

WHY IS THERE CHANGE IN TRAVEL BEHAVIOUR? IN SEARCH OF A THEORETICAL FRAMEWORK FOR MOBILITY BIOGRAPHIES

JOACHIM SCHEINER

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Summary: In the past decade, life course approaches to travel have emerged that seek to understand the dynamics of travel behaviour over the life course. While this concept, often labelled ‘mobility biographies’, has generated a multitude of studies, it still lacks theoretical underpinning. This paper discusses key concepts drawn primarily from psychology and sociology that may help understand the mechanisms that contribute to stability and change in travel behaviour. Specifically, it discusses levels of change and stability (ranging between the individual and ‘the system’), factors that serve resistance to change (habits, heuristics, personalities, and regimes), factors that trigger change (such as changed requirements, opportunities, or abilities; motivation; the interplay between attitudes and context; stress; expected outcome of change), stages of behavioural change, and the role of socialisation in stability and change. The paper concludes with an outline of research needs. This includes making stronger links between qualitative and quantitative approaches, linking mobility biographies with research on the social embedding of travel, looking at interactions between life domains, behavioural dimensions, and population groups, and the further development of policy approaches.

Zusammenfassung: Im vergangenen Jahrzehnt haben sich lebenslauforientierte Ansätze der Mobilitätsforschung entwickelt, mit denen die Dynamik des Verkehrsverhaltens über den Lebenslauf hinweg besser verstanden werden soll. Dieses Konzept der ‘Mobilitätsbiografien’ hat eine Vielzahl von Studien hervorgebracht; dennoch fehlt es an theoretischer Untermauerung. Dieser Beitrag diskutiert Schlüsselkonzepte, vorwiegend aus der Psychologie und Soziologie, die zu einem besseren Verständnis der Mechanismen beitragen, die zu Stabilität oder Veränderung des Verkehrsverhaltens führen. Der Beitrag diskutiert folgende Punkte: unterschiedliche ‘Levels’ von Veränderung und Stabilität (vom Individuum bis zum ‘System’); Faktoren, die Veränderungen hemmen (Gewohnheiten, Heuristiken, Persönlichkeitsfaktoren, Regimes); Faktoren, die Veränderungen auslösen können (veränderte Erfordernisse, Gelegenheiten und Fähigkeiten; Motivation; das Zusammenspiel von Einstellungen und Kontext; Stress; erwarteter Nutzen der Veränderung); Stadien der Verhaltensänderung; die Bedeutung der Sozialisation für Stabilität und Veränderung. Der Beitrag schließt mit einer kurzen Skizze von Forschungserfordernissen. Diese beinhalten eine stärkere Verknüpfung qualitativer und quantitativer Zugänge, die Verknüpfung von Mobilitätsbiografien mit Forschungen zur sozialen Einbettung der Mobilität, die Betrachtung von Interaktionen zwischen verschiedenen Domänen des Lebens, Verhaltensdimensionen und Bevölkerungsgruppen, und die Weiterentwicklung anwendungsorientierter Forschungsansätze.

Keywords: mobility biography, life course, travel behaviour change

1 Introduction

Over the past decades, a number of research approaches to travel behaviour have emerged that aim to investigate change. They may be classified into three broad strands. Firstly, studies have shed light on short term variability in travel behaviour from day to day and from week to week. These studies have made clear that there is much variation in destination choice, mode choice, route choice, choice of departure time and other behaviour under the seemingly robust, routinised surface of transport (et al. 2012; RAUX et al. 2012; STREIT et al. 2015; see CHATTERJEE

et al. 2016 for linking short term variability to mid-term change). Secondly, the effects of voluntary travel behaviour change campaigns on mode choice have been studied to evaluate policy programmes, such as travel demand management concepts (ROBY 2010; ENOCH 2012). Thirdly, the long-term development of travel behaviour throughout people’s lives has been investigated using labels such as mobility biographies (LANZENDORF 2003; SCHEINER 2007), life course approach (CHATTERJEE et al. 2013; SHARMEEN et al. 2014; GOULIAS and PENDYALA 2014) or life trajectory approach (OAKIL 2013; RASOULI and TIMMERMANS 2017). Geography plays a prominent role in all these

research strands. While the strands are closely related to one another, this paper focuses on understanding long-term stability and change in travel and is thus situated in the mobility biographies literature. It nonetheless draws considerably on the wider behaviour change literature. This begs the question as to why travel behaviour change should be studied under the notion of the life course or biography. This is because behavioural changes typically end up in the formation of new routines/habits and therefore may have long-term consequences; and because they are embedded in wider social, economic and spatial settings that are stable in the long-term. Thus, the evolution of individual travel behaviour over time can be seen as an interplay between stability and change.

