and capture publications using many different understandings of the concept of sustainability, the above definitions are not used explicitly to assess inclusion or exclusion at this stage.

### 2.3 Personal mobility

The thesis focuses on urban planning for sustainable personal mobility. The definition of mobility given in the introduction embraces walking in addition to motorised and non-motorised transportation of people. The term personal emphasises that it is people who move or are being moved. Moreover, it implies that planning should focus on people and their needs. Some scholars, such as Geels (2018), use the term passenger mobility. However, this seems to imply that people are passengers in some vehicle, whereas personal mobility also includes walking.

Planning for personal mobility is an emerging field (UN-HABITAT, 2013). Different scholars have shifted to mobility planning from transport planning at different times. For example, for the research group led by Banister, this shift happened when the sustainable mobility paradigm was published (Banister, 2008). Some researchers use the terms ‘mobility planning’ and ‘transport(ation) planning’ interchangeably, for example, a research group led by Axhausen (Future Cities Laboratory, 2018). In this thesis personal mobility planning is defined as resident-centred planning that brings people
together locally, providing accessibility and reducing the need to travel (based on UN-HABITAT, n.d.). The trends in personal mobility planning is towards more flat, participatory approaches.

2.4 Approaches to change

Several responses to change can be distinguished – mitigation, adaptation, resilience-building measures, transition and transformation (Pelling, 2011; Shaw et al., 2014).

Mitigation is “the action of reducing the severity, seriousness, or painfulness of something” (Oxford Dictionaries, n.d.). In the scientific literature, mitigation is often seen as related to reduction of vulnerability to the effects of emissions (Orlove, 2005).

Adaptation is “the action or process of adapting or being adapted” (Oxford Dictionaries, n.d.). An example is adaptation to the actual and expected climate change effects, including changing our lifestyles (IPCC, 2014).

Resilience is “the capacity to recover quickly from difficulties; toughness” (Oxford Dictionaries, n.d.), or “the capacity to deal with change and continue to develop” (SRC, 2007). Moreover, ecosystem resilience is defined as “a measure of how much disturbance (like storms, fire or pollutants) an ecosystem can handle without shifting into a qualitatively different state. It is the capacity of a system to both withstand shocks and surprises and to rebuild itself if damaged” (SRC, 2007).

Transition and transformation are often used interchangeably in relation to a radical change (Hölscher et al., 2018), although they have different origins and may mean different things. According to Oxford Dictionaries (n.d.), transition is “the process or a period of changing from one state or condition to another” and transformation is “a marked change in form, nature, or appearance”. Another definition of transition is “a non-linear shift from one dynamic equilibrium to another” (Loorbach et al., 2017, p. 600) And another definition of transformation is “fundamental shifts in human and environmental interactions and feedbacks” (Hölscher et al., 2018, p. 1). O’Brien and Sygna (2013) distinguish between four types of transformations: transformational adaptation, transformations to sustainability, transforming behaviours and social transformations. The third one, transformations to sustainability, according to O’Brien and Sygna, often refers to the development of pathways that aim to reduce carbon emissions and is
sometimes called transitions. At the same time, transformations can be seen as a pathway of transition (Geels and Schot, 2007).

In this thesis, the term transitions is mainly used since it is often used on a sub-system’s level, such as energy or mobility (Hölscher et al., 2018), or in this case urban personal mobility.
3 RESEARCH DESIGN

In this chapter, the overall research design, methodology and research approaches are presented.

3.1 Outline of the research design

The research design is based on the aim and RQs and is illustrated in Figure 2. Methods for each of the papers are outlined as well as the main relations between the papers and the RQs.

Figure 2. Relationship between the papers with outlined methods, types of research and research questions.
As seen, the papers differ in research focus, scope and methods used. Paper A has an exploratory character, focusing on identification of the prominent research themes and their development in the past decade, the main bodies of knowledge and their potential overlaps, as well as the ‘organisation of the field’. Paper B suggests a framework for analysis of complexity in co-production processes with regard to epistemic communities, language and culture, which is then tested in three geographical locations. Finally, Paper C analyses three futures approaches, namely backcasting, foresighting and SymbioCity and their potential application in two geographical locations. Learnings from these studies became the base of the thesis, its results and conclusions, and inspired the identification of some possible future studies.

3.2 Methodology

Methodology is a way of operationalising an investigation. It starts with a philosophical grounding, including ontological and epistemological beliefs. This study has been a combination of exploratory and case study research, which is why no particular interpretative frameworks or theories were adopted. Several typologies that are used to classify philosophical frameworks (e.g. Creswell and Poth, 2018; Kezar, 2001; Marsh and Stoker, 2002) were useful for growing an understanding of the stances of different scholars. Getting to know about different theories utilised by different researchers (see Paper A) was also useful, to see the broad spectrum of approaches available for the research questions at hand. In the future studies, the approach that will be chosen will guide what framework(s) will be used and what theories are relevant.

Both quantitative and qualitative methods are used in this thesis. Quantitative methods are used in Paper A, to help categorise the information. Qualitative methods are used in all three papers.

Creswell and Poth (2018) distinguish five approaches to qualitative research – narrative research, phenomenological research, grounded theory research, ethnographic research and case study research. Only phenomenological research seems to be inappropriate for the purpose of this thesis, since such an approach is aimed at understanding the essence of a lived phenomenon.

Furthermore, since the focus of the thesis is on mobility from a systems perspective, it addresses the needs of society at large and, perhaps, in future studies, of selected geographical locations. Therefore, also narrative research was excluded (as it deals with stories of individuals, groups or communities).
Ethnographic research would be helpful to understand the culture of mobility patterns; however, the focus of the thesis is more on future decision-support systems.

Grounded theory research is considered for future studies, as it improves understanding of the position and perspectives of diverse categories of practitioners and, based on their experience, to develop personal theoretical frameworks.

However, at this stage, to study existing literature and to observe several locations and practices utilised in those locations were considered most useful to better understand the field. The case study research approach utilised in the thesis is described in more detail below.

Another type of research that was not described by Creswell and Poth (2018) is exploratory research (Swedberg, 2018). It fulfils the other part of the aim of this thesis. Ethics of empirical studies and researcher bias, as well as validity of research, are also important aspects. All of this is also described below.

3.2.1 Exploratory research

Exploratory research is used when little is known about the subject or a lot is known and one wants to develop new ideas about the topic or new hypotheses (Reiter, 2017; Swedberg, 2018). It is a qualitative study, often with a combination of several methods used to gain knowledge in the field and to outline further questions to explore (Swedberg, 2018).

In this thesis, an exploratory study was undertaken in Paper A, where the fields of mobility, urban planning and transitions were analysed, as well as their overlaps and relations. It aided a better understanding of the fields and the formulation of some questions for future studies.

3.2.2 Case studies

Yin (2014) defines a case study as an empirical inquiry that analyses a phenomenon in a real-world context. A case study helps to promote an in-depth understanding of a certain phenomenon. Identification of several cases and their comparative analysis can help to generalise the knowledge gained for a specific category (Flyvbjerg, 2011).
A collective case study approach (Creswell and Poth, 2018) was selected to contribute to answers to the RQs. Two studies were performed (Papers B and C). One phenomenon analysed in several geographical locations was selected for each study to enable comparative analysis across different geographical sites and to create a base for generalisation of the concepts addressed.

In the first case study (Paper B), transdisciplinary co-production processes in public transport planning were observed and analysed in relation to epistemic communities, language and culture. This study is based on three workshops in Karlskrona, Sweden, Tricity (Gdynia, Gdansk, Sopot), Poland and Klaipeda, Lithuania.

The second case study (Paper C) focuses on some prominent planning approaches for sustainable mobility. The backcasting, foresighting and SymbioCity approaches, and their applicability in two contrasting geographical locations - Kisumu, Kenya and Gothenburg, Sweden, were analysed.

Information gathered for each of the cases was rather detailed. It allowed comparison between the geographical locations for each case. Thus, it was possible to verify whether theoretical knowledge is applicable to the specific context of mobility planning in different parts of the world. Context-based knowledge proved to be very important for planning processes. Moreover, comparative analysis of cases in each study enabled identification of context-specific knowledge and generalisation.

3.2.3 Validity

There are many approaches to validation in qualitative studies. Creswell and Poth (2018) recommend a set of strategies for validation, using lenses of a researcher, a participant and a reader or reviewer. The way these are used in this thesis is described below. It is important to mention that empirical results of this study are context- and time-dependent as they are related to the dynamic social systems.

Researcher’s lens

Triangulation of data sources and methods was used. More specifically, multiple methods to address the RQs and diverse perspectives in the literature were used. Throughout the thesis, studies were followed by reflections on personal biases and experiences (Creswell and Poth, 2018;
Denzin and Lincoln, 2005; May and Perry, 2017). Negative case analysis strategy was not used. Instead, evidence that does not fit the theme is addressed in the discussion.

**Participant’s lens**

At certain stages of the thesis work (mainly in Paper B), transdisciplinary co-production of knowledge between practitioners and researchers was used. The other aspects of a participant’s lens, prolonged fieldwork and a participants’ feedback, were not applied in the thesis.

**Reader’s or reviewer’s lens**

The descriptions of methods used in the appended papers are detailed, which allows for transferability. Moreover, these papers are subject to peer review (journals and a handbook). An external audits strategy was not used in this study.

### 3.3 Research approach

In this section, the research approach is described, including how the research is situated, how ethics of empirical studies relate to research bias, as well as reflexivity and co-production/co-creation approaches.

#### 3.3.1 Situating the research – transdisciplinary research

Here, a transdisciplinary approach means knowledge production that integrates inputs from both academic (different disciplines) and non-academic (values, knowledge and expertise) sources (Polk and Kain, 2015, p. 9). Moreover, in this thesis the process of transdisciplinary knowledge co-production happens in the context of practical application of the produced knowledge with the intention to provide ‘socially robust knowledge’ (Pohl et al., 2017, 2010). A transdisciplinary approach goes beyond a multidisciplinary approach (“where disciplines work side by side on a common theme”) and an interdisciplinary approach (“where a certain degree of integration occurs between disciplines and their problem formulations, and use of methods and/or theories”) (Polk and Kain, 2015, p. 9). In North America, an interdisciplinary approach is often defined as “crossing of academic disciplines” (Simon et al., 2018a, p. 2). Sometimes, the terms
transdisciplinary and interdisciplinary are used synonymously, reflecting a difference from the definition provided above.

This thesis represents a transdisciplinary study in two ways. First, the systematic literature review (Paper A) and a study of planning processes for transport in Kisumu, Kenya and Gothenburg, Sweden (Paper C), evaluate both academic and non-academic literatures. Second, the study of planning processes for public transport in the Southern Baltic region (Paper B), is done in a co-production manner between researchers and practitioners.

3.3.2 Ethics of empirical studies and research bias

In relation to the research topic and methods, the following ethical considerations were taken into account:

- Information about individual participants and actors of the case studies remained anonymous, unless information about them (e.g., their professional background) were important for understanding the context of the study.
- Interview recordings were accessible to the authors of the respective articles only. The audio files have been archived and stored on an external USB drive for further access on demand.
- The empirical materials were stored only in a way that can be used to extract quotations or information on demand.

Bias in this study is related to human nature. Performing interviews and doing field studies, one tends to agree with people who hold similar worldviews. Reflecting on that help to isolate the investigator from the case and assess the situation more objectively. Being situated in a case study context helped to get a better understanding of the real situation. However, there was a risk of being affected by the pre-existing assumptions of the expected results. Nevertheless, case studies allow for testing of such assumptions as they unfold in real-life practice (Flyvbjerg, 2011; George, 2019; Yin, 2014).

3.3.3 Reflexivity

Reflexivity is a process of reflecting on oneself as a researcher (Denzin and Lincoln, 2005). It does not only reflect on the choices one makes regarding research questions and collaborators, but also on who one is and the
identities that constitute the fluid self in the research environment. Reflexivity looks at evaluation of the foundations of interpretative frameworks themselves (May and Perry, 2017, pp. 4-5) and has three main imperatives:

- Self-awareness is necessary to understand one's own obligations and expectations;
- Our everyday practices require monitoring in the dynamic environment we live in;
- Deliberation and action are necessary as the guidelines for action might be conflicting.

Having a reflexive research process enables one to embrace the complexity of the dynamics within us and in the world around us. However, there are several risks related to such an approach: one can become non-relational and take complex forms in writing and self-representation.

Positionality (Agar, 1996) is one example of how reflexivity can be applied in the research. Being an outsider in the case study contexts of Kisumu, Kenya, Gothenburg, Sweden, Karlskrona, Sweden, Klaipeda, Lithuania and Tricity, Poland, had its advantages and disadvantages. On the one hand, being a ‘neutral’ investigator implied some power and opened doors. On the other hand, being female, not married and a young researcher, created constraints on being taken seriously. Additional preparation was required to overcome these challenges as well as thorough explanation of the intent with the inquiries to the participants.

3.3.4 Co-production and co-creation

Co-production has many definitions coming from different fields. Often, co-production and co-creation are used interchangeably. However, here co-creation is seen to include four stages: conceptualisation, design, production and analysis of the research, whereas co-production often happens only in the last two stages (Simon et al., 2018a).

Moreover, there are differences in definitions of co-production. In North America, co-production refers to interactive knowledge production and is seen through a boundary organisation that bridges politics and science (Pohl et al., 2010). In this thesis, however, co-production of knowledge is defined as a “collaboratively based process, where different actors and interest groups come together with researchers to share and create knowledge that can be used to address the sustainability challenges being faced today, and increase
the research capacity to contribute to societal problem-solving in the future” (Polk and Kain, 2015, p. 2). In the latter definition, co-production is situated in the local context and provides “socially robust knowledge” (Pohl et al., 2010).

The most common model for understanding the relationship between science and society is the linear model (Polk, 2015), where knowledge moves in one direction – from science to society. Moreover, sectoral distribution of work, responsibilities and funds is common today. Planning is not an exception. To address these challenges, a co-production approach could be useful to develop a more radical strategic approach in planning (Watson, 2014). It is important to differentiate collaborative and communicative planning from co-production:

- Co-production often works outside the established rules.
- Collaborative planning focuses primarily on creating different types of plans, while co-production concerns not only planning, but also implementation.
- In collaborative planning, it is assumed that destructive effects of power can be addressed through debate. In co-production, power and conflicts are acknowledged and further studies are required to fully understand how they can be considered in relation to a governmental institution.
- Engagement with a governmental institution in co-production processes gives tangible results and focuses more on action than on talk.
- Working internationally, scaling up of local initiatives becomes possible to the global level within the co-production approach.

In the thesis research, a co-production process was encountered in the INTERCONNECT project² (Paper B). The project provided a platform for co-production of methodology, empirical studies and inspired co-production inquiry between researchers and practitioners, which resulted in Paper B. The co-production process improved mutual trust, created a shared responsibility towards action (both within the project and in research) and gave a tangible result – workshops that were organised with the help of a developed methodology.

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² See: www.interconnect.one
4 SUMMARY OF APPENDED PAPERS

This chapter presents summaries of the appended papers as well as short statements of contribution of the present author.

4.1 Paper A

*Context adapted urban planning for rapid transitioning of personal mobility towards sustainability: a systematic literature review*

Submitted as


Summary

By means of a systematic literature review and bibliometric studies, several prominent research themes within and between the fields of mobility, urban planning and transition studies are identified and mapped in relation to the goal of urban planning for rapid transitioning to sustainable personal mobility. Also, the development of these themes in the past decade is described. The themes are: planning and policy for sustainable mobility and accessibility, backcasting and scenario planning, indicators in planning, modes of transport, decision-making, studies of global North and global South, as well as overarching themes of equity, equality and justice, roles of institutions, and co-production of knowledge. The article also discusses the use of the temporal dimension in the selected publications. Moreover, the main bodies of literature and the ‘organisation of the field’ are outlined.

Relation in thesis

This paper provides a basis for the thesis and future work. It combines academic and non-academic publications and identifies research gaps, partly dealt with in the other papers, and as guidance for possible future research directions.
Present author’s contribution

The study design was undertaken together with one of the other authors. Critical reflections on the results as well as editing of the paper were done collaboratively between all the authors. The present author performed the systematic literature review and additional quantitative and qualitative analyses, proposed in the original design for the study, performed interpretation and analysis of the results, and created a first draft of the paper.

4.2 Paper B

Lost in translation: a framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture

Submitted as:


Summary

Participatory approaches (e.g. backcasting and co-production of knowledge) are increasingly recommended in the planning literature for facilitating major changes. A complication for co-production is that many contemporary urban areas are multilingual and multicultural, which makes conditions for diverse participatory processes even more complex. Participatory approaches also face the challenge of epistemic communities (or schools of thought – “networks of knowledge experts” (Haas, 1992, p. 2)). Based on the differences among participants, knowledge integration is often difficult. Moreover, even within the same epistemic communities, challenges may occur depending on the local context. That is why thorough preparation for participatory approaches is required. This paper presents a preliminary conceptual framework for analysing complexity in multilingual, multicultural, multi-stakeholder, and co-production settings. Concepts of multilingualism, epistemic communities and culture are used for the framework development. It was tested in three workshops around mobility within and between the regions in the Southern Baltic region. The
framework was then critically assessed based on several aspects inherent in co-production: inclusiveness, cross-sectoral understanding and applicability to different contexts. In addition, the framework was evaluated in relation to the concept of time and compared to other studies. Finally, based on the framework application, several elements that are recommended to be taken into consideration for effective co-production are outlined. These elements are linguistic equality among participants, disciplinary integrity, a working culture of mutual respect and simultaneous mitigation and informed facilitation. Moreover, the study brings a question of the value of time, which is important on the verge of big changes that need to happen.

Relation in thesis

The suggested framework is used to analyse groups of participants from different perspectives of epistemic communities, culture and language and to prepare process leaders (or facilitators) for effective events in the ongoing work and provides a foundation for the continued participatory action research or transdisciplinary co-production research planned for the future.

Present author’s contribution

The present author had an initial idea for the study. This was then reflected upon and developed together with several other authors. The process of framework development was done in a co-production manner between academics and a practitioner. The authors performed a literature review, conceptualization of the framework and writing of the first draft. The present author performed the empirical studies.

4.3 Paper C

_Sustainable Transport Futures: Analysis of the Selected Methodologies Supporting the Planning Process Towards Achieving Goal 11 Sustainable Cities and Communities_

Published as

Nikulina, V., Baumann, H., Simon, D., Sprei, F., 2018. Sustainable Transport Futures: Analysis of the Selected Methodologies Supporting the Planning...
Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.


**Summary**

This paper analyses the usefulness of three futures methodologies (backcasting, foresighting and the SymbioCity approach), in relation to the planning processes of the bus park and railway station in Kisumu, Kenya, as well as Centralen in Gothenburg, Sweden. Advantages and challenges of each methodology are described. Moreover, the study examines the application of futures methodologies in multisectoral urban transitions apart from transport and draws conclusion on what can be learned from it. Based on interviews, feasibility studies and field studies, it was concluded that backcasting is the most suitable of the three methodologies in both locations despite their sharply contrasting contexts. The main reasons are its applicability both on large and small scales, the possibility to develop creative solutions, and the possibility of a high level of integration of stakeholders. Moreover, the study shows that application of futures methodologies can be beneficial in tackling complex challenges and addressing several goals and targets at the same time, such as the SDGs. The study also brings another time perspective – the time perception by the participants of the planning process: “in Kenya tomorrow is already [the] future” (Eising, 2015).

**Relation in thesis**

This paper contributes to the methodological discussion on mobility planning approaches, specifically those looking far into the future, namely backcasting, foresighting and SymbioCity approaches, and thus provides a foundation for future studies.

**Present author’s contribution**

The study design and critical thinking for this paper were carried out collaboratively by all authors. Regular group meetings were complemented by small meetings between the first and one of the other authors, depending on the stage of the paper development. The present author conducted the literature review, analysis of methodologies, field studies and interviews both in Kenya and Sweden, as well as a survey in Kisumu, and produced the first draft of the paper and led the writing process.
5 MAIN FINDINGS AND DISCUSSION

This chapter interprets the main research findings of the appended papers and integrates them into synthesized results. Because of the exploratory character of the thesis, discussions of the results and validity considerations are also integrated in this chapter.

5.1 Prominent research themes in personal mobility planning

The identified prominent research themes in relation to urban planning for rapid transitioning to sustainable personal mobility can be illustrated as a jigsaw puzzle (Figure 3), where each piece represents a theme and colours represent field of studies or categories of themes.

![Figure 3. Research themes for transitions towards sustainable personal mobility. Five categories – planning (blue), process monitoring and evaluation (yellow), policy development and governance (orange), sustainability (green) and transitions (purple).](image-url)
Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.

Five categories of themes are identified: planning (blue in Figure 3), process monitoring and evaluation (yellow), policy development and governance (orange), transitions (purple) and sustainability (green). Each of these categories is briefly described in the subsections below.

One can see in Figure 3 that sustainability (green) informs (illustrated by the arrows) the other four fields. The connections between the pieces of the jigsaw puzzle represent interconnectedness of the categories and themes (they do not represent causality, though). Jigsaw puzzle in this case is used as a metaphor. Moreover, the systematic literature review (Paper A) showed that transition studies seems to stand alone whereas the others are interrelated. A similar observation was made by Wolfram (2018), who suggests that transition management stands beside urban planning due to differences in approaches.

Urgency of change does not appear as any of the main themes in this figure. However, this became more apparent and explicit with the recent IPCC Special Report (2018).

5.1.1 Planning

The systematic literature review (Paper A) revealed that the planning towards sustainable mobility category is much larger than the other categories in terms of number of publications. In that literature, six themes were discussed: planning process, approaches to planning, modes of transport, system parameters, place and values.

The planning process literature (e.g. da Silva et al., 2008; Danoh et al., 2010; Emberger et al., 2008; Zhao, 2010) is focused on decision-making, its challenges and opportunities as well as different methods supporting it. Moreover, the discrepancy between plans and their implementation is widely discussed.