The travel behaviour change literature in all these strands is driven by empirical studies and the trial and evaluation of politically desired travel change. This may explain a certain lack of theoretical mechanisms offered by this literature in explanation of findings. However, as long as theoretical mechanisms that help understand why change happens (or not) are inadequately understood, practical projects may fail, and they can hardly be transferred to other practices. In addition, more theoretical reasoning can also contribute to wider scope and richer empirical research. For instance, to date, this research has strongly focused on estimating the effects of life course events on travel, although the approach is much broader than this may suggest.

A literature search reveals work on theories of change in a number of disciplines¹⁾. However, only some of this literature seems appropriate for application to mobility biographies. The closest theoretical links to mobility biographies can be found in some psychological theories that aim to understand behaviour and, thus, behavioural change. Some of these theories have found their way into mobility biographies research (e.g. the idea of script based habits, or the theory of planned behaviour, FUJII and GÄRLING 2003; BAMBERG et al. 2015). Sociological ideas have

provided another basis for existing mobility biographies studies, e.g. in terms of an interpretive-reconstructive approach (SATTLEGGER and RAU 2016), or in terms of links between long- and short-term decisions (LANZENDORF 2003).

This paper aims to contribute to the development of a theoretical basis for mobility biographies. The primary focus is not on how change can be deliberately achieved but on understanding why and how travel behaviour change occurs anyway – or not. It draws on various existing but isolated theoretical ideas on mobility biographies and links them with theories developed elsewhere that help understand stability and change in travel behaviour. The aim of the paper is thus to synthesise various existing ideas rather than to reconstruct any theory in detail. As a secondary aim, this synthesis is used to suggest some future directions for mobility biographies research.

The paper is structured as follows. Section 2 briefly outlines basic theoretical understandings of travel behaviour, and Section 3 presents the basic ideas of the mobility biographies approach and identifies their potential for theoretical advancement. Section 4 comprises the main novel contribution of the paper. It introduces a number of approaches from various origins that may serve to improve the theoretical understanding of mobility biographies. This is undertaken by introducing different levels of change (Section 4.1) and concepts that help understand resistance to change (4.2), by discussing the reasons why events and processes that occur in different life domains as well as outside the life of an individual may trigger changes in travel (4.3), and by introducing a stage model of the process of travel behaviour change (4.4) and the basic ideas of socialisation and linked lives (4.5). Section 5 attempts to briefly summarise these steps into a framework, and Section 6 outlines some research consequences.

2 Basic theory of travel behaviour

The most widely accepted theory to explain travel behaviour is probably the idea of a rational individual who maximises the net benefit of travel, whereby benefit is valued against the generalised costs of travel. Benefits are primarily a function of the activity performed at the destination, while the time, money and effort spent on the trip are considered generalised costs (MCNALLY and RINDT 2007). Though this latter assumption is contested by studies that find that people do not necessarily aim to minimise their travel but rather find a comfortable

¹⁾ This includes psychology, sociology, medicine, educational studies, international development cooperation, management and organisational development. A rather broadly defined Scopus search for “theory of change” (October 2016) resulted in 789 hits. Searching for “theory of behavioural change” or “theory of behavioral change” reduces the number to merely 37 hits. Leaving the theory out and searching for “behavioural change” (or behavioral change) AND transport AND travel leads to 226 hits. Strikingly, combining “theory of change” AND transport results in 17 hits (14 when transport is replaced by transportation, 8 when transport is replaced by travel), but with little actual reference to transport or travel.

and satisfying balance between travel and stationary activities (ORY and MOKHTARIAN 2005), the idea that travel is an effort helps in understanding why people tend to use habits (see Section 4.2 for more detail) in their travel behaviour that minimise the effort of constantly re-considering decisions, once they have been made.

While the benefits of activities may explain why people travel, they do not help in understanding why individuals prefer certain travel modes over other modes. Travel mode choice may be explained by considering the service qualities of various modes against one another.

Since the 1970s, the so-called activity-based approach to travel (actually a broad range of approaches) has raised awareness about travel being embedded in patterns of activities and time-use, rather than travel being understood merely as isolated trips (JONES et al. 1983; MCNALLY and RINDT 2007; BULIUNG and KANAROGLUO 2007, for a critical position see MILES et al. 2013). This has developed into a strongly differentiated research field that attempts to understand daily household and personal activity schedules, their purposes, start and end times and durations, activity places, trips that link these places and modes used. The social, economic and spatio-temporal embedding of activities and trips constrains the activity and travel choices made.