In this thesis, four different approaches to planning for sustainable mobility are in focus – the backcasting, transdisciplinary co-production of knowledge, foresighting and SymbioCity approaches. Backcasting (e.g. Borén et al., 2017; Robèrt et al., 2017; Te Brömmelstroet and Bertolini, 2010) is briefly discussed in Papers A and C, while transdisciplinary co-production of knowledge (e.g. Elmqvist et al., 2018; Simon, 2016; Simon et al., 2018b; Song, 2016) is discussed briefly in Papers A and B. These two approaches are identified as trends in planning in the past decade. The other two approaches, foresighting and SymbioCity, are analysed in Paper C. They were not identified in the
systematic search in Paper A, but they have played a significant role in planning in different places. Moreover, backcasting is often used as part of the SymbioCity approach. More details on approaches in mobility planning are provided in section 5.2.

The literature focusing on modes of transport (e.g. Geels, 2012; Hull, 2005; Newman and Kenworthy, 2015) is to a large extent related to the negative impacts of private cars on the environment. A parallel discourse in the literature related to the modes of transport focused on integrated multimodal systems. Other modes of transport, such as water, rail and air are often excluded from the urban mobility discourse. This might be due to the complexity of actor groups and regulations related to these means of transport.

Different elements of the mobility system are discussed in the literature related to system parameters (e.g. Banister, 2011; Bertolini et al., 2008; Cervero, 2002; Hickman, 2013). Examples of these parameters are land use, density, diversity, energy sources among others.

Place or local context are mentioned in the literature as important for planning (e.g. Elmqvist et al., 2018; Han, 2010; Imran, 2010). Complexity, actors, challenges, opportunities and people who travel are of particular interest according to the reviewed publications. A particular aspect of complexity in relation to epistemic communities, language and culture in co-production settings is addressed in Paper B. Moreover, empirical studies show the complexity of organisation of bus and railway stations in Kisumu and Centralen in Gothenburg (Paper C).

Finally, overarching values of equality, equity, justice and low carbon are the themes that the literature shows to be important to account for in the planning processes (e.g. Bakker et al., 2017; Parnell, 2016; Simon, 2016). These values relate to sustainability; however, they sometimes also appear individually in the literature and not in relation to sustainability.

5.1.2 Process monitoring and evaluation

The literature in the process monitoring and evaluation category focuses mainly on different types of indicators based on their purpose. Some indicators are used within diverse methodologies to assess sustainability in urban transport (e.g. De Gruyter et al., 2017; Jain and Tiwari, 2017; Youssef and Mohmoud, 2011). Another set of indicators is used for comparative studies in urban mobility planning (e.g. Haghshenas and Vaziri, 2012), and
strategy development (e.g. Shiau and Liu, 2013). Finally, three generations of indicators are identified for monitoring and evaluation of urban development (Elmqvist et al., 2018; Gómez-Álvarez et al., 2018).

5.1.3 Policy development and governance

Another category identified in this thesis is related to policy development and governance (e.g. Bertolini et al., 2005; Buehler and Pucher, 2011; Hull, 2008). In the literature in this category, different context-specific policies are discussed and their potential usefulness in other places. Another focus of these studies is on policy integration at different levels (e.g. Curtis and Low, 2012; Hull, 2010b, 2008). Finally, the role of governance in the planning is underlined in the literature (Haarstad, 2016; Hull, 2008).

5.1.4 Transitions

In the revised publications related to the thesis, this category comprises of a small number of papers. The transitions literature on mobility mostly studies historical cases (e.g. Gössling, 2013; Hickman et al., 2011) and identified pathways for the future (e.g. Cohen et al., 2016; Figueroa et al., 2013; Ny et al., 2017).

Accelerating transitions became an interesting question for scholars in the past several years. A number of studies have been done in the energy sector (e.g. Bento and Wilson, 2016; Kern and Rogge, 2016; Sovacool, 2016; Sovacool and Geels, 2016). In this literature, transport systems are used as an example of energy application, in terms of different fuels for vehicles. In this thesis, the main focus is on mobility, where energy becomes a secondary concern, related to the sources of power for vehicles. Studies in the energy sector can be seen as complementing the findings in this thesis as they go into detail in the discussion around fuel-powered vehicles, their emissions and how do they contribute to a larger energy system.

5.1.5 Sustainability

It was found in the literature review (Paper A) that sustainability can be understood differently by different actors. It can be seen as a policy end-
point (e.g. Goldman and Gorham, 2006), as a vision (e.g. Kenworthy, 2006), as a pathway (e.g. WBCSD, 2004), and as a lens to look through at the social reality (e.g. Carr et al., 2015). This shows the ambiguity of the term in current research and practice.

5.2 Organisation of personal mobility planning in society

In the past decade, the term ‘mobility planning’ seems to have replaced ‘transport planning’ by complementing it with additional issues for consideration. For Banister’s research group (see Paper A, Section 3.5.3), the change in terminology happened with the publication of “the sustainable mobility paradigm” article (Banister, 2008), which underlines the importance of combining transport and land-use in planning. It also raises other aspects important for planning, such as technological advancement, regulation of prices, land-use development and behavioural change through the means of information. These aspects show that actors other than transport planners need to be involved in the process, which makes the concept of mobility more complex than transport. Further developments in sustainable mobility definitions show that there has been a shift in approaches too: from people being moved by means of transport to movement of people (where people become the central focus). This creates the question of organisation of mobility planning: is it still the same organisational structure and the same authority (for transport planning) that should be responsible for mobility planning? And how is this reflected in the organisation of mobility planning research? At this stage, it is difficult to answer these questions.

The European Commission (EC) plays an important role in urban mobility planning in Europe. In September 2009, they adopted guidelines for an action plan on urban mobility, which later became widely known as the Sustainable Urban Mobility Plan (SUMP). These guidelines were meant to be of support for local, regional and national authorities that are working towards achievement of their sustainable urban mobility goals. The main feature of this approach is that it focuses on planning for people. One of the critiques of the approach is that it is not clear how challenges of climate change and societal issues are accounted for in the SUMP (Arsenio et al., 2016). Other researchers suggest to use SUMP as a process guideline and to complement it with a multilevel transport system model (Okraszewska et al., 2018). It is possible to conclude, however, that SUMP can be used as an initial guideline for mobility planning.
The urgency of change on a global scale, as well as SUMP on a European scale, triggered development and adoption of new approaches to mobility planning to address complexities. These include the backcasting, SymbioCity and transdisciplinary co-production of knowledge approaches (see Papers A, B and C), among others. The foresighting approach, on the other hand, became less accepted among planners as it often leads to lock-ins to current technological development (see Paper C).

Several forms of backcasting (Dreborg, 1996) can be identified – participatory backcasting (Carlsson-Kanyama et al., 2008; Robinson et al., 2011; Soria-Lara and Banister, 2017), backcasting from principles (e.g. Broman and Robèrt, 2017; Holmberg and Robèrt, 2000; Missimer et al., 2017a, 2017b), backcasting as a tool for strategic planning (e.g. Holmberg and Robèrt, 2000; Phdungsilp, 2011), as a tool for scenario building (e.g. Soria-Lara and Banister, 2018), and as a tool for policy analysis (e.g. Robinson, 1982). They are used for different purposes by different scholars.

The SymbioCity approach (Ranhagen and Groth, 2012) facilitates studies of scenarios of possible futures and estimates of how the future might look, based on current trends and historical data. Backcasting is often used as part of the SymbioCity approach.

Finally, transdisciplinary co-production of knowledge (Polk, 2015) focuses on involvement of actors from academia and practice and deals with complex societal challenges.

Sustainability challenges add another layer of complexity to the process of participatory approaches. Backcasting from non-overlapping sustainability principles (Broman and Robèrt, 2017; Holmberg and Robèrt, 2000; Missimer et al., 2017a, 2017b) suggests a holistic view of the sustainability challenge and facilitates participation of diverse actors. At Mistra Urban Futures, for example, three pillars of sustainability are emphasized – economic, socio-cultural, and ecological, and an additional one is suggested – political (MUF, 2015). Despite the attempts to have democratic participatory processes where all the opinions are accounted for (e.g. Borén et al., 2017; Hickman et al., 2012, 2011; Robèrt et al., 2017; Soria-Lara and Banister, 2018), the question of whose voices get to be heard in practice in such processes remains under-researched. Moreover, the challenges of understanding within and between epistemic communities remain present (see Paper B and Haas, 1992; Simon et al., 2003, 2018b). Finally, it is not clear how some of these approaches address the urgency of change, created by, for example, climate change (Horowitz, 2016).
5.3 Sustainability in personal mobility planning

Various approaches have been suggested for the study of different sustainability aspects in mobility planning. On the one hand, social sustainability is addressed through studies around accessibility, health impacts, equity, justice and meeting the needs of people (e.g. Curtis, 2008; Ferreira et al., 2012; Gössling, 2016; Parnell, 2016; Simon, 2016; Waters, 2016; Woodcock et al., 2013). On the other hand, in relation to environmental sustainability, publications are often devoted to various methods of pollution reduction (e.g. Chiu, 2008; Friedlingstein et al., 2014; Vagnoni and Moradi, 2018), prevention and minimisation of resource depletion (e.g. Stoett, 1994; Thomas, 2009; Wackernagel et al., 2006), but not so much is said about biodiversity preservation (e.g. Urban, 2015). And even fewer approaches have a comprehensive view, where both the environmental and social dimensions of sustainability are covered and integrated into a methodology for participatory strategic planning and action along economically viable pathways for change, such as in the FSSD (Broman and Robèrt, 2017). Using such a framework together with, for example, the concept of planetary boundaries (Rockström et al., 2009), is a way of handling prioritization of actions based on the urgency of change (Robèrt et al., 2013).

The complexity of the sustainability challenge and the urgency related to, for example, climate change call for comprehensive approaches. On the one hand, carbon emissions need to be reduced fast enough to prevent further ‘natural’ disasters. On the other hand, other aspects of sustainability, such as loss of bio-productive land and biodiversity, as well as aspects of social sustainability, need to be addressed simultaneously. The question of trade-offs becomes very important (Scherer et al., 2018) and some scholars suggest that possible actions should be assessed as regards their potential to be strategic stepping-stones in change pathways towards the full scope of sustainability (Broman and Robèrt, 2017).

A publication by Camagni and colleagues (2002) suggests how one could measure social and environmental impacts in urban development in relation to mobility. However, elements of both social and environmental sustainability outlined in the article are non-comprehensive.
5.4 Temporal dimension in personal mobility planning

In the literature review and empirical studies (see Papers A, B and C), it became clear that there are different ways of thinking about and discussing the temporal dimension in personal mobility planning: urgency of change, short- and long-term thinking, ‘economic’ versus ‘social’ time, travel time and illustration of time in different languages. This finding is potentially of significant importance, as it relates closely to the ability of people from different disciplines and cultures to work together in co-production settings. The different perspectives are elaborated below.

5.4.1 Urgency of change

Urgency for change was found to be the most spoken of, both in the literature and in the empirical studies. The Brundtland Report (UN World Commission on Environment and Development, 1987) could be seen as one of the main publications suggesting a new way of thinking and approaching planning. Scholars from different epistemic communities seem to agree that change needs to happen (Banister, 2011, 2008; Hickman and Banister, 2007; Köhler, 2006; Markard et al., 2012; Woodcock et al., 2009).

In the empirical studies, the urgency of change was also observed. For example, in the survey in Kisumu, Kenya (presented in Paper C), one of the participants wrote: “Please act immediately”. As for the workshops, described in Paper B, lively discussions around challenges faced as well as an extended list of burning issues in each location (Borén and Ny, 2018) can be interpreted as a sign of the need for urgent change.

Despite the agreement upon urgency of change, there is little said in the peer reviewed literature studied about how positive change can be accelerated. Two studies that focus on accelerating transitions in mobility are reported by Ny et al. (2017) and Geels (2018). Ny et al. (2017) performed a backcasting from principles study and developed a roadmap for the south east of Sweden, as well as discussing implications for society and developing support for municipalities. The research was guided by the FSSD (Broman and Robert, 2017). This thesis contributes to this work by, for example, looking at the temporal dimension in the existing literatures and positioning the research in relation to other fields. Geels (2018) provides a historical analysis of passenger mobility in Great Britain, looking at the socio-technical system, based on the multi-level perspective (Geels, 2005). He describes how gradual reconfiguration of the system happened, and how the process was
accelerated between 2007 and 2013 due to the financial-economic crisis, car engine innovations, a modal shift away from private cars, and biofuels.

Finally, Roberts et al. (2018) propose a new research agenda related to acceleration of transitions, focusing on politics. Three main directions are identified as necessary to research on to support deliberate acceleration: the role of coalitions in the process, feedbacks in policy making that enforce change through actors' preferences, and the role of broader contexts (institutions, culture, technical systems and political economies). The role of local context was underlined in all three of appended papers (A, B and C). Policy-making was identified as one of the prominent research themes in Paper A. Political coalitions is a theme that did not appear in the findings of this thesis. However, it was mentioned in the Mistra Urban Futures' approach to sustainability (see section 2.2) and could be relevant to consider in the future studies.

5.4.2 Perception of time

Perception of time can be described through the lens of short- versus long-term thinking. In the literature this issue is widely discussed within backcasting and other related discourses.

There is a trend among many planning scholars to use backcasting instead of forecasting or to use the two approaches in combination. Backcasting starts with envisioning the future as a platform for development of pathways for getting there, in contrast to the forecasting, which extrapolates trends into the future. Moreover, backcasting can be seen as a 'debate and decide' process, while forecasting could be seen as 'predict and provide' process (Kenworthy, 2006). More detailed advantages and disadvantages of both approaches are described in Paper C.

The backcasting approach reflects on both short- and long-term work. Starting with an envisioning process, where long-term thinking is used, the process goes on to look back to the present and assess the current state in relation to the vision. Then possible steps that could be taken to reach the vision are generated (addressing both short- and long-term options with a space for flexibility based on the unknown). This is then followed by the final

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3 “Debate and decide” is an approach, “where computer models are used to help envision a more ecological, sustainable future for the city” (Kenworthy, 2006, p. 82).
4 “Predict and provide” is an approach, “where the objective is to build enough new infrastructure to meet future increases in demand” (Köhler, 2006, p. 296).
step of prioritizing actions into a strategy (Holmberg and Robert, 2000). As pointed out before, it is important to repeat this process and recreate the strategy as the development takes place, especially in a complex context as sustainability (Broman and Robèrt, 2017).

A related way of looking at a long-term approach is through the identification of goals. Such goals could be at any level – international, national, regional or local. The reviewed literature, however, argues that there is a lack of methods that could aid integration of diverse goals and translate them into a local context (Elmqvist et al., 2018; Hrelja, 2011). Moreover, the human factor in adaptation of planning processes to technology and policy innovations is analysed in the literature to a minor extent in terms of responsibilities, decision-making and bureaucratic processes (Banister, 2012; Hodson et al., 2017; Hull, 2010b; Thynell et al., 2010; Wangel et al., 2013).

To illustrate the issue of perception of time in practice, the following quote from one of the interviews in Kenya (Paper C) can be used: “in Kenya tomorrow is already [the] future” (Eising, 2015).

5.4.3 ‘Economic’ versus ‘social’ time

Time can be analysed through a lens of value. Time could have ‘economic’ value. It is perhaps best described using the metaphor *time is money* and “we often calculate the value of work in man-hours” (Mikkelsen, 2005, p. 329). On the other hand, time could have ‘social’ value – how do you spend time with other people in society.

An example of value of time is described in Paper B in relation to interpretations of the workshops. On the one hand, interpretation takes time, which means it costs money for the organisers to have it (Mikkelsen, 2005). Moreover, in the case of consecutive interpretation\(^5\), it doubles the time of the event for participants. On the other hand, time given for discussions in participatory approaches is crucial, especially if the topic is sensitive or might lead to a conflict. This creates a dilemma: either the event should be twice as long, or information delivered half as long. In the case of participatory approaches, such as co-production, it creates a challenge of communication and, thus, represents a challenge of the value of time. As

\(^5\) Consecutive interpretation happens when a speaker gives time to an interpreter to repeat what has been said in another language before continuing.
observed in the workshops, each type of interpretation has its advantages and disadvantages and a process leader needs to account for it.

5.4.4 Travel time

Several studies in the reviewed literature focus on travel time or time budgets\(^6\) (Black and Schreffler, 2010; Black, 2009; Buchari, 2009; Kane, 2010). In the past, it was desired to go as fast as possible as far as possible, in other words, to have fast and efficient transport. The sustainable mobility paradigm (Banister, 2008), suggests that planning for mobility should be evaluated based on the sustainability perspective. It changes the desired mobility to safe and slow (Banister, 2011). In a broader perspective, it changes the discourse towards contrasting slow and fast lifestyles (Höjer et al., 2011).

Viewing time in regard to travel time can be seen as contributing to a discussion of technological fixes versus socio-technological transformation (transition). A technological fix could help us to have cleaner, faster and more efficient transport; however, it might not make our mobility safer or accessible to everyone. That is why transition on a socio-technical level is necessary.

Practice shows that the best solutions for safe and slow mobility would be context-dependent, based on the terrain, available resources and infrastructure and strategic investments and commitments of the local government.

5.4.5 Time in relation to languages

Finally, language is an important instrument of communication in participatory approaches, such as co-production of knowledge. The main challenge here, is that in some languages, time could be verbalised in different tenses. For example, in Indo-European languages, there are past, present and future tenses. At the same time, tenseless languages (those languages that do not have a grammatical category of tense) describe time in another way, for example, using verbs, moods and other words (Bittner, 2005). Examples of such languages are Chinese and Malay (including Indonesian). Unawareness of this issue may lead to challenges in communication in multilingual co-production environments.

\(^6\) Time budget refers to the amount of time that can be spent on traveling on average (van Wee and Handy, 2016).
In this thesis the challenge of time verbalisation was not faced due to the language constructions used by participants of the studies. However, it might be the case in future studies if, for example, collaboration with China would be established.

5.5 Validity considerations

The systematic literature review (Paper A), has limitations in terms of language (only publications in English, Russian, Ukrainian and Czech were considered), time frame (2008 – April 2018), selected keywords, and selected databases (Scopus and Web of Science). The prominent research themes were identified within these limitations. If any of these parameters had changed, the results might have been different.

Moreover, the empirical studies of this thesis were conducted in Karlskrona and Gothenburg, Sweden, Tricity, Poland, Klaipeda, Lithuania and Kisumu, Kenya. This represents a limited set of contexts and does not allow for far-reaching and firm conclusions. Also, if the study sites had been different, the results could have been different too, as planning processes and practices are highly context-dependent.

The Paris Agreement and the SDGs, for example, have created international pressure to change in development patterns of urban mobility worldwide. This is why diverse approaches and tools are rapidly developing. Because of this rapidly changing landscape of approaches and tools, if someone were to repeat the studies of this thesis, the results might turn out differently.

Also, personal biases of the present author, based on previous knowledge and experience, might have influenced the results. Multiple methods to address the research questions and the use of reflexivity to support interpretation and analysis of the findings were used. However, there might still be something missed or misinterpreted.

Considerations of the temporal dimension within the systematic literature review (Paper A) were mainly analysed within the SLR database for qualitative analysis (see Paper A, Figure 1), which consists of 154 publications. If also SLR database for quantitative analysis were included in the study, the results might have been different.
6 CONCLUSIONS AND FUTURE STUDIES

6.1 Concluding remarks

The thesis provides a map of some prominent research themes and discusses their relevance to the field of urban planning for rapid transitioning to sustainable personal mobility. The analysis of the identified themes and their development over the past ten years shows that there has been a shift in mobility planning from 'predict and provide' towards participatory visionary approaches. This, in turn, has led to new challenges, related, for example, to epistemic communities, language and culture. Furthermore, it is seen that sustainability considerations have become increasingly pronounced in the urban mobility planning literature. However, different dimensions of sustainability are often considered individually (e.g. the ecological and social dimensions) and coordinated approaches to sustainable mobility planning are virtually lacking.

At the methodological level, the thesis provides a preliminary conceptual framework for analysing complexity in co-production processes with regard to epistemic communities, language and culture, as well as a discussion of the usefulness of four specific planning approaches for the desired planning support, namely the backcasting, transdisciplinary co-production of knowledge, foresighting and SymbioCity approaches.

The overall conclusion is that there is a need for research that would show how mobility actors can contribute to resolve pressing issues related to climate change fast enough without compromising other aspects of sustainability, including how temporary trade-offs can be addressed in a strategic way.

6.2 Future studies

Based on the literature overview and empirical studies reported on in the thesis, as well as the urgency of change underlined by, for example, climate change, some areas for future studies are suggested below.

Literature studies as well as international agreements express the urgency of change in personal mobility practices. Transition studies often provide pathways towards a sustainable future, which describe certain steps that need to be taken to achieve sustainability (e.g. Cohen et al., 2016; Figueroa et al., 2013; Ny et al., 2017). However, not many studies show how the process of change can be accelerated (Geels, 2018; Roberts et al., 2018) and what
factors in particular that would lead to an adequate rate of change. Therefore, it would be interesting to analyse what measures could be taken in, for example, carbon emissions reduction to affect the rate of change towards sustainable personal mobility. Moreover, potential actions in emission reductions might create trade-offs with other aspects of sustainability, which would need to be mitigated or addressed.

Policy-making is already obvious as a critical factor for shifting urban mobility towards sustainability. However, it is related to several challenges. On the one hand, policies (or their combinations) have context-specific effects, which is defined by local conditions and, thus, need to be revised from place to place. On the other hand, policies related to mobility planning are not isolated and need to be integrated together with the other policies at different levels (e.g. Hull, 2008; Köhler, 2006; Soria-Lara and Banister, 2017). This creates a need for integrated policies, to support change to meet, for example, the 1.5°C target (IPCC, 2018). Therefore, it would be interesting to look more into methodological support for the creation of integrated policies.

Aspects of human behaviour are also critical. People play a key role in mobility patterns. These patterns differ between countries and regions based on the geographical location, available infrastructure and local culture, among other factors. Studies show that even within the same geographical area there might be differences in mobility patterns (Klinger et al., 2013). Climate urgency, for example, suggests that we need to change our mobility habits. However, there is no agreed approach amongst scholars on how to facilitate such a change and what authorities can do to support it. Thus, it would be interesting to investigate how authorities can assist a change towards sustainable mobility habits.

All of the above would be interesting to seek answers to in a comparative manner to better understand how different approaches to mobility planning can be used in diverse contexts, how the concepts are understood among practitioners in different places and how we can make a deliberate rapid transition happen in reality.
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Varvara Nikulina
Need for speed:
towards urban planning for rapid transitioning to sustainable personal mobility.


48


Varvara Nikulina

Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.


Varvara Nikulina

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Context adapted urban planning for rapid transitioning of personal mobility towards sustainability: a systematic literature review
Paper A is submitted as:

Context adapted urban planning for rapid transitioning of personal mobility towards sustainability: a systematic literature review

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Abstract

Sustainability related challenges in mobility planning have been recognised at the international level and the urgency for change has been widely discussed among scholars. However, there seems to be no general agreement on the best ways of pursuing such change. To seek answers to the question of how to pursue change, this study analysed the development of the broad research fields of mobility, urban planning and transitions, and the overlap of these bodies of literature. Both academic and non-academic literatures were covered. By means of a systematic literature review, as well as bibliometric studies, several prominent research themes that address change from planning and transition perspectives were identified. Moreover, these themes describe different viewpoints and challenges in mobility planning. These include planning and policy for sustainable mobility and accessibility, backcasting and scenario planning, indicators in planning, modes of transport, decision-making, studies of global North and global South, as well as overarching themes of equity, equality and justice, roles of institutions, and co-production of knowledge. Strategies for staying up to date with these fields were also identified. In the literature covered, the temporal dimension in mobility planning was described in four different ways, but little was found about how accelerated transitions towards sustainable mobility can be achieved. Further knowledge gaps were identified in relation to behavioural change, policy development, institutionalisation of planning capacity and social sustainability in mobility planning. This created an outline for possible future studies.

Keywords: systematic literature review; personal mobility; sustainability; planning; rapid transition; urban
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1 Introduction

For many cities, the ‘peak car’ period has passed [1–3]. Newman and Kenworthy [2] have suggested that we are entering a new age of more sustainable mobility that could be called ‘a new golden age of rail’. This could be true, but it can be debated to what degree it will be rail or new integrated multimodal solutions that could overtake the private car. What is important is that changes are taking place anyhow and decisions we make today will pave the way for future development. In addition, the Sustainable Development Goals (SDGs7) and the New Urban Agenda8 largely affect decisions and plans for future development. Many stakeholders are trying to incorporate them into existing goals and targets but they are often failing to do so since they are being tied to everyday tasks of individual organisations [5]. It therefore seems clear that incremental steps in planning are not enough and that a more radical approach is necessary.

Other issues, such as questions of social sustainability are gaining wider attention in the planning discourse. Equity, equality and justice are proven to be important in transitioning towards sustainable mobility [6–11]. The same applies to different categories of passengers and the adaptation of the planning process in relation to societal changes, particularly demographic transition (first mortality, then fertility is declining, leaving an increase in the ageing population), migration and ‘floating population’ (those who live in rural areas, but work in urban areas) [11–13]. Often, these challenges are seen and addressed one by one, leading to sometimes controversial outcomes and new problems. For example, prioritisation of the motorised transport over non-motorised is unfair for the poorest of the poor [7,8]. Therefore, it is necessary to understand better what issues are important to account for as well as what approaches are being used in planning to be able to identify one or more approaches to address the issues.

Finally, climate change, the IPCC reports9, the Paris Agreement10 and other international agreements create additional time pressure to make a change towards sustainability as soon as possible. The recent IPCC Special Report [14] specifically acknowledges transport as a challenge and urges for a fast radical

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7 Sustainable Development Goals are the goals adopted by all United Nations Member states in 2015, they represent a call for urgent action in a global partnership, see: https://sustainabledevelopment.un.org/sdgs
8 The New Urban Agenda serves as a vision for a sustainable future and connects to the SDG11 [4], see: http://habitat3.org/the-new-urban-agenda/
9 The most recent is the Special Report of IPCC, October 2018 [14] arguing for immediate action.
10 The most important is Paris Agreement in 2015 [15] that brings together all nations to address climate change.
change overall. However, there seems to be a lack of understanding regarding the extent to which planning studies and transition studies address the need for rapid changes, as well as to what extent transition studies are integrated with planning studies. This is important to investigate further as a combination of the two would likely be necessary to make sufficiently rapid and extensive changes happen.

### 1.1 Research goal and research questions

Based on the general overview described above, the study aims to provide a systematic inquiry into the relevant publications, analyse to what extent studies of urban planning, mobility and transition studies overlap in the cited literature, what main themes have been discussed to date and what the ‘organisation of the field’ is.

The main research question for this systematic literature review (SLR) is: “What is the state of the art for context-adapted urban planning for rapid transitioning of personal mobility towards sustainability?”. This question is split up into four sub-questions as follows:

- **RQ1**: What are some prominent research themes within context-adapted urban planning for rapid transitioning of personal mobility towards sustainability?
- **RQ2**: How did the identified themes evolve during the past 10 years?
- **RQ3**: What are the main related bodies of literature and to what extent do they overlap?
- **RQ4**: What is the ‘organisation of the field’?

To answer these questions, we used systematic literature review methodology, qualitative analysis as well as a number of bibliometric methods to assist in systematising the data. The combination of research methods allowed us to classify and analyse the literature, using both algorithm-based approaches and our own understanding of the subjects.

Below we first describe some key concepts and say more about the methods and tools used in this study. Later, we interpret and analyse the results of the SLR. Finally, we discuss past, present and likely future research.
1.2 Key concepts

Here mobility is defined as “the ability of an individual [...] to move about” [16] freely and easily. It contrasts the definition of transport – moving people (or goods) by different means of transport [17]. This definition of mobility opens up for a possibility to consider other ways of moving people around than by means of different modes of transport. ‘Freely’ in this context means that people have the freedom to move about, whereas ‘easily’ refers to accessibility to people, places, spaces, work and other necessary services and facilities. In this way mobility is closely related to accessibility [8,18].

In this paper, urban planning defined as “an important tool for city leaders to achieve sustainable development. It helps to formulate medium- and long-term objectives that reconcile a collective vision with the rational organization of the resources to achieve it” [19]. Urban planning traditionally involves several tasks, such as land use distribution, built environment design, infrastructure development and communications. In some places transport planning is part of urban planning, while in others transport or mobility planning have their own authorities and respective plans.

Context adapted planning implies the importance of local context considerations in the planning processes.

We did not define the terms transition and transformation in this paper, because there is no agreement on definitions among scholars and we wanted to be open to any interpretation.

There are also many definitions of sustainability and many stakeholders understand it differently, which creates a challenge of the direction in planning [20]. Using the idea of a systems approach in planning [21], sustainability was suggested by some to be a policy end-point (or sustainability as a vision [22,23]), instead of sustainability as a pathway, where an outcome is not defined and the state would become progressively “more sustainable” [21]. Another way to understand the term is as a lens to look through at the social reality [24]. Sustainable mobility is intentionally not defined in this paper because the purpose was to explore the literature related to the research questions and not to impose or identify publications that use specific definitions of sustainable mobility and then analyse them.
2 Methods

Guidelines for systematic literature review suggest to use a time restriction to scope the study [25] (p. 48). The main focus of this study was on the publications of the past decade (2008-2018) but the literature analysed starts from 1993, when the oldest book included in this SLR was published. The year 2008 was selected due to Banister’s publication “The Sustainable Mobility Paradigm” [26] that became a reference point for many future studies around sustainable mobility, suggesting that conventional planning should be reconsidered based on the sustainability perspective.

2.1 Systematic literature review

A systematic literature review was performed, mainly based on the combination of recommendations of two studies. The first of these studies, Pickering and Byrne [27], helped to identify the process (15 steps of SLR, p. 539), whereas the second study, Petticrew and Roberts [25], provided general guidelines on when to perform SLR, what types of studies to include, how to assess them and how to address possible biases. The general flow of the SLR is illustrated in Figure 1 (below).

Performing an SLR gives a comprehensive approach to assessing relevant literature using a defined methodology, identifying the criteria for selection of the published work, assessing relevance of the scholarly publications to the research questions, structuring the data extraction and analysing the results.

To address the Research Questions outlined above, several strategies for data acquisition and clean-up have been used. They consist of keywords identification, databases identification and keywords search, and expert advice on suitable literature.

To systematise and interpret the data, both quantitative and qualitative methods have been utilised. The selected quantitative methods (some of them are bibliometric methods: citation, co-citation, co-authorship and network analyses) are described in section 2.2. and research tools in section 2.3. From the obtained data, prominent research themes have been identified and described, followed by analysis of different bodies of literature and ‘organisation of the field’ that suits the research aim. Moreover, to better understand the fields and bodies of literature, we quantitatively analysed the geographies of case studies, as well as theoretical and conceptual frameworks utilised in the publications of the SLR.
Figure 1. Process flow of the systematic literature review (white boxes on the right relate to the white box with the SLR database for qualitative analysis while purple refer to the SLR database for quantitative analysis; bibliometric research tools are written with italics).

The systematic literature review has a transdisciplinary character – meaning that both academic and non-academic literatures are included – and incorporates publications’ findings from mobility, urban planning and transition studies.
2.1.1 Data acquisition and clean-up

2.1.1.1 Keywords identification

Keywords were identified through an iterative search process starting from a few terms inspired by the research questions. After some iterations this expanded into 19 keywords: ‘mobility’, ‘transport’, ‘accessibility’, ‘urban’, ‘city’, ‘$sustainable’


and ‘decision maker*’. The number of keywords was then reduced through a quick combinations test where synonyms were identified in a series of searches (Figure 2). The test searches showed that ‘fast’, ‘accelerated’ and ‘rapid transitions’ were covered in ‘transitions’; ‘indicator’, ‘criteria’, ‘principle’, ‘success factor’, ‘decision*making’, and ‘decision maker*’ were covered in the literature on planning; and ‘context adapted’ did not give any results, so a synonym term ‘local context’ was selected for the search.

Finally, the following keywords were selected for the keywords search of this SLR: ‘mobility’ (‘transport’, ‘accessibility’), ‘urban’ (‘city’), ‘$sustainable’ in combination with either ‘local context’, ‘plan*’ or ‘transition’. The scheme is illustrated in Figure 3:

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$^{11}$ Symbol $\$ $ refers to stemming search technique and returns all the words with the same word stem [28].

$^{12}$ Character * refers to wildcard [29] that retrieves all the variations of the word(s).
In the search strings, each word from the rectangle on the left in Figure 3 was used in combination with each term from the oval on the right. It created 18 search strings.

We are aware that the terms transition and transformation are sometimes used interchangeably, both referring to a radical change, and sometimes very differently, with transition referring to incremental change as opposed to more radical change by means of transformation. However, the concepts that these terms point to come from different schools of thought, with their own underlying assumptions and distinct approaches, where transition has been said to focus more on concrete changes within societal subsystems (e.g. energy and mobility) while transformations rather deal with the link between society and ecological externalities [30]. In this study we focus on the transition term, because it is closer to our research focus.

2.1.1.2 Databases identification and keywords search

The databases Scopus and Web of Science have been used to search for publications from January 2008 to April 2018. The subject areas covered were social sciences, engineering, earth and planetary science, multidisciplinary, decision science, economics, econometrics and finance, environmental science, business, management and accounting, energy, computer science, agricultural and biological sciences, decision sciences, mathematics, arts and humanities, and psychology. Although we used both databases, our primary study showed that most of the publications from Web of Science are present in Scopus too (four publications were found in Web of Science only).
2.1.1.3 Expert advice on suitable literature

A systematic approach to keywords search of databases in SLR has its advantages, allowing consideration of publications that might have been missed otherwise. At the same time, it has its limitations related to the selected publications as they become the starting point of the analysis. An example of such a limitation is publications by Robinson [31,32], one of the founders of backcasting. They were not on the resulting list of keywords search of the SLR due to their publication dates (before 2008, namely 1982 and 1990). In addition to that, a co-citation analysis was performed, and its result did not show these publications either, because they were not cited at least four times within the selected publications. To address this limitation, expert advice [25] (pp. 104-105) on suitable literature was collected. This added 21 publications in total and ten of these were neither in Scopus, nor in Web of Science as they were recently published books and articles.

2.1.2 Screening for relevance

The main inclusion criteria for the publications were: publications being original research papers written in English and published in peer-reviewed journals (including articles in press), as well as peer-reviewed books and book chapters. Language restrictions created limitations by excluding publications written in other languages (some of them were published in Chinese, Spanish, German and Polish). It could be seen as restricted science in transdisciplinarity [33]. However, including them into the analysis could have been difficult and risky as content could have been lost in translation or misinterpreted. Given that the lead author had a proficient command of Russian, Ukrainian and Czech, some additional publications that were identified through the bibliographic studies and written in these languages could also be assessed for their relevance to the Research Questions. Review papers, conference papers and reports were not included into the search.

2.1.3 SLR databases

There were two SLR databases formed for the analysis: an SLR database for quantitative analysis and an SLR database for qualitative analysis. The first one consists of the results from the primary SLR search in the Scopus and Web of Science databases and from the expert advice. In addition, citation and co-citation analyses was performed to identify further literature that could have been missed through the primary SLR process. These publications were added to the SLR
database for quantitative analysis. To better understand the fields, the other SLR database for qualitative analysis was identified within the SLR database for quantitative analysis. The publications from the qualitative database were fully read and analysed in-depth. This enabled viewing the field from the systems perspective, identifying possible biases and knowledge gaps.

Specific methods and research tools used for the bibliometric studies are further described below.

2.2. Bibliometric methods

For bibliometric studies, we extracted the following information: authors, publication metadata, references and citations. Several tools were used to clean-up the data. We used Microsoft Word and Excel for primary fixes, such as removing blank spaces/cells and refining the consistency of language (for example, from ‘decision making’ into ‘decision-making’) as well as refining the names and titles (for example, from ‘Gossling’ to ‘Gössling’). In addition to that, we used OpenRefine\(^\text{13}\) to go through the words and names that are slightly different, for example ‘city’ and ‘cities’. OpenRefine is an open source software to work with messy data, which is available in several languages. It is important to process data in this way to avoid duplicates in the analysis. Having duplicates in the networks would make it more complex and the relative importance of a particular keyword, author or publication would be decreased.

2.2.1 Citation analysis

One of the common methods of bibliometrics, citation analysis \([34]\), has been performed for this SLR. Scientific literature is based on the arguments that are supported by relevant cited publications and in that way creates relationships between publications in the field. The usefulness of citation rankings in research evaluation is being debated \([35]\). Firstly, metrics do not fully reflect the overall contributions of researchers towards institutional mission and the wider public good. Secondly, studies show that women and interdisciplinary research become disadvantaged due to lower citation frequency than what is typically the case for men and disciplinary research \([36]\): “Evidence suggests that men are reluctant to cite women” and “interdisciplinary research … tends to be cited less often than papers in the mainstream of disciplines”. Thirdly, hyperproflic authors might have

\(^{13}\) See: http://openrefine.org/
limited involvement in the research process and “do not meet traditional authorship criteria” [37]. As suggested, the best way to address the potentially limited usefulness of citation ranking is to publish in peer-reviewed journals to supplement the ranking evaluation with a peer-review process by the experts [36].

In case of systematic literature reviews, bibliometric studies give an overview of what publications had an effect on the subsequent articles and books. Moreover, citation analysis allows the identification of main journals, research institutions and other types of data for bibliometric analysis. We used citation analysis to identify the most cited publications and the main journals within the SLR database for quantitative analysis. In addition, citation analysis helped identifying complementary literature (red arrow in Figure 1). This resulted in 69 publications, however, after removing duplicates, only 22 publications remained, and of those, ten did not meet the eligibility criteria (see Figure 4).

2.2.2 Co-citation analysis

Co-citation analysis, in contrast to the citation analysis, shows the relationships between publications, as well as how strong those relationships are. This can be illustrated in networks of related literature (with two or more publications cited together in the same article) that would show the links between the publications and their relative proximity to one another [38]. Such an analysis can visualise groups/clusters of literature with the most relevant content [34] and lead to the identification of core themes [39] and schools of thought [38]. Moreover, co-citation analysis can show development of the field over time as interests of the researchers change [34]. In this SLR, we have analysed publications’, co-citations’ and keywords’ occurrence and co-occurrence to describe the development of the field.

2.2.3 Co-authorship analysis

To illustrate social networks among researchers who share similar interests, co-authorship analysis has been performed. In contrast to citation and co-citation analyses, co-authorship analysis shows what groups of researchers collaborate [40]. Co-authorship analysis can therefore be used to identify schools of thought. We used this method to depict collaborations formed to publish works selected in the SLR database for quantitative analysis, as well as to focus on the most published authors’ networks.
2.2.4 Network analysis

Network analysis illustrates the relations and interactions among the elements of the system. In social sciences network analysis is used to identify network properties, for example formation clusters in the system or allocation of node centrality [41]. In our SLR we used network analysis to map the keywords and authors of publications. Moreover, we calculated node size and node centrality – how many links each node has, illustrating each node’s importance within a system [38]. With that we identified the main keywords, authors and their respective networks within the SLR database for quantitative analysis.

2.3 Bibliometric research tools

Open source software CitNetExplorer\textsuperscript{14} has been used to analyse citations based on the data from the Scopus and Web of Science databases. First, we created a list of selected publications on Scopus; the publications not available in Scopus were searched and added to another list on Web of Science. Ten of the 21 publications recommended by the experts were not found in either of the databases and they were excluded from the co-citation analysis. Using an intermediate open source software called CitedReferencesExplorer\textsuperscript{15} we saved the data from Scopus into the suitable for CitNetExplorer format (the same as in Web of Science by default). Later, it was combined with the data from Web of Science. The compiled file was imported into the CitNetExplorer [42] that allows creating and analysing citation networks, clusters of publications and core publications. To analyse citation networks, we retrieved the reference lists from the SLR database for quantitative analysis. Only the 40 most cited publications were visualised in the network. To avoid excessive amounts of linkages between publications on the graph, the minimum number of citation links selected was two. This also excluded the intermediate publications in the paths [42] (p. 805). Then, we used the ‘Clustering’ function to identify publications that are closely related based on their citation network. Using given parameters, the software identified three distinct clusters (blue, purple and green). Finally, we used the ‘Core Publications’ function to identify those that have at least four citation relations.

To visualise data networks we used the Cytoscape open source software [43]. We created graphs that depict network layout, degree centrality and clustering. The size of nodes represents degree centrality: the larger the node, the more times it was mentioned within the SLR database for quantitative analysis. In addition to

\textsuperscript{14}See: http://www.citnetexplorer.nl/

\textsuperscript{15}See: http://andreas-thor.github.io/cre/
that, the thickness of edges represents the number of times the two connected nodes were mentioned together, indicating their relevance to each other. By default, the networks were distributed from the largest to the smallest on the graph. We used this tool to analyse two sets of data – keyword co-occurrence and co-authors co-occurrence – in two stages: first, to illustrate the full network, and, second, to narrow it down for further analysis. In case of keywords, we filtered out those combinations that occur only once in the network. The bigger the size of a node, the more frequently the keyword is used. The thickness of the links between the nodes represents a number of times pairs of keywords occur (the thicker the line, the more often the pair of words is used). With respect to co-authors, we focused on the seven largest networks. The same idea applies there: the larger the node the more publications the author has (within this SLR database for quantitative analysis); the thicker the line is between two authors (thickness of the line represents the number of publications they have together), the more often they collaborated within the timespan of the SLR, the more research interests they thereby likely have in common.

Finally, we used a ‘word cloud’ to illustrate keywords occurrence [44] using WordClouds open source software\(^\text{16}\). The font size of the words represents the frequency of occurrence of the keyword in the literature selected for the SLR.

## 3 Results and interpreting analysis

### 3.1 Overview of the gradual refinement of identified publications

A flow chart adapted from the so-called Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [45] was used to illustrate the process of creation of SLR databases for quantitative and qualitative analyses (Figure 4, below).

In total, 444 publications (380 articles, 42 books, 17 book chapters and 5 manuscripts) were assessed for eligibility. Ten of the articles were excluded due to their narrow focus and the remaining 434 publications were analysed using bibliometric methods. The SLR database for quantitative analysis was created based on the relevance of the literature to the Research Questions, partly identified by the authors and experts, and partly through the citation analysis. Within that

\(^{16}\) See: https://www.wordclouds.com/
Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.

database, the SLR database for qualitative analysis was determined. It consists of 154 publications: 143 articles, 9 books and 2 manuscripts dated from 1993 to April 2018.

Figure 4. Adapted PRISMA flow chart based on Moher et al. [46].
3.2 Identification of prominent research themes

3.2.1 Citation and co-citation analyses

For this analysis, the SLR database for quantitative analysis was used, which consists of 434 publications (see sections 2.2.1, 2.2.2 and 2.3). Of those, ten publications were recommended by the experts and not available in the Scopus and Web of Science databases. In total, 424 publications were analysed.

As described in section 2.3, the 40 most cited publications within the SLR [42] (p. 807) are illustrated in Figure 5 where each bubble represents a publication that is identified by the primary author’s last name(s).

![Figure 5. Citation nets. Three clusters of the literature: green represents the indicators cluster; purple represents the backcasting and scenario analysis cluster; blue represents the planning and policy for sustainable mobility and accessibility cluster.](image)

This figure shows citation interrelations (connecting lines) between the selected publications: for example, Åkerman [47] and Jones [48] both cited Gudmundsson [49]. Further analysis shows how adding cited and citing publications creates a more detailed network of relationships between the publications. Colours represent different clusters in the selected literature. Based on this analysis, three clusters were identified by the software (see Section 2.3). Based on our interpretation these clusters got the following names: indicators (green cluster), backcasting and scenario analysis (purple cluster), and planning and policy for sustainable mobility and accessibility (blue cluster). The clusters are not illustrated.
as separate entities as they are interlinked through some publications cited by several researchers from different clusters. Moreover, their distribution reflects the proximity of themes. For example, Kenworthy [23] and Hickman [50] from the blue and purple clusters respectively, share some citations, which places them close to each other, while Curtis [51] is depicted outside the network, which means that her work differs from the others in this graph.