The increasing number of variables that are used to model travel behaviour have been grouped in various ways. For instance, BUSCH-GEERTSEMA and LANZENDORF (2015) distinguish between situational and personal factors. The former refer to accessibility, which is reflected in three components: land-use, transport, and a temporal component, while personal factors include sociodemographics and psychological variables. Psychological variables, more specifically attitudes, were studied to some extent in the 1970s (see KROESEN et al. 2017, for discussion), but it was only from the late 1990s that interest in ‘soft factors’ such as attitudes, personality traits, lifestyles, and values re-emerged in attempts to better understand their role for mode choice or destination choice, rather than just assuming their relevance (see the theoretical considerations in VAN ACKER et al. 2010; for an empirical example see HEINEN 2016).

While studies of ‘soft factors’ typically rely on individualist conceptions of travel, another relatively recent strand in travel studies focuses on the role of personal social networks in travel behaviour. This research looks at private (and, sometimes, job-induced) relationships such as family networks, kin,

colleagues, and friends, and aims to find associations with destination choice, distances travelled, or mode use. Yet other studies investigate interactions in time use and travel within households, e.g. between spouses, or between parents and children. The embedding of an individual in his/her personal networks can be seen as a part of an individual’s decision context (LIN and WANG 2014; HO and MULLEY 2015).

All this research contributes to the development of a nuanced picture of factors that affect travel. At the same time, the various relationships between these factors are now understood as a complex network of interactions. Still, the basic conceptions tend to rely on a cross-sectional, static understanding, although it is often implicitly assumed that such factors are causes while travel is an effect. As an example, travel attitudes are typically treated as causes of travel in residential self-selection studies, although it is very likely that this notion of a unidirectional relationship is incorrect (FESTINGER 1957; BOHTE 2010; SCHEINER 2018). Longitudinal approaches such as mobility biographies may help disentangle such relationships.

3 Mobility biographies – basic ideas

The mobility biographies approach makes use of the basic ideas of travel theory and aims to develop a life course oriented, dynamic framework. Life course and biography research have a rich tradition in various disciplines (see MORTIMER and SHANAHAN 2003, for life course studies; CHAMBERLAYNE et al. 2000; ROBERTS 2002, for biography studies). Time geography provides an important point of origin for mobility biographies, as HÄGERSTRANDS (1970) idea of space-time paths have been – though only rarely – applied to the life span (MARTENSSON 1979). Time geography also inspired early seminal work that categorised travel behaviour by life cycle stages (HANSON and HANSON 1981; KOSTYNIUK and KITAMURA 1982; SALOMON and BEN-AKIVA 1983), with clear references to life course dynamics (CLARKE et al. 1982). The life cycle perspective was later applied in dynamic transport models such as MIDAS (GOULIAS and KITAMURA 1997) or ALBATROSS (TIMMERMANS and ARENTZE 2011). FRIED et al. (1977) conceptualised activity/travel needs as a product of a set of social roles. They theorised that behaviour will be adjusted if a mismatch appears between a person’s needs (as determined by the roles) and the perceived fit of the environment (e.g., the distribution of activity opportunities) to these needs.

In hindsight, all this work can be seen as fore-running the mobility biographies approach. The term itself was introduced by LANZENDORF (2003), while at the same time similar ideas were developed elsewhere (e.g. VAN DER WAERDEN et al. 2003).

There are a number of key concepts in life course studies that have been utilised in mobility biographies studies. The central idea is that lives can be understood as temporal paths or trajectories, and any point on such a path can be understood as a consequence of past experiences and decisions made, as well as future expectations, anticipations and aspirations (GIELE and ELDER 1998). The paths are structured by life stages (or phases) that are characterised by social roles and statuses, and their combinations (e.g. employed father, student mother). Changes in social role or status are called transitions, and go along with life events (e.g. entry into school, marriage), also called life course events, or key events (CHATTERJEE and SCHEINER 2015; SHARMEEN et al. 2014; MÜGGENBURG et al. 2015).

With respect to interrelations between various decisions made in a life at a certain stage, a hierarchical structure between long-term, mid-term and short-term is commonly assumed, in which long-term decisions shape the conditions and options for future short-term (and future longer-term) decisions (SALOMON and BEN-AKIVA 1983; LANZENDORF 2003; MILLER 2005; OAKIL et al. 2011; GOULIAS and PENDYALA 2014). For instance, long-term residential choice is typically assumed to shape mid-term vehicle ownership choices, that in turn shape short-term daily travel choices. Suffice to say that reverse relationships may occur on all levels.

Five major elements can be identified that play a key theoretical role in the mobility biographies approach. These elements are linked with sub-sections in the subsequent section.

(1) Though individual in nature, life courses develop within a societal aggregate. Hence, mobility biographies need to be understood in a wider context, i.e. in historical circumstances and processes in time and space. This is why they may be cohort specific, rather than universal, and may even be specific for certain sub-groups within a cohort, e.g. for men or women. For instance, expecting to be driven (rather than self-driving) was a shared experience among women, but not men, in earlier cohorts (and still is for recent cohorts in some countries). This suggests that different levels of change (society, interpersonal relations, individual...) need to be distinguished. This is discussed in Section 4.1 with a focus on the behavioural level of individuals, but also plays a role in later sections (e.g. in socialisation).

(2) Habits, which are reflected in the routine character of daily (travel) action, resulting in strong behavioural stability over time. Habits are a powerful, but not the only, factor that counters change. Resistance to change may also be a personality trait that is specific for some people. What is more, resistance to change also operates on an organisational or system level (Section 4.2).

(3) Close relationships between individual mobility biographies and other domains of the life course, as also highlighted in ZHANG's (2017) life-oriented approach to travel. These relationships point towards the links between the "dividuals" of an "in-dividual" (HÄGERSTRAND 1970), but they do not in themselves provide theoretical mechanisms to explain why changes in a domain result in changes in another domain. Similarly, one may ask why events and processes that occur outside the life course of an individual (e.g. in the transport and land-use system) trigger change in travel (Section 4.3).

(4) Significant changes in mobility that are motivated by transitions, events and learning processes over an individual's biography, and breaks in routines. A large portion of empirical mobility biographies work focuses on the impact of key events and transitions on mobility, i.e. mostly on mode choice and car ownership (ZHANG et al. 2014). These events have been classified by MÜGGENBURG et al. (2015) into (1) life events (or life-cycle events, life course events) that directly relate to the private or professional career, (2) adaptations in long-term mobility decisions (similar to mobility milestones, as defined by RAU and MANTON 2016), and (3) exogenous interventions (either targeted or not to achieve travel behaviour change), including disruptive events (MARSDEN and DOCHERTY 2013) and critical incidents (VAN DER WAERDEN et al. 2003)². The events may be deliberate choices, foreseeable but unavoidable events, or unexpected events that are beyond the control of a person or household (OAKIL et al. 2011, 221), but this classification does not comply with the three-fold classification above. Longer-term, gradual processes have been less studied. They may be due to learning processes and experiences made, as well as changes in needs and

² Due to lack of space this paper cannot discuss the classification of events and processes in detail. It should be noted, however, that the classification of events still deserves some attention in the future. For instance, critical incidents such as an accident or a flood disaster are not interventions, as the very notion of an intervention presupposes intention.

aspirations induced by gradually changing life situations. The process of travel behaviour change has been captured in stage models (Section 4.4).

(5) The links between someone's life course and the life courses of others in their social environment. These links may be studied using terms such as 'linked lives' (ELDER et al. 2006), socialisation, or peer groups. As the mobility biographies approach has been developed as an individualist approach, this point has attracted relatively little attention. It suggests strong links to recent research on the role of personal social networks for travel including both intra-household (or intra-family) (HO and MULLEY 2015) and extra-household (LIN and WANG 2014; SHARMEEN et al. 2014) interactions, and also indicates the importance of socialisation (Section 4.5) that links the individual to his/her wider social environment and is expressed in different levels of change (Section 4.1).

Mobility biographies studies have closer links to life course research than to biography research. As outlined above, the life course is typically conceived as a sequence of events and role transitions that a person lives through from birth to death (ELDER et al. 2006). In contrast, a biography is understood as a subject's self-reflective, meaningful action within the temporal structure of his or her own life (SACKMANN 2007, 50). Accordingly, biography studies tend to reconstruct the subjective meanings someone associates with his/her own life (ANTIKAINEN and KOMONEN 2003) while life course studies attempt to objectively measure sequences and structures in people's lives, e.g. by asking for pre-defined stations, events or sequences (see HOLSTEIN and GUBRIUM 2000, for a constructivist approach to the life course that may help overcome this gap). Nevertheless this paper uses the term mobility biography as it has been applied widely for related research in the past decade.