A closer look showed that planning and policy for sustainable personal mobility and accessibility should be seen as two separate clusters. They correspond to two distinct fields and two groups of people that deal with their own respective questions – planners and policymakers. That is why we suggest that the blue cluster, identified by the software, should be split up into two – cluster A and cluster B. The publication by Curtis [51] in this graph is an illustration of the need to distinguish between these two themes as it is located distantly from the other publications.

Details of what publications in each cluster were analysed are described in section 3.3. More publications for each cluster we retrieved through the ‘Drill Down’ function of the software. They were not displayed in Figure 5 due to the limitation of the 40 most cited publications.

### 3.2.2 Occurrence and co-occurrence of keywords

In total, 775 different keywords were analysed, most of which related to planning for mobility (transport) in urban contexts. The results of the keywords occurrence analysis are presented in a word cloud (Figure 6). A word cloud depicts the frequency of terms related to planning for transitions towards sustainable personal mobility, creating a ranking list. The top five terms identified here were ‘sustainability’ (51 occurrences), ‘sustainable transport’ (42), ‘transport’ (31), ‘sustainable development’ (26) and ‘sustainable mobility’ (24) which is in line with the keywords search.
For keywords co-occurrence analysis, we removed these five terms that were the keywords of the primary search and illustrated a network of remaining keywords that occurred at least three times (Figure 7). Those terms show up as nodes and the bigger the node is the more times it was used in the publications (see section 2.3). They represent research themes in this SLR. The biggest nodes in this network are ‘public transport’ (22 occurrences), ‘travel behaviour’ (13), ‘transport policy’ (12), ‘accessibility’ and ‘governance’ (11 each). The term ‘transition’ occurred three times, which means that publications on mobility transitions are represented to a minor extent in this SLR and planning for transitions is not represented. However, transition is often part of the larger discussion, for example ‘energy transition’ or ‘socio-technical transition’. Although, these words are also not commonly used in this SLR as the analysis shows.
Varvara Nikulina
Need for speed:
towards urban planning for rapid transitioning to sustainable personal mobility.

Figure 7. Keyword network. Keywords co-occurrence related to planning for transitions towards sustainable personal mobility.

The connections among the research themes identified through keywords co-occurrence are also shown in Figure 7 (for detailed method explanation see sections 2.2.4 and 2.3). As citation nets (Figure 5) suggest, some articles were assigned to the respective categories but had weak links with the other publications in the SLR selection. The same is seen in the keywords' co-occurrence analysis: there is a large interconnected network of keywords, as well as several small groups of keywords that occur together in individual articles. They were filtered out to better represent the network as they were mentioned less than three times. The thickness of the connecting lines between the keywords reveals the keywords that are commonly used together. For example, the most common combinations of keywords are: ‘accessibility’ – ‘mobility’, ‘cycling’ – ‘public transport’ and ‘mobility’ – ‘cities’. This seems to represent the discussion between two discourses – accessibility and mobility. In some publications of this SLR it was suggested that cycling should be included in the public transport system (see section 3.3.6). Finally, mobility in cities corresponds to the main theme of this SLR. Among those pairs of keywords that got removed in filtering were ‘public transport’ – ‘sustainable transport’, ‘developing countries’ – ‘sustainability’, ‘sustainability’ – ‘transport policy’, ‘public transport’ – ‘sustainable mobility’, ‘governance’ – ‘transport’, ‘mobility’ – ‘sustainable development’, and ‘sustainable development’ – ‘transport’. They mainly show the importance of sustainability in
mobility planning in different contexts and that governance plays a key role in the process.

This analysis shows that, in addition to our four main clusters (*indicators, backcasting and scenario analysis, planning for sustainable personal mobility and accessibility and policy for sustainable personal mobility and accessibility*), one can identify a cluster of *modes of transport* and another one for *mobility planning in the global South*. In the literature the term ‘developing countries’ appears frequently but we prefer the term global South.

### 3.3 Description of prominent research themes

#### 3.3.1 Temporal dimensions in mobility planning

The concept of time was often discussed within this SLR in different contexts. Four different ways of talking about time were identified: in terms of travel time, in terms of planning goals and strategies, in terms of short- or long-term thinking, and, finally, in terms of urgency for change.

Many studies were devoted to travel time and time budgets (how much time can be spent on traveling on average) [52–55]. First, mobility planning was aimed to have faster and more efficient transport systems, however, with the introduction of sustainability into the mobility discourse [26], the dialogue shifted towards slow and safe mobility [56], with additional benefits of health and other activities that can be done while traveling. In a broader picture, the discussion shifted towards slow and fast lifestyles [57].

Another perspective on time was brought up within the planning process. Trends, targets and strategies are tied to the time plan. They affect the pace of adaptation in the planning process, technology and policy innovation. In turn, this translates into the human factor – how much time decision-making and bureaucratic processes take [12,58–61].

In the literature, short- and long-term planning are naturally combined in backcasting and other processes that start with visioning. A detailed description of the body of literature devoted to backcasting and scenario analysis is provided below (see section 3.3.5).

The indirect reference to time can be identified in discussions around urgency for change. The Brundtland Report [62] gave the first push for discussions around the need for different planning practices [26,50,56,63–65]. Increasing emissions,
Varvara Nikulina
Need for speed:
towards urban planning for rapid transitioning to sustainable personal mobility.

alongside other factors, added concrete reasons for change [66–68] and more recent Paris Agreement’s 1.5-2 degree target created additional pressure for change. Rapid urbanisation concepts, in turn, included new stakeholders in the discussion [69–75]. Finally, the need for transition towards sustainable mobility was underlined [22,76].

3.3.2 Global vs local context

We are part of the global societal system and our local context identifies our challenges and possibilities, giving advantages and disadvantages for implementation of a rapid change. Globalisation comes with shared technologies and knowledge; however, it brings along goals (e.g., the SDGs), agendas (e.g., the New Urban Agenda) and recommended plans (e.g., Sustainable Urban Mobility Plans [77]). While this can be seen as a push towards sustainable development at the global level, one of the important challenges lies in the translation of it down to the local level.

It is widely known that there is likely no solution for all and that just transferring knowledge and solutions between countries and contexts is not likely going to be enough. Many studies concluded that there is no universally suitable mechanism for the integration of goals at different levels and translation of them into everyday tasks [5,11]. At the local level, the process is often constrained by barriers of rebound effects, conflicting visions at different levels, lack of consensus among stakeholders, path dependencies (when decisions made in the past could affect solutions in the future), diverse needs of passengers, and institutionalisation of policies [61,78–80]. For example, in China rapid urbanisation brought increased private transport, relocation of residents and inadequate service provision [81,82]. Even within the same geographic and political context, there could be difference in mobility patterns (mobility cultures) [78]. Thus, local context creates a core for planning processes [5,8,11,61,78–86].

3.3.2 Theoretical and conceptual frameworks

Theoretical and conceptual frameworks help us understand the world and ourselves (ontology). We all use them, explicitly, such as is often done in the social sciences or implicitly as often occurs in the natural sciences [87]. Being aware of one’s own frameworks is especially important in qualitative inquiries as it provides direction of research goals and outcomes, creates the scope for studies and creates a basis for evaluation of research-related criteria [87]. To evaluate what theoretical
and conceptual frameworks that are used in the existing literature, we included this aspect into our analysis.

Based on the SLR database for qualitative analysis, we have identified that 43% of all sources explicitly use theoretical frameworks. All 121 theoretical frameworks determined were categorised in 17 groups. From Table 1 one can see the diversity of fields and disciplines the theoretical frameworks come from. The largest category is planning theories (12% frequency of use), followed by economic theories (11%) and behavioural theories (9%).
<table>
<thead>
<tr>
<th>Category</th>
<th>No. of theories</th>
<th>% of occurrence</th>
<th>Theoretical frameworks</th>
<th>Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social theories</td>
<td>7</td>
<td>7%</td>
<td>General sociological theory, assemblage theory, social innovation theory, social practice theory, theories of structuration, grounded theory, Southern theory</td>
<td>[8,11,54,65,88–91]</td>
</tr>
<tr>
<td>Learning theories</td>
<td>2</td>
<td>2%</td>
<td>Learning theory, social learning theory</td>
<td>[92,93]</td>
</tr>
<tr>
<td>Complexity and organisation theories</td>
<td>2</td>
<td>3%</td>
<td>Complexity theory, organisational theory</td>
<td>[11,79,94,95]</td>
</tr>
<tr>
<td>Systems theories</td>
<td>9</td>
<td>5%</td>
<td>Socio-technical system theory, complex systems theory, ecological systems theory, social system’s theory, systems theory, systems theory, network theory, actor-network theory, social network theory</td>
<td>[11-13,96–98]</td>
</tr>
<tr>
<td>Theoretical Frameworks</td>
<td>Count</td>
<td>Percentage</td>
<td>Theoretical Frameworks</td>
<td>References</td>
</tr>
<tr>
<td>------------------------------------</td>
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<td>------------</td>
<td>---------------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Development theories</td>
<td>4</td>
<td>5%</td>
<td>Development theory, theories of sustainable development, Western development theories, resilience theory</td>
<td>[8,11,13,53,102,103]</td>
</tr>
<tr>
<td>Urban theories</td>
<td>10</td>
<td>7%</td>
<td>Social theory on urban development, urban development theories, urban theory, contemporary urban theory, critical urban theory, Western urban theory, theories of urban governance, urban fabric theory, sustainable cities theory, theories of cities</td>
<td>[2,3,11,20,61,82,93,96,104]</td>
</tr>
<tr>
<td>Spatial development theories</td>
<td>5</td>
<td>6%</td>
<td>Theories of spatial development, central place theory, location theory, space syntax theory, spatial configuration theory</td>
<td>[12,52,82,96,99,102,105]</td>
</tr>
<tr>
<td>Policy and governance theories</td>
<td>6</td>
<td>4%</td>
<td>The theory of environmental policy, policy mobilities theory, policy transfer theory, theories on policy change, theories on the state and its policy instruments, evolutionary governance theory</td>
<td>[63,69,90,98,115]</td>
</tr>
</tbody>
</table>
Table 1. Theoretical frameworks used in the publications (Continued).

<table>
<thead>
<tr>
<th>Political theories</th>
<th>1</th>
<th>1 %</th>
<th>Theories from political science</th>
<th>[116]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional theories</td>
<td>6</td>
<td>6 %</td>
<td>Institutional theory, theories of empowerment, social just</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ice theory, justice theory, theory of the just city, femi</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nist theory</td>
<td>[6,8,12,69,98,117,118]</td>
</tr>
<tr>
<td>Community-oriented theories</td>
<td>3</td>
<td>2 %</td>
<td>Participation theories, community-based operations theo</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ry, theory of community</td>
<td>[93,119]</td>
</tr>
<tr>
<td>Psychological theories</td>
<td>11</td>
<td>7 %</td>
<td>Psychological theories, conventional choice theory, cons</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>umer choice theory, multi-attribute utility theory, ratio</td>
<td>[12,13,26,56,65,79,110,120,121]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>nal decision theory, material possession theory, socio</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>cognitive theory, gender theory, escape theory, flow the</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ory, prospect theory</td>
<td></td>
</tr>
<tr>
<td>Behavioural theories</td>
<td>10</td>
<td>9 %</td>
<td>Travel behaviour theory, theory of planned behaviour, b</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ering-law theory, discourse theories, theories of discurs</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>ive constructions, meta-theory of critical realism, valu</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e-belief-norm theory, cognitive dissonance theory</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>----</td>
<td>-----</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Data science theories</td>
<td>8</td>
<td>6%</td>
<td>Control theory, game theory, Dempster-Shafer theory, fuzzy theory, analytic hierarchy process theory, rough sets theory, theory for measuring urban material and energy flows, graph theory</td>
<td>[11–13, 121, 127–129]</td>
</tr>
</tbody>
</table>
There is no one planning theory that is adopted by everyone, instead there are many different versions of planning theories, which also develop over time. However, as mentioned by Tennoy et al. [113], the works most referred to are those by Friedmann [130], Healey [131], Flyvbjerg [132], Hull [95,116], and Stead and Meijers [133] in Tennoy et al. [113]. The difference in the theories comes with an evolving view on possibilities in planning and governance, questions related to democracy and perceived challenges at the time. That is why it was difficult to distinguish one particular theoretical framework to present here.

The two most utilised theoretical frameworks in this SLR were (socio-technical) transition theory from the theories of change category, and utility theory from the economic theories’ category.

Transition theory, sometimes referred to as socio-technical transition theory or multi-level transition theory was developed by Geels [134]. The purpose of it is to facilitate radical change using multi-level perspective in the transitions of the present time, to analyse those transitions that happened in the past and to assist in the identification and formulation of the pathways to move forward.

The utility theory belongs to the category of economic theories. It deals with choices of individuals by ranking the available options [123]. In transport planning it is often used in relation to modes choice.

Mobility planning in urban contexts is a complex task and requires a combination of theoretical approaches. Table 1 shows the diversity of theoretical and conceptual frameworks utilised in the publications of the SLR. Several patterns can be observed as researchers utilise theories on planning economy, behaviour and change. These patterns correspond to the gaps often mentioned in the literature – that we need a change that would not lead our economy to collapse, that planning should be focused on people and their needs, and, finally, that people themselves need to change their habits.

Theoretical and conceptual frameworks outline the direction of the prominent research themes determined in section 3.2. It is important to understand the fields selected for this analysis and their overlaps to answer present and future overarching questions.

### 3.3.4 Indicators

As was illustrated in citation networks (Figure 5), there are six publications in the green cluster; however, the ‘Drill Down’ function of the software helped us identify
14 more publications that belong to this cluster. The main characteristic of this cluster is the focus on methodology development to utilise indicators according to their diverse purposes.

The earliest publication in this cluster focused on four innovative directions for urban transport [21], derived from sustainable development principles: limitation of human throughput, efficient technological progress, extraction of renewable resources without exhausting them, extraction of non-renewables at the rate of substitution by renewables [49]. These articles further influenced the SLR selection of publications as they were cited in the later publications.

Several methodologies were designed to assess sustainability in urban transport [128,135-138] and perform ecological footprint assessment [139]. Another example of indicators used for evaluation of sustainability was developed by Bulkaen et al. [140], where they combined multi-criteria analysis (MCA) and multi-actor MCA (MAMCA) to involve stakeholders into the assessment process. To have a holistic approach to transport planning and assessment of sustainability, a systems approach was proposed by Ngossah et al. [121].

Evaluation was identified as another purpose for indicator use. Indicators can be used to perform comparative studies of transport in urban context through analysing transport systems [141]. Projects for transport planning can be evaluated focusing on different contexts, such as countries of global South, where a corresponding set of indicators should be utilised [48]. Strategies for sustainable mobility can also be analysed using indicators [66,127].

In case of monitoring and evaluating cities, three generations of indicators can be identified [11,142]: classical economic indicators (first generation), end use indicators based on understanding of development (second generation), and holistic and comprehensive indicators (third generation). However, most of the indicators, even of the third generation lack ‘geo-localized’ and people-centred approaches as well as fail to account for urban dynamics [11,102,103,142].

Articles in this cluster are mainly focused on the development and application of methods for the selection and application of indicators for planning for sustainable mobility.

3.3.5 Backcasting and scenario analysis

Another relatively small cluster of publications is devoted to studies of a backcasting approach and scenario-making as tools for sustainable mobility
 planning. There was no intention to go into detail with different types of backcasting, however some main points related to the approach are outlined below.

The main influence in this cluster was provided by the backcasting approach [88]. Dreborg [88], who focuses on the envisioned future and possible pathways of getting there (the “debate and decide” process [23] (p. 81)) contrasting to extrapolating trends into the future as it is done in forecasting (the “predict and provide” process). Involvement of the general public and a diverse group of stakeholders would raise awareness and build up commitment to the cause. Moreover, the focus in the temporal dimension of planning would change from short-termism to long-termism by creating vision and goals. A general trend in the approach is that it should have a place for ‘strategic conversation’ [70,143], in other words to be participatory, inviting stakeholders to a dialogue. Backcasting can also be part of a co-production approach (having an input from researchers and practitioners) through a dynamic process [144,145].

Using a backcasting approach and scenario development allows seeing the situation from a new perspective, coming to non-conventional conclusions and posing new questions. For example, using this approach in the UK, transport planning led to the creation of two scenarios of possible future and policy packages for meeting a 2030 target [50]. Additional behavioural and technological changes would be necessary to implement these policy packages [57]. ‘What-who’ interaction helped to create scenarios, relating actions to responsible stakeholders and in that way identifying power relations [60]. One of the interesting conclusions for urban planning in Sweden was that leisure travel can be increased by 30% without stepping outside of the sustainable pathway by having multinuclear urban planning combined with implementation of IT solutions instead of structurally enforcing travelling (for example, commuting or shopping) [47]. Finally, new questions were asked [146]: “what is the direction of the policy development over a long period of time? Where can new funding sources be found and how can funding power be devolved? How can land acquisition and its value uplift be monitored and regulated?”

A backcasting analysis through utopian thinking proved to have provided additional value in planning processes as it helps to define the ideal future [106,114].

A generic community planning process model developed by Robèrt and colleagues [22] is based on another type of backcasting - backcasting from boundary conditions for sustainability. This approach supports transitions in pragmatic, systematic and strategic way.
The book linking the three clusters – backcasting and scenario analysis (purple) and planning and policy for sustainable mobility and accessibility (blue clusters A and B) was authored by Hickman and Banister [65]. The book covered a range of topics, from scenario development and participatory backcasting to emerging approaches in mobility planning and transitions towards sustainable mobility with several examples in different contexts. They also brought up the concept of time and the lack thereof to make effective change. It was also the first time when these authors talked about planning for transitions.

### 3.3.6 Planning for sustainable mobility and accessibility

This is the largest cluster within this SLR that corresponds to the main theme – planning for sustainable mobility in an urban context. Several themes appear here in this group: urban form, modes of transport and multimodality, planning for accessibility, as well as local context.

Urban form discourse was broadly researched by Cervero and his colleagues. To achieve traditional urban planning with its transit-oriented development, Cervero and Kockelman [123] argued that three dimensions (3Ds) need to be taken into account – density, diversity and design. High density, land-use diversity alongside pedestrian-oriented design are favourable for non-motorized travel. In the following study in 2002, Cervero [120] developed a normative framework, where he included generalized cost and travellers’ socio-economic attributes to the core 3D dimensions. Parallel to Cervero, Stead [147] analysed the relationship between land-use, socio-economic factors and travel patterns in the UK, and came to the same conclusion that socio-economic factors play a major role in travel patterns, even larger than land-use characteristics. In 2010, 13 years after the original paper, the number of D dimensions increased to seven, by adding destination accessibility, distance to transit, demand management and demographics [148], highlighting the importance of the local context.

In 2006 Kenworthy presented a framework for decision-making that to a large extent combined the 3D dimensions, critical responses that were later presented as principles of the sustainable mobility paradigm [26] and a vision-oriented approach (similar to backcasting). Kenworthy’s framework consisted of ten critical eco-city dimensions that, in addition to the above-mentioned parameters, included the protection of natural urban areas and food-production capacity.
Moreover, the sustainability definition in this framework had a fourth, cultural, dimension, contrary to the common triple bottom line definition\textsuperscript{17} \cite{149}.

Multimodality as part of sustainable solutions was presented by Bertolini and le Clercq \cite{150}, who also talked about a supply-demand relationship that could be maintained through land-use patterns. The way of integrating public transport and sustainability can be illustrated as a ladder \cite{95}, where barriers can be found on each step. This proved to be the case in the UK. Cycling is often seen as part of such an integrated transport system. Examples described here show the importance of integration of cycling into the transport system, supported by suitable policies, as well as raising awareness and education among the traffic participants \cite{64,151}. Another side of integration relates to transport planning and land-use. Many researchers approach it through the concept of accessibility – “what and how can be reached from a given point in space” \cite{152} (p. 207), \cite{8,18,51}.

The sustainable mobility paradigm presented by Banister in 2008 \cite{26} brought another perspective to mobility planning: two principles of conventional planning, namely derived demand and travel cost minimization. These were suggested to be reconsidered based on the sustainability perspective. Moreover, reasonable travel time was recommended to replace travel time minimization. Banister brought ideas of decreasing the need to travel as well as transport and land-use policy measures and technological innovation that would facilitate a change in planning towards more sustainable mobility. On the social sustainability side, the issues of public awareness and acceptability, health, as well as stakeholder involvement were discussed. Finally, four principles of the sustainable mobility paradigm were identified: “making the best use of technology; regulation and pricing; land-use development; clearly targeted personal information” \cite{26} (pp. 78-79). In the following study, Banister \cite{68} developed the concept of sustainable urban mobility further, accentuating the urgency of change, and posing a question regarding leadership and commitment on the way to achieving a paradigm shift. Moreover, he brought up a rebound effect – when increased individual welfare might lead to increase in kilometres travelled. The interrelation between travel distance, speed and time was discussed the same year \cite{56}. The author argued that the conventional paradigm of minimizing the travel time, thus increasing the speed, is unsustainable, therefore the changes in land-use planning should be applied by reducing the need to travel.

A small number of articles focused on the contextualisation of the planning. Zhao \cite{71}, using the example of Beijing, described how urban sprawl occurred and its consequences for mobility. He suggested that increased local autonomy can lead

\textsuperscript{17} Sustainability has three pillars – economic, social and ecological \cite{149}.
to unsustainable solutions. In a very different context, on small islands, stakeholder participation proved to be useful for the planning process [72].

The transport system is complex and cannot be seen in isolation from infrastructure, energy systems, built environment, and the people who are using it. A number of studies suggest methodologies for integration of transport with the built environment, land-use and energy [83,105,126,153–155]. However, there is no single methodology that is accepted by everyone. There is an expressed need for a systemic transdisciplinary approach\(^8\) that would include stakeholders with different backgrounds coming both from academia and practice [22,89,105,119,124,157]. The literature suggests that in the future, mobility planning should be people-oriented and place-based, and an institutionalisation of practice could be helpful in the process [158,159] that is subject to evaluation [107]. The combination of urban fabric theory and economic assessments is argued to make the acceleration in urban planning possible [3]. However, behavioural change and policy development would still remain a challenge and require additional measures.

The previously mentioned term ‘accessibility’ was often defined as the ability to access places, spaces, labour market, knowledge and experiences. However, a broader definition complements with the allowance of social equity and the use of power and justice systems to achieve it [8,18]. It gives a space to address social challenges through the concept of accessibility.

Several studies of this SLR were devoted to the development of tools to assess accessibility, give planning an alternative view on mobility, and enable comparative analysis based on accessibility [96,109,160]. In all, they enrich the toolkit for work with accessibility.

### 3.3.7 Policy for sustainable mobility and accessibility

This cluster is the smallest in this SLR and its main focus is directed towards governance and policy making. Co-citation analysis suggests several publications to be the most cited within this selection.

\(^8\) Here, a transdisciplinary approach means interactive knowledge production that is happening in the context of application and provides ‘socially robust knowledge’, in contrast to the North American approach, where a ‘boundary organisation’ is a mediator between politics and science [156]. Here such an approach is considered as interdisciplinary.
At the same time as Banister published his sustainable mobility paradigm article, Hull [116] published her work on sustainable mobility from the governance perspective. She argued that achieving sustainable mobility requires an agreement on definitions and direction of development among all public sectors that should be involved in the process, followed by equality in decision-making, incentives for the general public to use sustainable mobility modes of transport, and legal and financial support for joint projects among the sectors and authorities.

Policy change was another widely discussed topic. One example is from Örebro, Sweden, described by Hysing [69]. There, three important factors for change were identified: new policy ideas, reorganisation of local administration and entrepreneurs that created a pressure. However, what actually made the change possible was politicians. Another positive example of policy change towards sustainable transport in Freiburg, Germany was described by Buehler and Pucher [161] using the historical view perspective. There, a principle of carrots and sticks was a success factor: car-restrictive measures were put in place while incentivising cycling, walking and public transport.

Literature within this SLR underlines the importance of challenging current prevailing policies and the way they are designed [6,162]. A case in Canada shows that policies are often developed and implemented in a non-integrated way, which challenges their effectiveness [90]. Policy can be seen as an instrument to assist change, which would also affect politics at the local and global levels [12,13].

Based on the evidence of sustainable accessibility studies [152], Bertolini et al. argued that policy measures in the Netherlands should be revised. They suggested getting away from the sharp limits of 30 minutes to reach the destination and to replace it with gravity-based accessibility measures: “considering, instead of the sharp limits of a contour (e.g. more or less than 30 min), a more gradual decrease in travel time or cost utility” (p. 219). Bertolini et al. recommend assessing travel costs instead of the travel time. They also distinguished two types of competition among spatial opportunities – at origins (probability of other destinations to be chosen) and at destinations (related to the number of travellers going to competing destinations).

Urban governance is complex and comprises institutions, socio-technical elements and networks [104]. There are at least three ways of understanding such a system – vertical (laws, regulations), horizontal (informal flows of knowledge) and infrastructural (related to the built environment and infrastructure) perspectives.

A systems approach in planning [21], as suggested by Goldman and Gorham, helps to see sustainability as a policy end-point, instead of sustainability as a pathway. A
similar approach was observed in studies by Kenworthy [23], who suggested to consider sustainability as a vision, as suggested above. Moreover, the authors identified and described four areas of innovation: the ‘New Mobility’ (dealing with “how individuals plan their daily activities”), the ‘City Logistics’ (addressing “the business of goods movement”), the ‘Intelligent System Management’ (infrastructure – public institutions relationship), and the ‘Livability’ (society – transport systems interactions) [21]. Each of these areas can be described through complex systems that require development of new policies and innovation.

3.3.8 Other identified themes

In addition to qualitative analysis of bibliometric studies, this chapter aims to address the concepts included into the SLR database for qualitative analysis that might have been missed above. To follow up on the themes identified in section 3.2.2 (Figure 6 and Figure 7), the modes of transport and global South mobility planning themes will be described below. Moreover, there are some other identified themes that are presented in the literature to a minor extent: decision-making in mobility planning, equity, justice and equality in mobility planning, and the role of institutions in planning and co-production of knowledge.

The need for behavioural change was expressed throughout most of the studies in this SLR. Planners and decision makers cannot achieve a transition towards sustainable mobility without involving the end users into the process [12,163]. An ageing population (or demographic transition) starts becoming a concern in many places across the world too when advancement in medicine and longer life creates new challenges for mobility planning [11–13].

3.3.8.1 Modes of transport

The transport modes discourse often focuses on the land-based means of transport, specifically on the discussion of public transport replacing private cars. Electrification is argued to be the future, however, only replacing fuel-based vehicles with electric ones does not lead to fully sustainable solutions [1,3,129,164] as it will not improve some sustainability related problems like lack of urban space and traffic jam-induced stress.

Coverage of different modes of transport was another widely discussed topic. Several studies argued for some specific means of transport [3,165,166], while others argued for integrated multimodal transport systems that include private...
vehicles, public transport, shared services and mobility on demand [86,91,97,167,168].

The passenger perspective was addressed through studying mode choice between public transport and private cars [108,110,122,169]. It has been identified that location, socio-demographic parameters, psychological and cultural traits, as well as space allocation for modes of transport, are the major factors affecting the mode choice.

### 3.3.8.2 Global North and global South mobility planning

A majority of the literature in this SLR studied and analysed cases in the global North. Relatively few studies focused on the global South have been captured through the selections done in this SLR. This can be explained by the selection of journals in Scopus and Web of Science databases as they do not include journals edited in the global South. This paper therefore does not claim to provide a full picture of the studies, but rather to touch upon several issues identified within the scope of this SLR.

When talking about the global South, local context plays a crucial role in the planning for mobility as the solutions might be very different from those in the global North. Lahore’s example (Pakistan) claims that insufficient institutional capacity led to a change from a more sustainable to a less sustainable transport system that even less meets the needs of the citizens [170]. International investments can change power relations and affect the planning process by changing the direction of development of a target country [54,170]. For example, in this way technical solutions can be enforced in a way that was not initially planned by the local government.

Several criteria/indicators were developed to support planning for sustainable mobility in the global South that were different from those for the global North [53,102]. Finally, based on the experience from Singapore, policies that enabled sustainable development in fast developing cities were outlined [171].

### 3.3.8.3 Decision-making in mobility planning

Emberger and colleagues [172] identified three approaches to decision-making in Europe (vision-led, plan-led and consensus-led) and five levels of public participation (provision of information, consultation, making decisions together, acting together, and supporting independent stakeholder groups). Later, taking a
plan-led approach as a base, the researchers developed a process for decision-making. Finally, they tested the transferability of this approach in the context of South East Asia, where four elements were identified as transferable (objectives, policy instruments, barriers and strategies) while others had to be changed.

The other literature in this SLR has described several methods for decision-making processes for mobility planning [92,173,174].

3.3.8.4 Equity, justice and equality in mobility planning

Questions of equity\textsuperscript{19}, justice\textsuperscript{20} and gender are often framed as part of social sustainability [13]. In the context of the global South, justice and gender equality are often neglected in planning processes [9,54,79,101,175].

As mentioned before, social justice and equity are emerging concepts in social sustainability of cities [6,10,11]. They can be analysed through the concepts of accessibility [8,18], utilisation of justice theory [118], or frameworks such as the one described by Boisjoly and Yengoh [93].

3.3.8.5 The role of institutions in planning

In many publications within this SLR, institutions were mentioned as important factors for achieving the change. Planning always depends on space and time, and decisions made in the past could affect solutions in the future, creating path dependencies. Institutional change is necessary for stepping out of the path dependency [11,98,108,170]. Five groups of institutional barriers can be identified: financial, cultural, legislative, political, and technical [12] and a systemic approach is required to overcome them.

3.3.8.6 Co-production of knowledge in planning

The final theme of research in this SLR is about co-production of knowledge in planning processes. Lack of knowledge on co-production among transdisciplinary researchers and practitioners has been emphasised throughout this SLR [8,11,94,157,176]. The studies from the global South underline the importance of co-production between different thought collectives, attention to the existing social

\textsuperscript{19} Urban equity – rights, opportunities, accessibility and affordability [7,8].

\textsuperscript{20} Justice refers to electoral, procedural, distributional justice as well as enforcement [7,8].
organisation in the local context, and the diversity of stakeholders to be involved in the planning process to enable learning, experimentation and creation of adaptive transport systems [177].

### 3.3.9 Major bodies of literature

We know that the number of citations in itself may not show the relative influence of a certain publication. Still, as a complement to other analyses, we think it is important to identify the most cited publications. We expected this to further help to analyse the prominent research themes identified above (see section 3.2).

In the process of SLR as described in section 2.1, 434 publications were selected (this refers to the SLR database for quantitative analysis, see section 2.1.3). Firstly, to determine the publications that had been cited the most, a search for the most cited of the selected publications was conducted using the Scopus and Web of Science databases. This search was limited to publications that had been cited at least 100 times. This resulted in 16 of the publications being highlighted. Within those 16, it was found that Cervero and Kochelman [123] was the most cited with 1190 citations globally. Secondly, a search for citations within the initial 434 publications was conducted to compare results. It was found that 13 publications of the previous 16 were still among the most cited, with the article by Banister [26] being the most cited with 51 citations. The results of this process are shown in Table 2.

The articles in Table 2 were already described above (see sections 3.3.6 and 3.3.7) suggesting coherence in the results from two types of analyses. These articles do not represent the key concepts in the field, but they are rather major bodies of literature and it is useful to be aware of them when outlining the field and making one’s own judgements.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Publication title</th>
<th>Publisher</th>
<th>No. of citations (Scopus &amp; Web of Science)</th>
<th>No. of citations (within the SIR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervero, Robert, and Kara Kockelman</td>
<td>1997</td>
<td>Travel Demand and the 3Ds: Density, Diversity, and Design</td>
<td>Transportation Research Part D: Transport and Environment</td>
<td>1190</td>
<td>30</td>
</tr>
<tr>
<td>Banister, David</td>
<td>2008</td>
<td>The Sustainable Mobility Paradigm</td>
<td>Transport Policy</td>
<td>562</td>
<td>51</td>
</tr>
<tr>
<td>Pucher, John, and Ralph Buehler</td>
<td>2008</td>
<td>Making Cycling Irresistible: Lessons from The Netherlands, Denmark and Germany</td>
<td>Transport Reviews</td>
<td>534</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 2. List of the most cited publications (Continued).

<table>
<thead>
<tr>
<th>Year</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>The Eco-City: Ten Key Transport and Planning Dimensions for Sustainable City Development</td>
<td>Kenworthy, Jeffrey R.</td>
</tr>
<tr>
<td>2001</td>
<td>Relationships between Land Use, Socioeconomic Factors, and Travel</td>
<td>Stead, Dominic</td>
</tr>
<tr>
<td>2006</td>
<td>Sustainable Urban Transport: Four Innovative Directions</td>
<td>Goldman, Todd, and Roger Gorham</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Title</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Zhao, Pengjun</td>
<td>2010</td>
<td>Sustainable Urban Expansion and Transportation in a Growing Megacity: Consequences of Urban Sprawl for Mobility on the Urban Fringe of Beijing</td>
</tr>
<tr>
<td>Hickman, Robin, and David Banister</td>
<td>2007</td>
<td>Looking over the Horizon: Transport and Reduced CO2 Emissions in the UK by 2030</td>
</tr>
<tr>
<td>Banister, David</td>
<td>2011</td>
<td>Cities, Mobility and Climate Change</td>
</tr>
<tr>
<td>Åkerman, Jonas, and Mattias Höjer</td>
<td>2006</td>
<td>How Much Transport Can the Climate Stand? - Sweden on a Sustainable Path in 2050</td>
</tr>
</tbody>
</table>
3.3.10 Geography of case studies

The final type of analysis helpful to describe prominent research themes is the geographical distribution of case study locations across the world (where the case studies were conducted). The selected 434 publications have a wide geography of case study locations. This is illustrated in Figure 8, spanning 72 different countries, with the largest number of publications from China and the UK (31 publications each), followed by Sweden (23) and Spain (20). Several publications had a broad focus on Europe, global South and Asia. They were not included in Figure 8, as only studies related to individual countries are counted there. The largest number of studies has been conducted in Europe 56 % (230 case studies) and Asia 23 % (96 case studies). Some other publications that do not show up in Figure 8 are those that do not have a geographical focus since they are conceptual, methodological or describing various models.

Figure 8. Number of case studies per country.

Figure 8 illustrates some limitations of the geographical scope of case studies in this SLR. This includes a low representation of studies in the global South. Several reasons for this limitation can be suggested. First of all, as suggested above, in section 3.3.8.2, journals edited in the global South are not part of Scopus and Web of Science databases. Language could be seen as another explanation to a limited geographical scope. As was mentioned in section 2.1.1, publications written in languages other than those that the authors’ have a sufficient level of understanding of were excluded. Some of them could have had case studies of the local contexts. Finally, research finance plays a big role in where the research is done: often money is allocated for local projects to address the issues there.
Establishing new partnerships, especially with places of different culture, are time and resource consuming processes with many bureaucratic barriers and often seen as too demanding for pursuing.

3.4 Different bodies of literature

In this SLR we had an inquiry into the three bodies of literature that were related to mobility, urban planning and transitions. Keywords occurrence and co-occurrence analyses (Figure 6 and Figure 7) showed that mobility and urban planning are closely related. Prominent research themes of these two fields were outlined above in section 3.3. Transition studies, though, have not yet been characterised. A brief summary of transition studies related to mobility are presented below.

Based on the qualitative analysis, we have identified that the need for transition is no longer a question [63,178]. Current research in transition studies is addressing levels at which transition should or could be happening and who should be involved [115,179,180]. The multiple level perspective (MLP) [181] describes three levels where the change can be happening: niche, socio-technical regime and socio-technical landscape. It was identified that technical transition would not be enough to achieve a sustainable state. It should be happening at the socio-technical level, meaning that society has to change too. Politicians, institutions and communities need to cooperate in such a radical change. New knowledge created through participatory approaches and comparative studies would benefit the planning process. As co-benefits, it would allow a shared understanding of the sustainability discourse, as well as a combination and reconfiguration of existing solutions and governance processes. From retrospective transition studies we know that the system expected to change should be ready (for example, infrastructure should be in place) and there should be acceptance from people. Urban transitions of today should be based on causal dynamics, comparability and acknowledgement of differences as well as they should be planned [11,61,63,76,100,108,115,179,180,182,183].

This brief summary shows that the bodies of literature in planning and transition studies discuss similar topics and face similar challenges, however it seems that collaboration between them is lacking. If a transition were to be successful, the literature suggests that it should be planned for, preferably in a co-production manner.
3.5 ‘Organisation of the field’

3.5.1 Keywords

In order to stay up to date with the research, it is useful to create alerts in the databases, such as Google Scholar. As outlined in section 2.1.1, there are some keywords that are useful for the future search strategies (see Figure 2). Moreover, further analysis of keywords occurrence and co-occurrence (Figure 6 and Figure 7) showed other useful keywords. Depending on what the next research questions would be, different combinations of keywords could be used.

3.5.2 Main journals

Another way of monitoring the fields is through subscriptions to the journals. To identify what the main journals in the field are, we conducted the following analysis. Figure 9 shows the number of articles selected through systematic literature review per year published in the top journals (that have more than 10 publications within this SLR) from 2008 to 2018. It shows that on average there are articles relevant to this SLR in three to four out of five journals each year and the highest number of relevant articles was published in 2013. The total number of journals within the 434 selected publications is 147. The main journals identified in this study are Transport Policy (total, 22 articles), Journal of Transport Geography (total, 19 articles), WIT Transactions on Ecology and the Environment (total, 16 articles), International Journal of Sustainable Transportation (total, 14 articles), and Transportation Research Part A: Policy and Practice (total, 11 articles). One can see that the total yearly number of relevant articles (see the top of Figure 9) has approximately doubled from 17 in 2008 to about 45 in 2015-2017. This means that the academic community likely has evolved.
Interestingly, five of the most cited publications identified in Table 2 were published in the main journals identified in Figure 9. The other 11 articles were published elsewhere, which means the topic of planning for transitions towards sustainable personal mobility could be found in a diverse range of journals and – significantly – that there is no undisputed leading journal in the field.

### 3.5.3 Scientific communities

The third way of staying up to date with research is to follow certain researchers. For this purpose, we have analysed scientific communities within this SLR. A key authors network analysis (see section 2.3) showed 215 networks in total: 90 publications were written in pairs; 51 publications were written in groups of three; 31 publications in groups of four; 12 publications in groups of five; 16 publications in groups of six; 6 publications in groups of seven; 2 publications in groups of eight and, finally, 7 publications in groups of nine or more authors. Only the largest networks are illustrated in Figure 10 (below).
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.

Figure 10. The largest networks of co-authorship with countries of authors' affiliations.
The three largest author nodes are David Banister (with 14 publications in this SLR selection), Robin Hickman (ten publications in this selection) and Luca Bertolini (eight publications in this selection). They belong to the same network – Network 1, the largest one (represented by 19 publications). Moreover, between 2008 and 2018 Banister and Hickman worked together tightly, within this selection publishing six common works. This network of authors is coming from five different countries (with the majority from the United Kingdom) and have diverse expertise: planning, geography, environmental science, social science and transport science. All together they create a multidiscipline thought collective that focused on topics discussed above: accessibility [184] and ‘mobility environments’ – another way of combining land-use and mobility planning [111], planning for sustainable mobility [125], challenges of interpretation of goals into indicators [185], dialogue processes among stakeholders [186] and, related to that, integration and creation of knowledge [187]. In several articles, the researchers mention the need for behavioural change and policy implementation in order to create a modal shift away from the current dominance of private cars [188]. As for modes of transport, a combination of train and bicycle was analysed in the Dutch case [189]. Finally, researchers in this group studied the time required for decision-making in the given context [58] and developed sustainability pathways for non-OECD countries [67].

Network 2, the second largest network is based on six publications written by planning researchers from five countries and represents another thought collective. Four of the publications are about the importance of co-production of knowledge from experts and researchers to meet the goals and targets [99,113,190,191]. Two more publications in this network have a bit narrower focus. One is on radical policy change and its conflicting implications [117]. The other one is questioning the electrification of cars as a single technical fix towards sustainable mobility [164] and comes to the conclusion that it, if it would be the only focus, would not break the path-dependency of the car-based transport system, but rather take away financial and institutional resources from efforts to promote non-motorized and public transport.

Figure 10 contains two international networks (Network 3 and Network 4) that focus on quantitative analysis of urban travel in China [73,74,192–194].

Network 5 illustrates a multidisciplinary group of researchers coming from five countries working on the assessment of accessibility worldwide with the help of creation of a travel time to cities map [195]. Within this SLR these researchers have only one publication together, making it the largest network of collaborators for an individual paper. Another single article network (Network 6) was focusing on design for sustainable built environment [196].
Finally, Network 7 is international and multidisciplinary, focusing on policy for sustainable mobility in the global South [75,197].

The analysis shows the diversity of research topics and countries of affiliation. The largest network covers a broad range of topics and, as has been discussed above, has some of the most cited publications within and outside of this SLR (according to Scopus and Web of Science database analysis, see section 3.3.9). However, most of the publications in this SLR are written by small groups of authors, often working on the local scale.

4 Concluding discussion and further work

This systematic literature review has aimed to outline and map the main themes related to planning for rapid transitioning of personal mobility towards sustainability as well as their development in the past decade, analyse overlaps of different bodies of literature, and create an organised view of the field for continued information retrieval.

To sum up reflections throughout the paper, SLR as a method has its inherent limitations by not being able to identify literature outside the parameters given by the researcher. To address that, expert advice was collected (resulting in 21 additional publications) and citation analysis was performed (giving another 12 relevant publications). Although the selected articles do not cover an exhaustive list of publications in the fields of mobility, urban planning and transitions, the literature analysed here should be seen as an initial map of these areas (up to April 2018) with observations of general trends and outlines of the main gaps in research in the respective fields and their combination.

The following paragraphs briefly answer the posed Research Questions (RQs):

- RQ1: What are some prominent research themes within context-adapted urban planning for rapid transitioning of personal mobility towards sustainability?

Four different ways of talking about the temporal dimension in mobility planning have been identified. This includes travel time, planning goals and strategies, short- or long-term thinking, and, finally, the urgency for change. However, not much literature was found that discussed how we can make change towards a sustainable state happen quickly enough to meet the goals and strategies identified on local, national and international levels, keeping in mind a long-term perspective and meeting passengers’ needs to move about freely and easily.
In order to understand a large picture where rapid transitions could fit, prominent research themes were also identified. The literature that was selected in the SLR process brought up a number of themes: planning and policy for sustainable mobility and accessibility, indicators, backcasting and scenario making, modes of transport, decision-making in planning, studies of global North and global South, as well as overarching themes of equity, justice, gender, the role of institutions and co-production of knowledge in planning processes. Most of the publications were devoted to planning: who we are planning for, what the best solution is and what we focus on. However, not so many of them focus on the how: how we prioritise actions, how we make sure all the important stakeholders are included in the process, how we plan using a people-oriented, place-based approach, and how we make all this happen fast enough to sustain present and future generations.

- RQ2: How did the identified themes evolve during the past 10 years?

The analysis also shows a shift in the planning approach as the field seems to move away from the predict-and-provide [63] to the long-term-focused visioning approach [22,57,63,106,144,145]. Social sustainability is underrepresented in this selection of literature, which might be indicating a minor integration of social issues in planning processes. Recent literature, though, emphasises the importance of addressing equity, justice and equality when planning for sustainable cities. The analysis shows that there are many indicators available for different purposes. However, it was found that the main question is how to integrate them to meet all the local, regional and national requirements, as well as international agreements, such as the SDGs. Participatory approaches in planning, particularly backcasting and co-production of knowledge, are in trend, assuring a combination of academic and practical knowledge, as well as access to other types of knowledge, such as indigenous knowledge. It shows that planning is acquiring a systems approach, where needs of diverse stakeholders are addressed in relation to sustainability. So far, these approaches have not proven to bring necessary changes, but they have raised awareness among stakeholders and the general public, which is the first step to major changes.