In the past few years, the reliance on statistical significance of cause-impact relationships has raised criticism of the mobility biographies approach. MILES et al. (2013) claim that mobility biographies studies to date are less fruitful than they could be because most studies are limited to statistical associations between past experiences and actions pre-defined by the researcher, and later behaviour. They call for a self-reflective, qualitative-hermeneutic understanding of people's narratives about their own biographies. In a similar vein, SATTLEGGGER and RAU (2016) suggest a reconstructive-interpretative approach and claim that mobility biographies studies should view people's memories as oral history that

shapes present action, rather than questioning the validity of recall data. This approach aims to discover latent, less conscious structures of meaning in mobility whereas more conventional mobility biographies studies typically examine realised behaviour and the impact of measurable variables or, in the case of qualitative studies (e.g. JONES et al. 2014; BONHAM and WILSON 2012), look for more overt meanings. At the same time, biographies are understood as social entities that do not necessarily follow linear temporal and cause-impact structures, and that combine and reflect social reality as well as subjective experiences (SATTLEGGGER and RAU 2016).

Overall, there are two basic epistemological understandings represented in mobility biographies research, which may perhaps be labelled 'positivist-structuralist' versus 'hermeneutic-interpretive-reconstructive'. These relate to life course and biography research, respectively, and they reflect a most basic discussion of paradigms in social sciences (GIDDENS 1976). Attempts have been made to bridge this gap to some extent in transport studies (e.g. SCHEINER 2005; GOETZ et al. 2009; SCHWANEN 2011), but on the other hand, one may well argue that the gap is actually quite productive and thus need not be closed (though certainly bridged). In any case resolving this issue is not a matter for a single paper. Hence, it is not further discussed here.

4 Understanding stability and change in mobility biographies

The five key elements of mobility biographies research outlined above will be elaborated upon in this section. Firstly, the wider societal context in which mobility biographies develop in a certain historical situation needs to be considered. It is hence necessary to distinguish between multiple levels (Section 4.1). Secondly, while much mobility biographies research focuses on change, a number of factors on different levels serve stability (Section 4.2). Thirdly, mobility has close relationships to other life domains, and changes in such domains may trigger changes in mobility. Understanding change is the main focus of Section 4.3. Fourthly, unravelling the process in which change unfolds can profitably involve the use of stage models (Section 4.4). Lastly, the term socialisation helps further understanding of how an individual life course unfolds in the context of related alters (Section 4.5). Figure 1 attempts to visualise the connections between these elements. It is further discussed in Section 5.

4.1 Sorting levels of change and stability

Distinct levels of analysis can be identified in the literature on theories of change, with authors either focusing on individual (behaviour, attitude) change or on systems change (system transformation, macro social change). In between these two extremes there are theories of organisational change that typically look at enterprises or administration. Individual travel behaviour change is the main interest of mobility biographies research, though interactions with other individuals, as well as organisations and societies, need to be taken into account. Looking at the span between individual and organisational levels, AMPT and ENGWICHT (2007) provide a helpful classification of theories following HALPERN et al. (2004):

(1) Individual level theories. These theories include 'classical' psychological theories that help explain behaviour stability and change, such as instrumental and classical conditioning theory (PAVLOV 1927; SKINNER 1953), cognitive dissonance (FESTINGER 1957), and the consumer information-processing model in economics with its idea of heuristics (IVERSKY and KAHNEMAN 1974). While this basic literature has clearly remained extremely valuable, it is very much limited to the individual.

(2) Interpersonal behavioural theories. These theories focus on the role of interactions, social embedding, role models, or mentoring. They include social cognitive theory with its key concept of self-efficacy (BANDURA 1977), social networks and support theory in which support may be understood as a form of social capital on the individual level (HOUSE 1981), social influence and interpersonal communication (based on authority, reciprocity or mutuality) (KELLY and THIBAUT 1978), attribution and balance theories that are based on ideas of biases in perceptions, beliefs and attribution of events and behaviours (HEIDER 1958). Though not discussed by AMPT and ENGWICHT (2007), the theory of interpersonal behaviour should also be included here as it highlights the role of affects, attitudes, and social factors such as norms and roles for the formation of behavioural intentions and thus behaviour while at the same time recognising the importance of past behaviour and the formation of habits and facilitating conditions for behaviour (TRIANDIS 1977).