- RQ3: What are the main related bodies of literature and to what extent do they overlap?

Planning for transitions was mentioned only once [65], and as identified above, transition and planning scholars are seemingly not collaborating with each other. In this study, it was found that this could be due to the differences in epistemic communities and perspectives taken by the scholars. We found that planners typically look forward, while transition scholars analyse the past, create pathways
for transitions and recently also started analysing the present. In all, their discussions tend to be parallel since it is not common to plan for transitions.

- RQ4: What is the ‘organisation of the field’?

As for ‘organisation of the field’, in this SLR we identified that there is no undisputed leading journal. The authors’ network analysis showed a clear dominance of one research group with the leading researchers David Banister, Robin Hickman and Luca Bertolini. Their research network is international and multidisciplinary and covers several topics within transport research.

To our knowledge no SLR on the crossroad of the fields of mobility, urban planning and transitions has been done before. The closest study that we have found that can be compared to our study was done by Wittstock and Teutenberg [198] and focused on transformations towards sustainable public transport. Their analysis can be seen as a complementing part to our analysis, as it covers one of the aspects of sustainable mobility – public transport. Our study, in contrast, has a systemic approach and analyses planning for sustainable mobility as a whole, also including, for example, walking and bicycling. Therefore, our study can likely be of value for scholars and practitioners working with questions of urban planning, sustainable mobility and to some extent, transition studies.

To conclude, the main knowledge gaps identified in the studied literature relate to the question of accelerating the transition towards sustainability. This might be an accurate reflection of a knowledge gap. It might also be related to a possible variation in terminology and approaches used to address change. Still, the many synonyms investigated and related topics investigated suggests that the gap is accurate in relation to the fields of mobility, urban planning and transition studies.

Given the identified knowledge gaps, we have several recommendations for future studies within the overarching theme of accelerating transitions towards sustainable mobility. We see two main types of studies that could be done. One could use either a systemic perspective or do research on specific elements of mobility systems and approaches. Among the latter, more analysis is required on behavioural change, such as motivating sustainable travel habits, and what policies need to be implemented to move towards sustainability in an integrated way. Furthermore, institutionalisation of planning capacity and social sustainability in mobility planning are other questions that need to be answered. It would also be interesting to analyse the temporal dimension in mobility planning in terms of technological change and policy development and implementation, and what role institutions play in this process.
Author Contributions: Conceptualization, Varvara Nikulina, David Simon and Henrikke Baumann; Methodology, Varvara Nikulina; Writing – original draft, Varvara Nikulina; Writing – review & editing, Varvara Nikulina, David Simon, Henrik Ny and Henrikke Baumann.

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Varvara Nikulina

Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.


Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.


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Varvara Nikulina

Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.

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Lost in translation: a framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture
Paper B is submitted as:

Lost in translation: a framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture

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Johan Lindal
Henrikke Baumann
David Simon
Henrik Ny

Abstract
Planning in modern urban environments requires skills to address complexity in order to move towards sustainability. Co-production of knowledge in transdisciplinary groups was found to be a useful tool in such contexts. Using the concepts of multilingualism, epistemic communities and culture, the article proposed a conceptual framework for analysing complexity of co-production settings, as an indispensable means of managing complex challenges. The framework was evaluated based on inclusiveness, cross-sectoral understanding, applicability in different contexts and time perspectives. Based on the framework, several aspects were suggested that a process leader (facilitator) would likely need to deal with when preparing for a co-production process: linguistic equality between participants, disciplinary integrity, a working culture of mutual respect, simultaneous mitigation and informed facilitation. Finally, the article suggested possible future research areas related to development of the framework, including (i) identification of levels of complexity and mapping specific tools to address complexity at each level; (ii) integration of other factors of diversity, such as gender, age, as well as (iii) political and institutional contexts.

Keywords: transdisciplinary, multilingual, multicultural, epistemic communities, multi-stakeholder dialogue, urban planning
1 Introduction

The metaphor ‘lost in translation’ here can be understood in three ways. It applies not only in literal terms – message being lost due to language constructions – but also for transdisciplinary spaces where the languages of different epistemic communities of practice (networks of experts that share a common knowledge-base) (Haas, 1992) become a barrier. The third underlying angle of being ‘lost in translation’ is the aspect of culture that cannot easily be depicted in words but still plays a crucial role in interpersonal communication of co-production processes. These three aspects therefore also take part in shaping the experience of such processes.

1.1 Transdisciplinarity

Modern cities face the increasing complexity in relation to planning necessary to address to move towards sustainability. The present capacity of our society is inadequate to do so (Brown, 2008). This challenge is relevant for local, national and international contexts, meaning that policymakers are in ever greater need of expert knowledge to be able to make well-informed choices. Experts are now found in diverse areas within and outside of academia and their joint forces – here, co-production of knowledge in transdisciplinary groups (Polk & Kain, 2015) – are necessary to tackle such complex challenges. In Western tradition, specialised knowledge became a barrier for social learning necessary to address complexity (Brown, 2008). This also affected non-Western countries whose local knowledge became inaccessible. In transdisciplinary teams, challenges of knowledge diversity are accelerated for a number of reasons such as different contexts within and between regions of the world; less shared epistemological understanding or theory of knowledge (Creswell & Poth, 2018); power relations between diverse actors and societal sectors, and culture in terms of practice, traditions, values and norms (Simon, Palmer, Riise, Smit, & Valencia, 2018). The challenges of unequal dispositions and power relations in co-producing knowledge are evident and need to be managed if the outcomes are to match the purpose of combining diverse expertise. As a starting point, one discipline must not be favoured over another (Pohl et al., 2010).

The level of complexity in transdisciplinary planning is severely increased when language barriers are present. Still, English is generally used as the everyday language as if virtually unproblematic, although it is certainly acknowledged that language is intimately linked to relations of power. This challenge has recently been highlighted by the German linguist Tilo Weber...
as a major obstacle for equal participation in transdisciplinary processes (Weber, 2018).

### 1.2 Multilingualism

Multilingualism is a widespread phenomenon in many contemporary states and urban areas. Canada, for example, has a long experience of mitigating the linguistic differences between French and English speaking citizens (Sullivan 2004, p. 991). Sweden also has five official minority languages, Finnish, Jiddish, Romani, Meänkieli and Sámi, each with its own historical legacy and legislative protection as well as some guaranteed administrative support to its speakers (Sundberg, 2013). Kenya has two official languages – English and Swahili, however there are many local languages and dialects, and even within the same city it is difficult to facilitate a dialogue (Nikulina, Baumann, Simon, & Sprei, 2018). One can also find many other examples of such contexts around the world.

Today, the need for multilingual dialogue is greater than ever. Different linguistic communities within the same region or stakeholders from regions in different countries need to co-operate in order to tackle complex societal problems, the UN and the EU being major examples of a much wider and everyday-based development. For example, the Sustainable Development Goals invite nations to collaborate in addressing a number of challenges formulated as goals. The challenges and possibilities of multilingual dialogue are essential elements in an era of globalization, multicultural societies and linguistic pluralism. Multilingualism is influenced and challenged by a still widespread universalist ideology of one common language (or lingua franca) claiming lingua franca as a prerequisite for maintaining vivid democratic dialogue (Lüdi 2015, p. 214). This is accompanied by increasing provincialism and nationalism throughout the world while the need for co-producing solutions to complex societal challenges within and across nation-borders is evident.

Georges Ludi (2015, p. 215) says:

> “The steady increase in the numbers of migrants, expatriates, exchange of scientists, etc. and the globalisation of communication through electronic media entail many forms of social multilingualism at the workplace, i.e. people with very

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21 See: https://sustainabledevelopment.un.org
Taking into account the challenges described above, solving issues across different scales will require both local and general expertise, which entails encountering both linguistic and epistemic differences (Haas 1992, pp. 12-13).

1.3 Culture

Working in a shared space of co-production in multi-stakeholder transdisciplinary group can lead to a culture shock: entering a group different from yourself (Leslie and Storey 2003, pp. 122-127), where, based on personal and working culture, a new group culture should emerge in the process. While personal culture is often subdued, working culture can become a barrier, for example, when certain stakeholders are not used to participatory approaches and feel uncomfortable openly sharing their opinions and thoughts. Cultural awareness both on a personal and on working level becomes another condition for creating an inclusive environment for the participants in the dialogue (Brouwer, Woodhill, Hemmati, Verhoosel, & van Vugt, 2016; Simon, McGregor, Nsiah-Gyabaah, & Thompson, 2003).

Being part of the same epistemic communities is argued to support such a dialogue through a shared systemic view of the challenge, enabling the identification of local needs, the framing of debate and negotiation, and, finally, the identification of suitable solutions and policies (Simon et al., 2003). These researchers also claim that local context plays a key role in co-production processes as even within the same epistemic community, challenges may arise.

1.4 Aim and target audience

These three concepts, multilingualism, transdisciplinarity and culture are not novelties and they are separately used by different epistemic communities. Based on the literature review, we could not find effective frameworks that support the process of simultaneously managing these concepts. This risks creating major obstacles for bringing matters forward in some of the most complex and pressing contemporary and future problems and thereby it also risks not creating sufficiently well-informed decisions in ongoing change processes. Therefore, the aim of this paper is to present a...
framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture.

The paper is mainly intended for facilitators, itself a diverse and ambiguous group (Mackewn, 2008). Facilitators here refer to professionals taking on the role of guiding diverse working groups, such as the cases of multicultural, multilingual transdisciplinary urban planning groups observed here. Providing facilitators with developed frameworks for such settings enables them to exercise their role and skills in a more productive way.

2 Methodology

In order to improve the ways for dealing with the challenges of understanding each other in co-production settings, a multidimensional framework that enables the analysis of translational, epistemic and cultural problems was developed.

2.1 Framework development

In order to develop a framework, we did a literature review of three areas: epistemic communities, language and culture, which was later synthesised. The results are outlined in the section 3.

2.2 Application of the framework

The developed framework was tested in three geographical locations across the Southern Baltic area. There, multi-stakeholder workshops for sustainable public transport were observed (see section 4 for more details) and followed by four interviews with the local table leaders (people who were managing small group discussions, often in their mother tongue). The list of interviewees can be found in the Table 1 (see Appendix).

Observation enables systematic documentation of events in a chosen context (Agar, 1996; Scheyvens, 2014). It creates a “textual picture” of the situation. For this specific study, the observer as participant stance was selected (Kawulich, 2005). It means that the observer can take part in the event, but priority in the process is given to the observation. During the workshops described below, the role of observer was combined with the role of facilitator. The limitations of this approach can be seen in researcher bias.
(Kawulich, 2005). As suggested in the literature, the reflexivity approach (May & Perry, 2017) was used to reflect upon the observations. Moreover, a set of short interviews was conducted shortly after the events.

For the purpose of this study, semi-structured interviews were used (Agar, 1996; Flowerdew & Martin, 2005; Mikkelsen, 2005). In the qualitative interviews with the facilitators of small group discussions (table leaders), the main themes were predetermined, whereas specific questions were raised in the process. The advantage of this approach was that an interviewee could lead the discussion and reveal information that might not have been foreseen by the interviewer.

2.3 Evaluation of the framework

The framework was then evaluated in relation to inclusiveness of co-production processes, cross-sectoral understanding, applicability in different contexts and time perspective, which constitute some of the main aspects of the co-production approach (see section 5.1).

3 Framework development

The framework that is proposed below is based on previous research and takes its origins in the literature related to epistemic communities, multilingualism and culture. These concepts are therefore described below.

3.1 Epistemic communities

Epistemic communities (Haas, 1992), or thought collectives (Fleck, Trenn, Merton, & Bradley, 1979), are to be understood as groups with shared and agreed forms of knowledge, thought styles, differing from or even fundamentally opposing those of other groups. Examples are engineers vis-à-vis social scientists in academia and public servants vis-à-vis entrepreneurs in other societal sectors. Due to various contextual, historical and contemporary reasons, these groups share specific knowledge often difficult to integrate into other fields. When successfully integrated, however, co-production of knowledge through collaborating thought collectives provides a more balanced understanding of a specific complex problem and its
solutions, while also enabling more integrated research (Baumann, 2009; Haas, 1992; Pohl et al., 2010).

Even within the same epistemic community, challenges may arise and change according to local context (Simon et al., 2018). No single thought style is able to derive the same results and knowledge everywhere, especially from a global perspective, as stated by James Esson and his colleagues (2016, p. 40) in a study of Accra’s mobility systems:

"The overarching argument that emerges from bringing a holistic approach that combines transport, mobility and livelihoods into conversation with the empirical findings is that conceptual frameworks such as the new mobility paradigm derived entirely based on conditions in the global North, are inherently limited, despite their implicit claims of global relevance."

3.2 Language

Sue Wright (2011) has argued for a lingua franca – that is English – in order to promote equal opportunity to evaluate information and make judgements and decisions in a European democratic context. This is based on a monolingual ideology with its roots in 16th century Europe, reaching its breakthrough during the late 18th century revolutions and Enlightenment (Lüdi 2015, p. 214). According to this ideology, communicative problems are to be mitigated through the use of one single language, whereas multilingualism is problematic and undesirable.

There are several reasons why this attempt at a solution is deceptive. Language acquisition is not merely a matter of a teaching and learning effort, but it is affected by ideologies, social identities, power and agency. In a socially and economically unjust urban environment, policing a diverse population to communicate using the same second language becomes, at best, a privilege reserved for the most prosperous communities. As Peter De Costa and Bonny Norton (2017) conclude: "Language learning is situated and attentionally and socially gated". In addition, multilingual individuals experience obvious benefits that are particularly valuable to knowledge production, such as enhanced cognitive functions and a higher likeliness of gaining new and creative insights (Yanaprasart & Lüdi, 2017).

Multilingual inequalities and its effects concern questions of recognition, identity, and, ultimately, morality. In the scientific tradition emanating from
Varvara Nikulina
Need for speed:
towards urban planning for rapid transitioning to sustainable personal mobility.

German philosopher George Wilhelm Friedrich Hegel (1977 [1807], pp. 113-114), recognition is either mutual – and therefore equal – or non-mutual and therefore unequal. An individual’s lack of recognition with regard to their identity is considered a form of oppression or negation of the self’s expected rights (Honneth 1992, p. 190). Due to a historical paradigm shift of class or estate partly losing its significance in favour of other foundations for social identity, such as ethnicity, gender and sexuality, language is today considered more intimately connected to recognition than before (Taylor 1994, pp. 31-32; 53-55). Not being equally recognized as a speaker means not being fully recognized as a conscious being.

A significant share of studies on multilingualism has been conducted in the educational sphere. Some findings state that in multilingual regions, such as Barcelona and Switzerland, enabling the use of multiple languages in education is not only possible but also adds value to students. Universities in both regions use innovative ways of teaching, team work and interaction – such as communicative applications and instant translation tools – required to make multilingualism productive and feasible in an organisational environment (Yanaprasart & Lüdi, 2017). In the case of the private and public transnational trade sector, Amy Artelt and Judith Sawaf (2013) observe a vast range of auxiliary devices supporting various European partners in successfully conducting multilingual operations.

One of the tools aiding multilingual dialogue is interpretation. The challenges of interpretation are well documented. First, naturally, the extra time spent on interpretation is roughly double that of a ‘normal’ dialogue. Second, data loss, for example, when data showing essential sociological variables – such as dialects and sociolects – are being translated into a standard version of the language being interpreted. Third, using a non-professional interpreter from the local area or a particular ethnic group during field work can often result in the researcher staying unsure of whether they have thoroughly understood the purpose of their research or if there has been a misunderstanding. Fourth, the nuances of irony, humour, rhetoric and politically ambiguous concepts all run a severe risk of being lost in translation (Bujra 2011, pp. 5-6). Finally, the perception of time could be a challenge. Indo-European languages have past, present and future tenses (with some variations), whereas many other language groups do not. This aspect can be easily lost in translation. Another side of the coin is ‘economic time’ vs ‘social time’, often creating misunderstandings in the development of co-operations (Mikkelsen 2005, p. 329).
3.3 Culture

Culture in terms of working and personal culture, for example traditions, procedures and perspectives, has large implications for the interrelations and interactions between the collective and the individual. An individual’s behaviour is often dramatically affected by the working group and workplace they are a part of or interacting with due to institutionalized cultural practices associated with that place and group. However, individuals themselves are also capable of affecting workplace culture to a certain extent, since they carry with them personal attributes, of which some are in turn affected by outside norms and identities such as gender (Somerville, 2005).

There is no one answer to questions of whether increased diversity between individuals is beneficial or restraining to working cultures. Indeed, there exist certain benefits of linguistic and/or ethnic homogeneity in work teams such as reduced misunderstandings and increased consensus and efficiency, whereas mixed teams can contribute to stress and anxiety. Simultaneously, known positive outcomes of mixed teams include reduced prejudice (Offermann, Matos, & Basu DeGraaf, 2014). In any case, many parts of today’s workforce are becoming increasingly diverse by design or by default, partly as a necessity and partly as a deliberate attempt at tackling challenges of discrimination. In the end, the main issue is therefore not to define whether diversity is beneficial, but rather how to optimize management of an urban environment of ineluctable linguistic diversity and its consequent communication challenges (Yanaprasart & Lüdi, 2017).

As experience from an international project between researchers and practitioners from Ghana and the UK shows, there is a need for reassessment in addressing multiple or conflicting world views even within the same epistemic community in order to help support intended beneficiaries of such projects to meet their needs and fulfil aspirations (Simon et al., 2003). Patchareerat Yanaprasart and Georges Lüdi (2017) conclude that, in the case of academia, little is yet known about how to practically manage diversity challenges in general, as the objectives in diversity policies are mainly set at a strategic level, such as to favour gender mainstreaming. Managing linguistic diversity is not expected to be an exception from the rule and could therefore be considered a blind spot for academic institutions.
3.4 Framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture

Based on the literature review, we suggest the following visualisation of the framework (Figure 1).

![Conceptual framework for analysing the complexity of transdisciplinary co-production settings in relation to epistemic communities, language and culture.](image)

The edges of the triangles on each base of the prism represent three parameters that define transdisciplinary co-production groups. These include the epistemic standpoint that participants have (see more in section 3.1), the language(s) they speak to a varying degree (see section 3.2) and the culture they more or less share (see section 3.3).

Epistemic standpoint is here differentiated between the personal level (see the edge named ‘individual’) – which school of thought each individual group member belongs to – and the epistemic standpoint of the group as a whole (see the edge named ‘group’), closely related to their occupation. The level of diversity could be different too: for example, a transdisciplinary
group in the co-production process could be looking at transport planning (edge ‘group’, low diversity) and have academics and practitioners working with this issue from different angles (edge ‘individual’, high diversity), compared to a group consisting of urban planners, where participants may well stem from various departments (edge ‘group’, high diversity) but share a similar education, working culture and perspective (edge ‘individual’, low diversity), and thereby end up looking at the same issue from the same or adjacent angles.

Language is differentiated between individual and working (see the edges named ‘individual’ and ‘working’ respectively). If a *lingua franca* is spoken, then on the ‘working’ edge it would be low diversity (everybody is sharing the same working language). If there are several languages used as working languages (there is no common language in the group), the level of diversity of working languages would be high and the more different working languages is spoken, the higher the diversity would be. The level of diversity on the edge ‘individual’ would depend on the amount of mother tongues present in the group: if there are, for example, just two languages, it would be a low diversity; if participants of co-production processes, for example, speak six different languages as a mother tongue, the level of diversity would be high on the ‘individual’ edge.

Cultural differences within the group and at work (‘group’ and ‘working’ edges respectively) add up to the complexity that a co-production facilitator could be facing. Participants of co-production processes could have different working cultures, for example, in one culture it might be the custom to address senior colleagues with the title and the last name (e.g. Dr. Lane) and in another culture it might be the custom to use the first name (e.g. Marcus). The diversity on the ‘working’ edge would be higher depending on how many such differences that can be identified. On the ‘group’ edge, culture would refer to the combination of personal ideas and customs that are reflected in a group. For example, the group culture would be of low diversity if all the participants of a co-production process would be coming from the same country, being female, eating vegan food and sharing the same interests; whereas the level of diversity would be high if the group would be international, with different worldviews, containing all genders and including diverse interests that are not shared to a high degree.

The level of diversity of each parameter separately and together as a complex entity would define what one should be prepared for and further lead to the selection of suitable methodologies and tools to support it.
4 Empirical application and findings from the three selected locations

4.1 Context of empirical studies

The context of the empirical study is three workshops (WS) within the INTERCONNECT project\textsuperscript{22} an ongoing international project (2017-2020) that received a flagship status on the European level. The project aims to reduce car dependency in the Southern Baltic area by providing user-oriented sustainable public transport in and between the participating regions and cross-border commuting. There are nine main partners and 11 associated partners from the Blekinge region (Sweden), the Guldborgsund municipality (Denmark), the Rostock municipality (Germany), the Tricity metropolitan area (Gdansk, Gdynia, Sopot, Poland), the Klaipeda municipality (Lithuania), and the Viimsi municipality (Estonia). Within the project, three main areas are in focus – demand, supply and governance of public transport. One of the project working packages called “Evidence, knowledge and experience” aims to assist local stakeholders of the partner areas in identifying current and future needs of the passengers, to facilitate co-production of a vision for sustainable public transport in the region, to identify a selection of sustainable solutions in order to address current and future challenge and to create a pathway to achieve it.

Through a co-production process between Blekinge Institute of Technology (the hosting institution that provided the project with the team of facilitators) and Region Blekinge (the project manager)\textsuperscript{23} the format to support a working package with stakeholder workshops in focus was defined and agreed upon. It was based on a community planning process model (Robèrt, Borén, Ny, & Broman, 2017) which aims to define an approach to sustainable transport planning. Development of this model was guided by the Framework for Strategic Sustainable Development (Broman & Robèrt, 2017) with its backcasting from principles approach (Holmberg & Robèrt, 2000). The model is based on four interdependent planning perspectives: resource bases, surfaces, technology and governance.