(3) Community theories of behaviour that relate to groups, organisations, social institutions and communities. They include, firstly, social capital theory (BOURDIEU 1985; COLEMAN 1988; PUTNAM 1995) that highlights the interactions and cooperation between people living in a neighbourhood and states that so-

cial capital helps explain the livelihood of an area. Secondly, innovation diffusion theory seeks to understand how new practices, ideas or goods spread in society and space over time. It states that the diffusion of an innovation (e.g., a practice) depends on its relative advantage over previous practices, its compatibility with the needs, habits or values of those who potentially adopt the practice, its complexity (or ease of use), and its potential for trialing (i.e. the chance to experiment) (ROGERS 1962). Thirdly, tipping point theory highlights the role of thresholds in the process of change. It states that change may accelerate like a 'social epidemic' at a point where a certain threshold or critical mass is reached (GLADWELL 2000).

The role of 'mass' points to system change theories that focus on an aggregate 'system' level. An example is KÖHLER et al. (2009), who discuss the chances of achieving a transformation to sustainable mobility. They describe the interweaving and coordination of activities between various societal subsystems (economic, social, cultural, infrastructural, regulative). The total of cognitive, normative and regulative institutions are called a sociotechnical regime (GEELS 2005 2012) that can be understood as a set of shared practices, standards and regulations. This approach is multi-layered in itself, in that it distinguishes between three nested levels of (1) wider, global sociotechnical landscapes, in which (2) the regimes are embedded, and (3) niches, in which innovations may emerge.

This paper cannot discuss all these theories in detail but some are picked up again below. At this point it is important to be clear that the different levels must be linked. There cannot be communities or organisations without individuals, but on the other hand individual action cannot be adequately understood without taking into account the organisation of individuals in social groups and economic, administrative and political institutions. This can best be described as a reciprocal relationship (GIDDENS 1984), though sociological debate emerges time and again as to which level gains priority over others.

Employing an individualist perspective in any case does not involve relinquishing the idea of a society as an entity. It rather implies a methodological decision to start analysis from an individualist perspective ('methodological individualism', GIDDENS 1976), but still consider the role of organisations and aggregates. For instance, theories that highlight the role of social norms for behaviour, such as the theory of planned behaviour (see below), may be individualist, but still provide conceptual links to inter-indi-

vidual, societal (or community) theories as the very idea of norms presupposes something ‘normal’ that is conceived as an outcome of collective agreement. The ideas of socialisation and linked lives also link individuals with the society they live in.

These links may be shaped in myriads of ways, and they are on multiple levels, not just on two or three. In terms of travel behaviour, they may include links between individuals, household and family networks (as can be seen in interactions between family members in travel), non-governmental organisations and lobby groups (such as motorist or cycling associations), enterprises (such as car manufacturers), neighbourhoods, community or upper-level administrations (e.g., planning agencies), political stakeholders, and more. Links may be organised on the local or regional level, or based on social, political or economic interests without geographical sorting. Policy is in itself an example of a societal subsystem (in transition theory terms) that works as a mutual link between levels. As regulation is primarily a top-down process while simultaneously policies emerge in bottom-up processes (in democratic systems), policies link the micro level of individuals with the macro level of organisations, the economy and society.

4.2 Resistance to change: habits, heuristics, personalities, and regimes

The most widespread theoretical concept used to explain why behavioural change may not occur is habit. Psychologists have argued that people develop habits based on internal scripts which they automatically retrieve to reproduce action without the need for the effort of weighing arguments (see FUJII and GÄRLING 2003, for a transport context). Habits work as behavioural ‘recipes’ that can easily be applied in situations that are experienced as similar to other, previously experienced situations. Thus, “the formation of habits is a mechanism to make life easier” (BUSCH-GEERTSEMA and LANZENDORF 2015, 34). Habits result in a simple form of path dependency – a good predictor of someone’s behaviour tomorrow is his/her behaviour today.

(Manifest) habits are visible in repeated, routine behaviour. Conversely, however, repeated behaviour does not in itself provide evidence of habits being at work. People may repeat their behaviour because they have found an individual optimum solution and have no reason to change (HOWARTH and RYLEY 2012; JOHNSTON and DEEMING 2016). On the other hand, those who show the strongest degree of a par-

ticular behaviour may have the strongest inclination to change due to variety-seeking and a desire to reduce boredom.