To get a better understanding of the local context of three selected partner cities, Karlskrona (Sweden), Gdynia (Poland), and Klaipeda (Lithuania), local partners of the project were invited to a dialogue that was ongoing for several months before the workshops. Local stakeholders as well as international partners got an invitation to attend the event. The main

\textsuperscript{22} See http://interconnect.one/

\textsuperscript{23} For more details, see Thematic Report for the project (Borén & Ny, 2018).
language of the workshops was English, while in each location different interpretation services were implemented.

As mentioned by Barbara Kawulich (2005), an observer can be excluded from the process due to the language of certain epistemic communities to which the observer is unfamiliar. In all three workshops, an additional layer to the risk of exclusion was the lack of a common spoken language that all participants were fluent in. A facilitator understanding both Swedish and Polish was at hand in two of the three workshops that occurred in Sweden and Poland, respectively. This enabled not only observation of the process and participants’ behaviour, but also understanding of the content of the discussion. In the last workshop, taking place in Lithuania, however, interpretation of the content was achieved only through oral presentation of summaries during the day and written forms with the notes from the discussions that were translated into English. However, nuances related to language as metalanguage (expressing underlying meanings) (Agar, 1996) could have been ‘lost in translation’ in all workshops.

In the first workshop (WS1) in Karlskrona, in February 2018, there were 43 participants originating from different countries, speaking different first languages and representing diverse epistemic communities. Most of the participants were local stakeholders living and working in the Blekinge region, with the exception of those project partners living and working in Germany and Poland. There were representatives from academia, public and private sectors, all working with questions of transport from different angles. English was spoken as a lingua franca in the large group discussions and presentations. However, when it came to break-out sessions in small groups, Swedes preferred to speak Swedish if the group was linguistically homogeneous. This meant that multilingual table leaders were collecting information delivered orally in Swedish and documenting it on flipcharts (for later presentation) and other reporting forms in English. The experience seemed not to have affected the group dynamics much, although, as one of the table leaders said: “In the mixed group participants were a bit more hesitant to express themselves [than in the native language groups]” (Wälitalo, 2018). Despite the diversity of thought collectives, participants came to the same or very similar conclusions in regard to the future of transport in the region. Many of these participants had worked together in the past, which might help to explain their resembling ways of thinking.

In the second workshop (WS2) in Gdynia, in February 2018, there were 53 participants coming mainly from Poland, in particular from Pomerania, Warmia and Mazury, represented by stakeholders from the local government, municipalities, service providers, academia and other relevant institutions. Most of them spoke Polish and only some of them understood
or spoke English. Moreover, there was one participant who spoke English and French, but not Polish. It was the first time that many of the participants met and worked together. For the duration of the workshop, an interpreter was hired who performed simultaneous (whisper) translation in smaller groups and consecutive interpretation for the entire audience. Simultaneous interpretation saved a lot of time; however, it was often a summary of what had been said. Consecutive interpretation doubled the time of the sessions, at the same time delivering interpretation paragraph after paragraph, which created the additional challenge of keeping the attention of the audience.

From the working culture perspective, workshops are not commonly used in Poland to facilitate multi-stakeholder dialogue. In order to attract participants, local organisers decided to change the title of the event from ‘workshop’ to ‘seminar’, which could be seen as misleading. During the event itself, participants were visibly uncomfortable with the format: they were unwilling to express their opinions during the sessions or ask questions at the presentations; when the question for discussion was not perceived as important for them, the session went very quickly, as not many people wanted to participate actively. Some of them left at different stages throughout the day. However, the questions of direct relevance that were identified as ‘burning issues’ (challenges they are facing right now at work) created very lively discussions, expressing different, sometimes contrasting opinions (Kuik, 2018; Wolniarska-Roszak, 2018).

In the third workshop (WS3) in Klaipeda, in March 2018, there were 17 participants representing the Klaipeda region. They were all either working for the municipality or for the city authorities. Most of them spoke Lithuanian and some spoke and/or understood English. As a solution to the multilingual challenge here, simultaneous translation through headphones was provided. Although it seemed like an optimal solution for saving time and providing sufficient interpretation, some words got lost in translation, for example, ‘accessibility’\(^\text{24}\) in Lithuanian was translated as ‘prieinamumas’ and back into English as ‘reachability’\(^\text{25}\). These two terms can have different meanings:

\(^\text{24}\) “Accessibility is the ability of people to reach goods or services as measured by their availability in terms of physical space, affordability and appropriateness. But accessibility also refers to the provision of services and facilities, job opportunities, education and housing, as well as the means of reaching them” (Simon, 2016; Waters, 2016).

\(^\text{25}\) According to Oxford Dictionary, reachable means “able to be reached; accessible or achievable”, as well as “able to be contacted”, purely in terms of being able to reach something: “a lush tropical island only reachable by seaplane” or “make sure that you set goals that are reachable” (‘reachable | Definition of reachable in English by Oxford Dictionaries’, n.d.).
definitions and underlying assumptions and can therefore not be assumed to be used interchangeably. Moreover, in the process of simultaneous translation it was difficult to monitor whether the intonations were kept to underline certain statements. As culture and background of the participants were if not the same, but very similar, the discussions were calm, and conclusions corresponded to one another (Valadka, 2018).

4.2 Testing of the framework in three geographical locations

Based on the empirical study, we can place our workshops within our suggested framework as follows (Figure 2):

![Figure 2. Conceptual framework for analysing complexity of co-production settings in relation to epistemic communities, language and culture tested in the selected workshop (WS) locations.](image)

Workshop 1 (WS1) involved several epistemic standpoints (medium diversity on the ‘individual’ edge), but most of them were working with questions of transport (meaning that the ‘group’ edge was of a medium diversity). Participants spoke several languages (a bit higher than medium diversity on
the ‘individual’ edge), including the *lingua franca* (a bit lower than medium diversity on the ‘working’ edge). Personal culture was diverse (medium diversity on a ‘group’ edge), as participants originated from different cultures. However, with the exception of the partners from Germany and Poland, the rest were accustomed to Swedish working culture (relatively low diversity on ‘working’ edge). The workshop was designed to highlight the Swedish traditions of, for example, *fika* (coffee break) and celebration of *semla* day (the day of special pastry called *semla*, a cream-filled bun). Celebrating diversity and welcoming all the different thoughts and opinions was a way to reunite everyone in a traditional way and get to know each other better.

By contrast, Workshop two (WS2) was characterised by a high diversity of culture, epistemic standpoints and languages. It was multilingual (with no common language, high diversity on the ‘working’ and ‘individual’ edges), multicultural (representing different cultures and working in different contexts, high diversity on the ‘group’ and ‘working’ edges) and involved different epistemic standpoints as participants represented a wide range of stakeholders (high diversity on the ‘individual’ and ‘group’ edges). Such a context was very demanding from the organisers’ side as they also came with their own cultures, epistemic standpoints and languages. The size of the group created additional pressure of keeping the attention and motivation throughout the day.

The last workshop (WS3) was quite homogenous among participants (low diversity on ‘individual’, ‘group’ and ‘working’ edges in relation to epistemic standpoints, language and culture), but the organisers came from very different contexts, which created a challenge in facilitating the day as the language barrier was the strongest obstacle. One cultural element that united them all was the International Women’s Day that was widely celebrated in the past, but only seldom nowadays. It was used as a starting point for the day to share a cultural tradition with all participants.

These three observations illustrate how epistemological, cultural and linguistic diversities intersect and interact in the shaping of a transdisciplinary multilingual urban planning dialogue. The diversity of epistemic standpoints was especially evident during the first and second workshops, when conversations were ongoing at the breaks, but these had quite different outcomes nonetheless. The co-production process at these workshops provided a good platform for knowledge co-creation, as diversity of epistemic communities in small discussion groups was encouraged (both on voluntary basis – participants were invited to create discussion groups with people they have never worked with before; and through planned distribution of participants based on their affiliation). The third workshop,
however, does seem to indicate that linguistic and cultural diversities do not categorically endanger transdisciplinary group work when intentionally managed. However, the presence of ‘calm’ discussion and absence of differing conclusions and critique may equally so be viewed as a lack of co-production of knowledge, in which a certain degree of critique and conflicts can be beneficial (Brouwer et al., 2016; Perry & Atherton, 2017).

Discussions in all three workshops were facilitated by a common understanding of the issue, but this was dependent on efficient communication between participants. When language barriers emerged, common understanding decreased somewhat. The first workshop, on the other hand, maintained a lingua franca ideal of English while Swedish was being used as an informal majority language, apparently leading to some participants being less active. In that way the questions of recognition, identity and morality were addressed by the organisers for the formal part of the event. However, in the breaks the participants were left without an interpreter, which means that networking and socialising was affected by it and the group naturally fell apart into those speaking one common language or lingua franca.

Furthermore, throughout all three workshops, cultural norms – such as the presence versus absence of workshops as part of the professional routine – contributed to challenging the degree to which discussion matters were treated. The professional cultural background was one of relative familiarity during the first and third workshops, whereas participants in the second workshop experienced a clash of both epistemic and cultural collective values while simultaneously facing the challenge of multilingualism. Participants of the third workshop had more in common epistemically, linguistically and culturally than those of the second.

4.3 Additional findings from the framework application

The starting point of this article was to investigate whether providing proper means for equal possibility of using one’s language in multilingual dialogue should be considered essential although insufficient in the context of multicultural transdisciplinary urban planning groups. Furthermore, each particular context needs to be addressed beforehand on its own terms with regards to its diversity challenges. The three observed geographical locations experienced only small differences with regard to official content and purpose but were significantly affected by nuances in culture and multilingualism, on top of the aforementioned general challenges of
epistemic diversity. All things considered, the workshops displayed a relative awareness and preparedness regarding multilingual challenges, but were less concerned with the sum of linguistic, epistemic and cultural clashes. As we see through the lens of the framework, multicultural, multilingual transdisciplinary groups require thorough preparation for co-production facilitation in order to address the topic of discussion and acknowledge diversity yet in a just way. It was found that the following elements should be taken into consideration to promote effective co-production:

*Linguistic equality between participants.* Participating actors, stakeholder groups and individuals need to be able to speak a language of their choosing, rather than a predetermined *lingua franca*. One language must not be favoured above others and participants must still be prepared to work together rather than in enclosed linguistic communities. This principle needs to be routinely reinforced and acknowledged, in order to secure the active participation of all stakeholders in mitigating a complex issue. Different types of interpretation can be at hand in this process, especially when moving towards a higher complexity, however the organisers need to weigh all the pros and cons of different forms of interpretation and be ready to compensate for risks.

*Disciplinary integrity.* The prerequisites for each participating discipline or profession need to be taken into account. Some may have less access to intellectual content than others, and others may have limited experience of practical problem-solving. Regardless, maintaining an equal ground for each discipline and profession to partake in group work, discussion and knowledge production is essential. This challenge may risk being overlooked in situations also facing linguistic diversity.

*A working culture of mutual respect.* Whereas participants hail from diverse normative conditions and traditions of working, that is working culture, it is essential that an additional culture of mutual respect needs to be fostered in a multicultural, multilingual and transdisciplinary group. This requires both understanding and a certain level of attention paid to the background of various participants. Naturally, however, facilitators of workshops, meetings and other urban planning contexts have limited access to information regarding the background of the participants.

*Simultaneous mitigation and informed facilitation.* The main challenge is to combine and tackle the aspects of epistemic communities, language and culture during the same event or situation. This challenge needs to be mitigated by introducing awareness-raising models, as described in Figure 1. If facilitators are made aware of the complexity of group diversities when
preparing for the event, the likeliness of them being able to manage such diversities is significantly increased.

5 Evaluation of the framework

5.1 Critical assessment

There are several aspects of co-production that we can assess the framework upon (Polk, 2015), such as inclusiveness, cross-sectoral understanding and applicability to different contexts. Additionally, we assess the framework from the time perspective.

The proposed framework accounts for potential differences in a transdisciplinary group to prepare process leaders (or facilitators) to conduct more inclusive workshops or meetings. Enabling every participant to express themselves and understand others fully empowers an individual to contribute to the process and confirms their recognition.

One could argue that there are other aspects that could be included into the framework. We are not suggesting that it is comprehensive as it would not increase its usefulness. Alternatively, we suggest that there could be supporting tools and methods that could go along with the framework to, for example, quantify the assessment of the situation that process leaders are concerned with and recommend concrete steps to change their process.

One of the underlying purposes of co-production is to increase the understanding between different sectors in a transdisciplinary context. Addressing complexity of transdisciplinary groups could lead to more inclusive processes and provide a platform for a more open and efficient sharing of knowledge and experiences. Of course, using this framework does not ultimately mean that a better understanding between the sectors will immediately occur. However, not addressing aspects discussed in the above framework might hinder mutual understanding substantially.

Finally, the aspect of time can be evaluated differently using this framework. On the one hand, time is money, and in a Western planning model (Mikkelsen, 2005) ‘economic time’ plays an important role in the planning of processes. We intend to do more within a shorter period of time: in other words, to be more efficient. In this case, an increase in complexity would require more time for preparation of the workshop or event and the workshop or event itself would last longer, for example, due to the chosen type of interpretation (see section 3.2). On the other hand, time can be seen
as an asset in the process – the more time is put into dialogues (considering there is a well-prepared process and content), the greater are the chances for understanding the situation and each other’s perspectives and for avoiding segregation in the group. It is suggested by Britha Mikkelsen (2005) that in a Western tradition ‘social time’ has lost its value while this is not true for indigenous people, for example.

The framework developed in this article, based on the literature and empirical studies, is expected to be possible to use to assist in preparation for facilitation of many different kinds of dialogues, not only in transdisciplinary contexts of complex problem-solving. It could also be a potentially useful assessment framework for participatory processes in a wide range of contexts such as kindergartens, schools, governance and businesses in which diversities pose communicative challenges. The framework could perhaps also be used as a basis for the development of new and innovative communication tools, applications and strategies for facilitating groups encountering these diversities. We further believe that such a framework could be used as a complementary tool to a certain community planning process model (Robèrt et al., 2017), as a starting point for the planning of transdisciplinary co-production work on local, national and international levels.

5.2 Comparison with other studies

In our literature studies we have not been able to find a framework for the assessment of complexity in multilingual multicultural multi-stakeholder transdisciplinary environments. The identified publication that was the closest in relation to the context was written by Derek Armitage and colleagues (Armitage et al., 2011). There, they describe the challenges they have been facing during the co-production process – the role of power, the varying degree of shared understanding and the normative context. The role of power in their work was defined as the “willingness to recognise and accept existence of different systems of understanding and practices” (Armitage et al., 2011, p. 997). Compared to the aspects of our framework, it is somewhat similar to the combination of disciplinary integrity and a working culture of mutual respect (see section 4.3). In relation to that, Derek Armitage and his colleagues write about shared understanding in terms of acceptance of different schools of thought. We, on the other hand, view normative context – shared desire to use knowledge – as an embedded value of co-production and as more related to the content of the workshop or event rather than to the work with participants in its own.
Another study that our framework could be compared to is dealing with multilingualism in education. Emma Dafouz and Ute Smit suggest the ROAD-MAPPING framework with six relevant components (Dafouz & Smit, 2016, pp. 403-409): “Roles of English, Academic Disciplines, (language) Management, Agents, Practices and Processes and Internationalisation and Glocalisation”. The authors address academic disciplines (closely related to epistemic communities in co-production processes) and language management (using similar concepts as we do) similarly to our approach, analysing the participants’ side of the process. Furthermore, they look at factors – agents, practices and context – that we view as external and that could be monitored but do not affect the complexity of transdisciplinary environments.

What is interesting to note, is that studies performed by two different groups of scholars, whose research is described in this section, and us, are attempting to increase inclusiveness in co-production processes. This underlines the importance of the work that we present in this article.

6 Concluding remarks and further work

In line with its purpose, this article has presented a framework for analysing complexity within urban planning by integrating three significant factors of contemporary diversity challenges: multilingualism, multiculturalism and varying epistemology. These three factors play major roles when present in dialogue and need to be approached to create the best conditions for moving forward with the issues that such dialogues are supposed to manage. The framework is aimed at the process leaders, mostly facilitators of workshops or co-production processes. It was found that, while being skilled in mitigating conflicting interests and ideas between participants, facilitators need further developed techniques for dealing with wider multiple challenges of diversity within groups.

Future studies on the subject also have the potential of further developing the here suggested framework by identifying levels of complexity and mapping specific tools to address complexity at each level, as well as by integrating other factors of diversity, such as gender, age, as well as political and institutional contexts.

26 Glocalisation – “the practice of conducting business according to both local and global considerations” (‘glocalization | Definition of glocalization in English by Oxford Dictionaries’, n.d.; Robertson, 2014).
Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.

Acknowledgements

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Appendix

Table 1. List of interviewees.

<table>
<thead>
<tr>
<th>Name</th>
<th>Date</th>
<th>Location of the WS</th>
<th>Role in the WS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lisa Wälitalo</td>
<td>March 18, 2018</td>
<td>Karlskrona, Sweden</td>
<td>Table leader</td>
</tr>
<tr>
<td>Anna Wolniarska-Roszak</td>
<td>March 26, 2018</td>
<td>Gdynia, Poland</td>
<td>Table leader</td>
</tr>
<tr>
<td>Rokas Valadka</td>
<td>May 28, 2018</td>
<td>Klaipeda, Lithuania</td>
<td>Table leader</td>
</tr>
<tr>
<td>Jarosław Kuik</td>
<td>May 31, 2018</td>
<td>Gdynia, Poland</td>
<td>Table leader</td>
</tr>
</tbody>
</table>

References


Varvara Nikulina
Need for speed:
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Varvara Nikulina

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Need for speed:
towards urban planning for rapid transitioning to sustainable personal mobility.

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Sustainable Transport Futures: Analysis of the Selected Methodologies Supporting the Planning Process Towards Achieving Goal 11 Sustainable Cities and Communities

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Henrikke Baumann
David Simon
Frances Sprei

Abstract

A quarter of energy-related greenhouse gas emissions (GHG) originate from the transportation sector. Continuously increasing demand for transportation services worldwide is one of the main urban challenges addressed by Sustainable Development Goal 11, target 2. One way to address this issue is to develop an integrated transportation system that can ensure confidence and comfort for the passengers. This will contribute not only to the customers’ experience but also to operators and authorities through sustainable, cost-effective, and profitable services. Conversely, the lack of such a system or a poorly managed system prevents the economy and society from realizing its potential. In the transition towards sustainability, the planning process of complex systems such as transportation often requires supportive tools and methods, such as futures methodologies that assist decision-making by providing information about possible futures. In today’s rapidly changing environment, forecasting tools do not always provide the expected outcomes since it is difficult to predict all the unexpected events. Therefore, there is a demand for alternative methods that not only grasp the constant changes but also create additional value (for example, meeting the needs of multisectoral collaboration and creation of common vision). The present article investigates the usefulness of three such methodologies, namely backcasting, foresighting, and SymbioCity, for the planning process
of the bus park and railway station in Kisumu, Kenya, and Centralen in Gothenburg, Sweden. The paper's contribution is a description of the Kenyan transportation system (which has not been studied in detail before), planning process, and pertinent issues related to the stations both in Kisumu and Gothenburg, located in the sharply contrasting contexts of global South and global North, respectively. On the basis of field research, interviews, and feasibility study of futures methodologies, the paper concludes that backcasting is the most suitable of the methodologies for both places, since it can be applied at a small scale, and provides creative solutions and has a high level of integration of stakeholders. Furthermore, the paper examines the application of the futures methodologies in multisectoral urban transitions apart from transportation and draws conclusion on what can be learnt from it.

Keywords: sustainability, development, transition, transportation, planning process, multisectoral collaboration, current state, backcasting, forecasting, bus park, railway station, Kisumu, Kenya, Centralen, Gothenburg, Sweden

1 Introduction

Transportation has not always been featured on development priority lists. It was not part of the UN Millennium Goals, but it is included in Agenda 2030's Sustainable Development Goal (SDG) 11: “make cities inclusive, safe, resilient and sustainable”. Its Target 11.2 requires all states “by 2030, [to] provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notable by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons” (UN n.d.). The transportation sector has several leverage points that can be influenced. They are closely connected to demographic changes. Factors such as aging population, growth of the middle classes, and increasing integration of women within the labor market increase demand mobility. It is both a challenge and an opportunity for development.

One of the main challenges facing cities worldwide is to meet constantly increasing demand for transportation services. A well-planned public transportation system provides passengers confidence in their daily mobility. Conversely, when the system does not function adequately, neither a city nor its inhabitants can realize their true economic potential. This is often the case in rapidly growing urban cities such as Nairobi (Daganzo et al. 2007; Becker 2011; Graeff 2013) and Kisumu. At the same time,
Gothenburg—which was awarded a Climate City 2015 prize in the Earth Hour City Challenge from Worldwide Fund for Nature (WWF 2015)—faces several transport challenges related to carrying capacity, air pollution, and transition towards a sustainable system (Cullberg et al. 2014). These require an understanding of how the system works, its strengths, weaknesses, and possibilities for improvement.

**Aim and Scope**

This paper investigates the usefulness of backcasting methodology in the planning process of the bus park and railway station in Kisumu, Kenya, and Centralen in Gothenburg, Sweden, compared to standard forecasting methodologies. Moreover, it examines applications of the futures methodologies in multisectoral urban transitions other than transportation and draws conclusion on what can be learnt from it. Both cities face challenges for transitioning towards sustainability, within which the respective study sites have strategic importance. The paper does not provide full descriptions of the futures methodologies (backcasting, foresighting, SymbioCity approach), which are readily available elsewhere, but concentrates on the main aspects related to their applicability in diverse contexts. Since Gothenburg’s planning process and current situation have been studied to a greater extent than Kisumu, special attention is devoted to Kisumu, for which only limited documented data exist.

**2 Methodology**

Two main themes are investigated: the respective planning processes and current state of the stations in Kisumu and Gothenburg. In order to understand the planning process in Kisumu, learning about Kenya and its transportation, document studies and 13 interviews were conducted. For the Swedish context, a literature study and two interviews were conducted.