In that they reduce complexity and uncertainty, habits resemble the idea of heuristics (or shortcuts) developed by TVERSKY and KAHNEMAN (1974). Both work as behavioural ‘recipes’. Heuristics are however not necessarily linked to ‘automatic’ behaviour, such as habits, but may be used in a conscious, ‘controlled’ way. They are naive judgements applied to handle complexity and uncertainty in real life. Travel behaviour has been recognised to be an extremely complex form of behaviour (e.g., HANSON and HANSON 1981; McNALLY and RINDT 2007), but on the other hand it is very prone to repetition and routine, especially when it comes to frequently made trips such as the commute, where daily circumstances in terms of time of day, destination and distance hardly vary.

Heuristics are simplifications of situations that are stereotypically applied as long as they practically work, irrespective of whether or not the information processed meets reality. As such, they tend to stabilise behaviour, rather than contributing to change. When applied in slightly varied situations in which behaviour meets unexpected reactions, however, precisely the application of heuristics may result in change. On the other hand, in exactly such situations circumstances may prevent people from using ‘recipes’ such as habits or heuristics. This may motivate them to develop new or revised heuristics. Conversely, there may also be habits that still exist on a latent level, and in situations of change they may be re-enacted and develop into manifest habits (SCHWANEN et al. 2012).

The use of habits and heuristics are relatively universal ways of acting. Resistance to change may also be a personality trait that is specific for some people, but not all. Risk aversion and aversion of regret that may occur in travelling due to choices made under uncertainty (e.g. one does not know whether an alternative mode or route is as beneficial as it appears) may lead to ‘choice inertia’, i.e. resistance to change (CHORUS 2014; BEN-ELIA and AVINERI 2015). NORDEFJÆRN and RUNDMO (2015) use SCHWARTZ’ (1977) norm activation model and find that various dimensions of resistance to change negatively affect the acceptance of push measures against the private car. The effects of travel preferences (called transport priorities in this study) point in the same direction. Preferences for flexibility, safety and security – attributes that are perceived to be linked to the private car – negatively affect the acceptance of push measures.

In a similar vein, HEINEN (2016) suggests that “threats to one’s identity may cause resistance to change” (238). This is when identity is constructed around symbols, beliefs or activities associated with a particular behaviour (e.g. driving) (see POLK 1998, for gendered identity and the car). On the other hand, lack of self-efficacy can cause resistance to change when someone does not believe that (s)he is able to achieve behavioural change or the desired outcomes (see below).

Persistence of behaviour can be due not only to individual-level habits or personality traits, but also to a higher, system level that prevents change, as multi-level transition theory argues (GEELS (2005 2012 for the transport sector). KÖHLER et al. (2009, 2986) point out that “stability and cohesion of societal systems are established and reinforced through cognitive, normative and regulative institutions”. This also refers to political, economic, and – explicitly – sociotechnical systems. The concept of regimes has been used to understand the forces that prevent change: “Regimes typically focus on system optimisation rather than system innovation, because habits, existing competencies, past investment, regulation, prevailing norms, worldviews and so on (...) result in path dependencies” (KÖHLER et al. 2009, 2986).

Even though regimes tend to achieve a stable state, they develop over time, and they may experience gradual trends as well as disruption. Individual life courses are embedded in such historical changes (as highlighted by GOULIAS and PENDYALA 2014). To ensure the adequate interpretation of mobility against the background of economic, social, technological and political conditions at a particular time and place, these conditions need to be taken into account. Such historical conditions may be reflected statistically in cohort or period effects in travel (WEIS and AXHAUSEN 2009; SCHEINER and HOLZRAU 2013). For instance, emigration and long-distance commuting were not just individual but collective experiences among East Germans after German reunification in 1990.

Reconstructing historical states and trends is a considerable challenge for mobility biography studies, and requires considerable knowledge of historical context and great care. For instance, the increase in mass motorisation over the past century may be reconstructed easily, but (for Germany) this is true only on the national level, not on a spatially or socially disaggregated level. At what point in time, and to what degree, a social norm of car ownership emerged from this trend is far more difficult to reconstruct.

4.3 Triggering change

The most frequently researched idea in mobility biographies studies is that changes in social role or status and associated life events trigger change in travel behaviour. This idea is in line with the well known links between activity patterns and travel, suggesting that different life domains are linked to travel changes, as events and transitions are typically linked to one or more domains other than mobility (e.g. housing, employment, household, social networks, health...) (ZHANG 2017). This may result in another form of path dependency. Long-term travel evolution may be the outcome of choices made in another life domain, e.g. car dependence based on residential choice. However, these considerations do not answer the question of *why* key events affect travel.