To better understand the suitability of the particular futures methodologies (backcasting, foresighting, SymbioCity approach) in the planning process, these were analyzed based on the framework proposed by Baumann and Cowell (1999). Backcasting can be used as a supportive tool in the decision-making process, which with time developed a strong focus on sustainability. Contrary to the other selected methodologies, a backcasting exercise produces a strategy towards achieving the locally defined goal (Holmberg 1998). Moreover, it is recommended as a planning tool by the UN (UN n.d.).
The research process includes the field studies, which require appropriate preparation, implementation, and analysis methods and techniques. Prior to the field studies, the following issues were taken into account: the research ethics (ESRC 2015), field study (Mikkelsen 2005) and positionality (Simmel 1908; Godbole 2014). While in Kenya and Sweden, methods of sociological primary research (Driscoll 2011) were applied: observation (Agar 1980; Scheyvens and Storey 2003; Kawulich 2005), semistructured interviews (Arksey and Knight 1999; Burton 2000; Flowerdew and Martin 2005), the “snowball” technique (Arksey and Knight 1999; Scheyvens and Storey 2003), and survey (Burton 2000; De Vaus 2013). This was followed by analysis using SWOT (Maylor 2010), stakeholder management (Thompson 2015) and futures methodologies in the planning process (Amara 1991; Dreborg 1996; Baumann and Cowell 1999; Holmberg and Robèrt 2000; Vergragt and Quist 2011; Ranhagen and Groth 2012; Kuosa 2014).

3 Results and Analysis

3.1 Planning Processes in Kisumu and Gothenburg

The planning processes of Kisumu and Gothenburg differ substantially. Due to the small capacity in Kisumu’s City Planning Department, most planning services are outsourced to private actors. The standardized procedure defined by the national government is followed (Otieno 2015a, b). Currently, there is one large plan—the Integrated Strategic Urban Development (ISUD) plan—that is in the process of being enacted into law in order to ensure the legality of the document and its legal enforceability (KAM 2016). Its main purpose is to guide new investment rather than being a mandatory master plan. Bureaucratic procedures and the reactive approach of the local planners constantly delay the planning process. Lack of long-term vision is another challenge that has to be addressed urgently (Eising 2015; Otieno 2015a).

At the time of the empirical study, work at the railway station was frozen. Nevertheless, on the international level, Kenya Railways has a big developmental project, which also involves Uganda, Burundi, and Rwanda (Mumo 2014). The main aim of the project is to build a standard gauge regional system (since the current one is old, partly destroyed and does not correspond to international standards). The project has two consecutive phases. The first phase involves the Mombasa–Nairobi line (by July 2016, 75% of work was complete), while in the second phase, the railway will continue from Nairobi to Malaba (the border town) through Kisumu. The second phase has been confirmed by the government in 2016, with up to 85%
financed by the China Exim Bank and 15% by the Kenyan Government (Mutambo 2016; Mwende 2016).

For the next 15 years, the Kenyan government has picked five priority SDGs for primary development. Goal 11 is not one of them, which means that the transportation sector will remain as a secondary area of interest (Muchangi 2015). In Sweden, every municipality/city decides for itself whether to include the SDGs in their planning or not and which ones are the most appropriate. Gothenburg’s Climate City 2015 award, for example, shows local authorities’ willingness to work and report on the progress towards achievement of the SDGs (WWF 2015).

As for Sweden, the planning process there is structured and well defined. Considerable attention is devoted to the preparatory stage. Consultations with the regional state authorities and municipalities are implemented on the early stages; consultations with the citizens on initial proposals are a norm (Larsson 2006). One example of such inclusion is the “Älvstaden” project, which includes big installation displaying the future Gothenburg city center, with the screens on the walls show the past, present, and future development projects (Göteborgs Stad 2015). Gothenburg also has a defined procedure for the planning process (Kain 2015).

One of the largest current projects in Gothenburg is the Västlänken project by Trafikverket (the national traffic and transport authority) (Trafikverket n.d.). It is meant to create a new commuter and regional train connection with three new stops and reduce the number of modal changes required to reach several parts of the city. Further exploration of the projects in Gothenburg is beyond the scope of the current paper.

Development of the transportation sector in Gothenburg forms part of the Transport Strategy for 2035. The plan incorporates a sustainability perspective in its vision. The strategy was developed “in an integrated process with the Development Planning Strategy and the green strategy” (Hellberg and Jonsson 2014). Based on the policies that influence the transport strategy, several small-scale plans are being developed or in progress, i.e., road safety programme (City of Gothenburg 2010b) and bicycle programme, which is in the development stage (July 2016) (Hellberg and Jonsson 2014). In Gothenburg, the planning process faces challenges in terms of collaboration among the large number of stakeholders involved.

Both Gothenburg and Kisumu have a strategic advantage in long-term planning based on their waterside locations. At the same time, the main difference is the perception of time: while Sweden has visions and development plans for 2030, 2050, etc. (City of Gothenburg 2010a, Hellberg

3.2 Current Situation: Organization of the System, Key Stakeholders, and Pertinent Issues

3.2.1. Kisumu

Kisumu is a national and regional center for trade, commerce, industry, administration, and communication. It was developed as a port and railway terminus due to its strategic location. Kisumu was the connection point for passengers and freight via Lake Victoria and overland to Tanzania, Uganda, Rwanda, and Burundi as well as to the other big Kenyan cities, such as Nairobi and Mombasa. The transportation system in Kisumu is represented by water transport (the lake port and the dry port managed by Kenya Ports Authority), air transport (Kisumu international airport), road transport with a variety of means (boda-boda27, piki-piki28, tuk-tuk29, taxi, matatu30, long-distance bus), and railway transport (as mentioned before under the large developmental project).

The bus park is a self-evolved unit in Kisumu. It provides mainly short-distance services within and between neighboring counties, but is also served by several long-distance operators. The bus park has no statistical data documented. To grasp the size of the park, based on the assumptions of the city planner and bus park superintendent, and assuming that every matatu leaving the park is full in the mid-season (summer), an educated guess would be that about 11,000 people per day travel through the bus park (Otieno 2015a; Rawinji 2015).

At the initiation stage, there was limited planning by the state—mainly provision of designated space. The structure of the bus park involves many actors that have different levels of power to influence the current situation and future development. Figure 1 depicts the system of the bus park that was identified during the field studies. The most decision-making power and ability to influence the current state in the bus park belongs to the government, although transportation is not a governmental service. There is

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27 Boda-boda – usually motorbike taxi, but can be bicycle taxi.
28 Piki-piki – motorbike taxi.
29 Tuk-tuk – motorized scooter taxi with a canopy.
30 Matatu – minibus with 14 seats on average.
top-down control over the government-owned land. Regulations connected to the services provided by the park are dictated by the National Transport and Safety Authority (NTSA). The service providers are Savings and Credit Co-operatives (SACCOs)\(^{31}\). In Kisumu, three groups of SACCOs operate within the bus park: the ones that are registered in Kisumu (24 cooperatives), SACCOs of the western region (19 cooperatives) and SACCOs registered in the neighboring county—Kisii. One can see that the number of Kisumu SACCOs represents 1/3 of total SACCOs that are involved in the provision of services at the bus park. It means it is more difficult to influence the situation at the bus park due to the involvement of external stakeholders.

![Figure 1. Bus park system.](image)

Current demand for services is met, although at first sight, it might not seem so. The SACCOs act reactively and ensure their performance, sometimes with a certain delay. Since there is no future development plan, there are no projections towards future demand and further study is needed.

The main challenges observed at the bus park are sanitation, solid waste, and maintenance of the park (especially drainage system), which often leads to damages of the vehicles. Based on our survey of the SACCOs' representatives, 11 main challenges were identified within the bus park, with the top three being harassment of passengers and vehicles by *touts*\(^{32}/\)manambas\(^{33}\).

\(^{31}\) SACCOs can exist in any industry, not only for transportation. In order to become a legal SACCO, a group of individuals has to register at the Ministry of Co-operative Development and Marketing. Usually one SACCO in the transportation sector operates on one route (Graeff 2013).

\(^{32}\) Tout – a person who provides route and stop information to passengers.

\(^{33}\) Manamba – tout who is possibly involved with criminal groups/activities.
inadequate space (too many vehicles for very limited area), competition with other vehicles (*probox*, *tuk-tuk*, private cars). Overcoming these challenges would be a stepping stone towards achieving SDG 11 Target 2. However, further research on the state of the art of private services and more detailed investigation on how to meet future needs would be necessary to develop the transition pathway.

The controversial role of *touts* was flagged as a sensitive or important issue by all survey respondents. The *touts* are vital to the operation of SACCOs, providing route and stop information to passengers. The controversy exists partly because many of the *touts* are or were homeless street children and possibly are involved with criminal groups/activities. The methods of coercion used by the *touts* can go beyond what would be considered respectful or appropriate in Europe. This is in part due to the intense competition between SACCOs and the importance of convincing customers to travel with their vehicles. There is thus a negative perception of these *touts*, as customers may feel unsafe due to the threat of physical or other types of harassment. It is controversial to suggest removal of these *touts*, not least due to the difficulty of enforcement, but also due to the important and useful role that they play (information messengers) and the fact that it is a valuable means of employment for people with fewer opportunities.

Several challenges outside the bus park (from the transportation system perspective) were also identified based on the SACCOs’ survey. The main three were high taxes, bad roads, and bribery to traffic police (“Corruption from traffic officers is a big problem. Please act immediately!!”).

Pertinent issues identified above are not directly related to SDG 11 except for the issue of touts, maintenance and challenges outside of the bus park. That supports the decision of Kenyan’s government to give priority to the other SDGs, namely Goal 3 (good health and well-being), Goal 4 (quality education), Goal 5 (gender equality), Goal 8 (decent work and economic growth), Goal 12 (responsible consumption and production), and Goal 13 (climate action) (Muchangi 2015; UN n.d.).

### 3.2.2. Gothenburg

Centralen Gothenburg is an interchange that combines bus station (the Nils Ericssonterminalen), central railway station and the surrounding territory: city buses, trams, taxis, stores, and a major indoor shopping center. It is a

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34 Probox – model of the car with five seats.
hub that provides urban, national, regional, and international services. The three main challenges identified at Centralen that make the planning process difficult are large number of actors, lack of cooperation among actors, and the physical state of individual elements of the station.

The number of actors involved within Centralen Gothenburg is very high, which makes the system difficult for the researcher to understand. The “Market model” has been applied to the central station in Gothenburg: different parts of the technical system were outsourced and built separately to mimic a market. Each element of the station belongs to different actors: “The tracks are managed separately, as well as traffic management and traffic information; to run the trains themselves constitute another business, broken down by a growing number of different actors; command and information in the wagons handled by yet other companies; ongoing equipment maintenance of yet other actors; Station buildings, commercial space located in a separate company, while waiting rooms operated by another, with the exception of the platforms that are subject to the return of another player. There are some examples of how the system has been fragmented. There are also several different operators running the same traffic route” (Meijling 2014).

Jernhusen is a key player in the system and planning process in Gothenburg with considerable perceived power. This state-owned company “owns, develops and manages properties along the Swedish railway” (Jernhusen AB 2011). Its activities embrace both passenger transportation and freight.

Centralen meets today’s travel demand and the future forecasts are taken into account in its development plans. The challenge remains the same—communication and collaboration among the stakeholders. From the brief exploration of Gothenburg’s situation, improvement of the physical appearance of the station as well as the management system would help to contribute to SDG 11.2 to make it more safe, accessible, and sustainable.

### 3.3 Futures Methodologies in the Given Context

#### 3.3.1 Futures Methodologies in the Planning Process

Futures methodologies are not obligatory elements of planning processes; however, they could be of great help. They allow stakeholders to see how the future could/should/would look, thus making the future more concrete. When conducting such studies, it is very important to figure out who your target stakeholders are (planners, companies involved, etc.), because it will
affect how the results will be presented. The analyzed approaches of backcasting, foresighting, and SymbioCity are used for the same purpose of assisting the planning process, but they require different information and sometimes different procedures. They may also outline new perspectives.

The outcome of backcasting is a step-by-step strategy for sustainable development towards the vision shared by the stakeholders. At the same time, it is difficult to know the future possibilities and the process requires thorough selection of the experts for qualitative data collection. The forecasting methodologies (foresighting and SymbioCity approaches) provide scenarios of how the future will look based on the current trends and historical data. In this case, it is difficult to avoid “locked-in” solutions and there might be a need for more expert contributions. Therefore, all three methodologies can be equally recommended to apply in the developmental process in general.

In the given context, the following points arose. Several authorities (Eising 2015; Nzomo 2015; Otieno 2015a) working with city development in Kenya mentioned during the interviews that it would be helpful to use foresighting or similar methodologies in their planning work. No universal approach would work for any environment. It always depends on the local context. That is why the three selected approaches are discussed below taking into account current state of the stations in Kenya and Sweden.

### 3.3.2 Kisumu

Based on the assessment of futures methodologies described above, only foresighting would be difficult to apply in Kisumu since it requires historical data, which are rarely documented. Thorough research on the previous performance would be necessary as the basis of the approach. The other two compared approaches (backcasting and SymbioCity) would be possible to apply in such environment. Their respective challenges and advantages are discussed below.

In case of backcasting, different level of education and different spoken languages (Luo\(^{35}\), KiSwahili\(^{36}\) and English) could be a challenge in creating common ground among the stakeholders involved in the early stages of the process. The high number of key stakeholders that are important for the participatory workshop would make it even more complex.

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\(^{35}\) Luo – local language in the Lake Victoria region in Kenya and Tanzania.

\(^{36}\) KiSwahili – first Kenyan national language, followed by English.
assessment of the current state, environmental, economic, social and spatial elements should be investigated, described, documented, and illustrated. The land issue would top the challenge list. Kisumu is a rapidly growing city and its transportation system is developing and evolving without official control. Various different means of transport create bigger demand for their services. The bus park is growing informally too, which makes the users (passengers as well as drivers) think that the only solution is bigger space for the bus park (based on the interviews and the survey). This topic would be one of the most sensitive among the stakeholders. To make the process inclusive, one would need to run several participatory workshops (on vision creation and discussion of the results). Nevertheless, using backcasting would ensure participation in the development process, creation of the shared vision among the stakeholders, and a concrete strategy towards the formulated goal. At the time of the study, backcasting had not been applied in Kenya, so using it would be a trial and might require adjustments due to the different culture.

Using the *SymbioCity* approach is also possible given the conditions in Kisumu. It is mainly used for city development; however, elements of the approach can be used on a smaller scale, such as the bus park. In fact, SymbioCity suggests using backcasting in the final stages: developing alternative solutions, evaluating their impacts, and integrating them further into the strategies.

Related to that, further challenges could be specification of the objectives, indicators, and targets. As mentioned before, for Kenya tomorrow is the future and actions of the government are reactive. If one is looking for solutions for the short term, SymbioCity could be a better option, although definition of “short term” has to be justified.

Depending on the main reason for using futures methodologies, the result could be a single solution or several solutions. If one desires a single answer—one way to go—SymbioCity would be a good option. However, if several alternative solutions are required in order to better understand what are the possibilities and opportunities, backcasting would be a better option.

When talking about development of the bus park, the scale is small in comparison to the city level (and deals mostly with one social problem despite the complexity); therefore, it would be easier and more “user-friendly” to apply the backcasting approach.
3.3.3 Gothenburg

For Centralen in Gothenburg, the SymbioCity approach would not be useful to apply. It has several dimensions which would not contribute to development, for example, building design and architecture. The station already has all the necessary constructions and building something additional would be use of materials, while sustainability often implies (depending on the local conditions) trying to avoid building new and using what already exists.

Backcasting and foresighting would be applicable in the given conditions of Centralen. Advantages and disadvantages are described below.

The challenge for using backcasting would be involvement of stakeholders. Their number is very high and even organizing a joint meeting could prove challenging. Nevertheless, backcasting provides creative solutions to existing problems and helps to avoid lock-ins. With the rapid development in the Nordic countries, backcasting would allow new ideas to develop based on possible trends, instead of relying on existing technologies. At the time of the study, backcasting had been applied in different sectors of Gothenburg city and municipality, which led to dialogue creation among the stakeholders and some innovative solutions.

Foresighting could also work in Gothenburg. However, since the results are based on historical data and the current situation, it might lead to unimaginative solutions.

Depending on what expectations from the futures methodologies are, foresighting could be helpful in order to see what the possible future of Centralen could look like, while backcasting would show what steps be undertaken to reach the envisioned future.

3.3.4 Futures Methodologies in Multisectoral Transitions Other Than Transportation

Three examples were investigated related to household nutrition, cities, and systemic change for sustainability and climate adaptation in coastal regions, where the main methodology used was participatory backcasting.

The Sustainable Household Nutrition (SHN) project as part of “Strategies towards the Sustainable Household (SusHouse)” took place between 1998 and 2000 in the Netherlands. It was followed up throughout the process, as
well as its impact after 10 years. The project had a limited budget, which has been identified as one of the main reasons for low levels of active stakeholder participation and the project did not have follow-up activities when the application for future funding was rejected (Quist 2007).

Wolfram and Frantzeskaki (2016) examine the necessity of radical systemic changes in urban development in order to have sustainable development without crossing planetary boundaries. No matter what direction one would take and which indicators they choose to assess the results, the current planning processes require additional support of futures methodologies.

Another project combining backcasting and adaptive management was implemented in South Africa (van der Voorn et al. 2012). The authors underline the constraints of the current methodologies that are being applied for adaptation strategy creation. Therefore, the two above-mentioned methodologies have been combined. The proposed framework is suitable for application in the strategy and policy creation and has been tested in the Breede-Overberg coastal region.

The investigated cases show the need for alternative methodologies to support the planning process. The complexity of current challenges requires an interdisciplinary and multisectoral approach that would contribute to sustainable development transitions. Such an approach should also contribute to the policy-making process. Futures methodologies can be complementary to existing ones and the combinations with the other emerging disciplines can have a great positive impact on the sustainable transitions.

Funding is one key challenge in the follow-up after the implementation of futures methodologies. In case of Kenya, it is crucial. As was investigated during one of the interviews, depending on what the funding would become available for, the government would react correspondingly adjusting all the plans and current activities (Otieno 2015a). Similar attitude can be seen in the Netherlands with the SHN project, where stakeholders’ activity was low due to the limited budget (Quist 2007).

**Conclusion**

The sharply different planning processes in Kenya and Sweden both have defined procedures; however, reality does not always correspond to the norms or rules.
As described before, Kisumu railway station has a revival plan, which is at the end of the first phase of implementation. The bus park, on the other hand, is not managed by any level of government—hence it is unique in terms of self-development. There is no plan for its development yet, hence there is a chance of incorporation of the appropriate SDG target. Several interviewees working with development planning mentioned the need for futures methodologies in their work (Eising 2015; Nzomo 2015; Otieno 2015a).

The transportation sector in Gothenburg has several approaches to sustainability integration at different levels. Nevertheless, our literature review and interviews show that planners are facing several challenges (Hellberg and Jonsson 2014; Isitt 2015; Kain 2015). That is why supportive methodologies could be useful for further development.

Futures methodologies can be applied to support the planning process. Depending on the local context, both backcasting and forecasting methodologies can be used. Backcasting would actually work in both the Kisumu and Gothenburg cases, since it can be applied at a small scale, it provides creative solutions and has a high level of integration of stakeholders. The modest study reported here has demonstrated its value, receiving a positive response from key interviewees in both cities.

Learning from the other fields, one can say that futures methodologies make a great contribution to the complex challenges that the world is facing and contribute to addressing several SDGs at the same time. Future development and adaptation to the local conditions would be the next steps in the research.

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Varvara Nikulina
Need for speed: towards urban planning for rapid transitioning to sustainable personal mobility.


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Frances Sprei is in the Energy and Environment Department, Chalmers University of Technology. Her research assesses different personal mobility options, such as alternative fuelled vehicles and electric vehicles as well as innovative mobility forms such as car sharing and ride sharing. Economic, political, technical, and behavioural aspects are taken into account. Her research methods are interdisciplinary combining quantitative methods such as econometrics with qualitative methods such as interviews.
The Paris Agreement, the recent Special Report from the Intergovernmental Panel on Climate Change, and the Sustainable Development Goals are examples of United Nation’s facilitated calls for urgent climate action and more generally for a rapid transition of society towards sustainability. Since urban personal mobility is a significant contributor to society’s current sustainability challenges, and considering current trends of population growth and urbanisation, there is a strong need to develop enhanced support for urban planning for rapid transitioning to sustainable personal mobility.

This thesis is part of a wider effort to develop methodological support for such planning and action. The aim of the thesis is to provide a partial foundation for that wider effort by: (i) identifying and organising prominent research themes related to the above topic; and since previous research points to benefits of a transdisciplinary, multisectoral and multicultural approach, (ii) exploring and addressing the complexity of co-production processes in such contexts; and (iii) analysing the appropriateness of some prominent planning approaches for the desired planning support.

The aim is pursued through a systematic literature review, including bibliometric analyses, and two empirical case studies, including workshops, interviews, field studies and feasibility studies. One of the case studies included participants from several countries in the Southern Baltic region and the other case study tested the usefulness of different planning approaches in the local context of Kisumu, Kenya and Gothenburg, Sweden, respectively.

The thesis provides a map of some prominent research themes and discusses their relevance to the field of urban planning for rapid transitioning to sustainable personal mobility. The analysis of the identified themes and their development over the past ten years shows that there has been a shift in mobility planning from ‘predict and provide’ towards participatory visionary approaches. This, in turn, has led to new challenges, related to, for example, epistemic communities, language and culture. Furthermore, it is seen that sustainability considerations have become increasingly pronounced in the urban mobility planning literature. However, different dimensions of sustainability are often considered individually (e.g. the ecological and social dimensions) and coordinated approaches to sustainable mobility planning are virtually lacking.

At the methodological level, the thesis provides a preliminary conceptual framework for analysing complexity in co-production processes with regard to epistemic communities, language and culture, as well as a discussion of the usefulness of four specific planning approaches for the desired planning support, namely the backcasting, transdisciplinary co-production of knowledge, foresighting and SymBioCity approaches.

The overall conclusion is that there is a need for research that would show how mobility actors can contribute to resolve pressing issues related to climate change fast enough without compromising other aspects of sustainability, including how temporary trade-offs can be addressed in a strategic way.