BUSCH-GEERTSEMA and LANZENDORF (2015, 36–37) argue that key events (or their anticipation) change the life situation and, sometimes, conditions for mobility. Habits do not work anymore because travel requirements, opportunities and/or abilities (‘ROA model’, HARMS 2003) may have changed. Travel behaviour is reconsidered, and deliberate decision making becomes necessary. The ROA model states that travel (1) requirements, (2) opportunities and (3) abilities precede attitudes and perceived behavioural control – two of three subjective factors used in the theory of planned behaviour (the third is subjective norm). The ROA model thus links the – basically intra-personal – theory of planned behaviour with extra-personal, situational factors.

The conceptual trigger between change in any ROA component and reconsideration of travel behaviour may be the emergence of stress. This has been suggested as a key theoretical mechanism by MILLER (2005) and explored for the case of car ownership by CLARK et al. (2016a). In their model, life events produce a discrepancy between current (car ownership) needs and actual (car ownership) state, and this discrepancy produces stress and reassessment (similarly: OAKIL et al. 2011, 211; MÜGGENBURG et al. 2015). Similarly, stress may be due to cognitive dissonance between attitude and current state of behaviour (FESTINGER 1957). Finally, either attitudes or behaviour (or both) will be adjusted.

It may be important to note here that transport researchers tend to highlight the adjustment of behaviour as a result of such stress. However, the attitude-behaviour link has never seriously been conceptualised as a unidirectional link (see for an excellent discussion KROESEN et al. 2017). Rather, stress may be reduced by adjusting attitudes to (existing) behaviour,

and this way of adjustment is probably more common than the adjustment of behaviour to pre-defined attitudes (see again KROESEN et al. 2017, for empirical evidence, and SCHEINER 2018 for a brief discussion). Yet still, in cases where attitude-behaviour dissonance remains, e.g. because attitudes cannot be adjusted to the extent necessary to bring them in line with behaviour, behaviour may be adjusted. That is, adaption to the new situation may be used as a coping strategy. The reaction to stress and, consequently, the coping strategy, likely depends on individual factors that determine whether stress is interpreted positively as a challenge, or negatively as a threat (eustress or distress) (WALINGA 2008, 321).

It is worthwhile returning to the ROA model at this point (HARMS 2003). The R component (requirements) was renamed from needs, a term that was used in a preceding model (NOA) that in turn was developed from motivational theories. This interesting shift in terms (BUSCH-GEERTSEMA and LANZENDORF 2015, 28) on the one hand places more emphasis on (more urgent) requirements, rather than (more voluntary, subjective) motivations or 'wants'. On the other hand, the extremely wide field of motivational psychology makes clear that there is more in motivation than just objective requirements. People need to be motivated in order to develop behavioural intentions and, ultimately, behaviour. People develop, and they may change their goals, aspirations and, consequently, motivations for action. Hence, there is a need to introduce motivation and the question of how motivation changes into theories of behavioural change. A basic understanding is provided by MASLOW's (1943) famous 'pyramid of needs'. Maslow suggests that needs are sorted in a hierarchical order, starting from very basic physiological needs, and ending with self-actualisation needs. Only as long as more basic needs are fulfilled will someone attempt to fulfil higher-order needs. This simple 'pyramid' may be idealistic and overly universal (HECKHAUSEN and HECKHAUSEN 2010, 59). But it is still recognised as a basis for understanding what drives people's action.

On the other hand, motivations alone would not drive action if there was no expectation of success. Self-efficacy is a term to describe whether someone expects to be able to successfully perform certain behaviour. The term was developed by BANDURA (1977) in his social cognitive theory (see also RUSSELL and WALSH 2009; HUTCHINSON and ESTABROOKS 2009; BULLY et al. 2015; FILIATRAULT and RICHARD 2005). He hypothesises self-efficacy to be influenced by vicarious experience, verbal persuasion, physiological feedback and, most importantly, performance accomplishment.

Similarly, the theory of planned behaviour (TPB) includes perceived behavioural control as a predictor of behaviour (mediated by behavioural intention) (AJZEN 1991; see also BAMBERG and SCHMIDT 2003). The TPB has been used frequently in transport studies (THORHAUGE et al. 2016; STANFORD 2014; RUSSELL and WALSH 2009; FILIATRAULT and RICHARD 2005). It is individualist in nature, but provides a link to the social environment in that it includes subjective norms as a predictor of behavioural intention, though it may be argued that this understanding of the social environment in the TPB is somewhat simplified.

STERN's (2000) attitude-behaviour-context model highlights the interplay between attitudes and context variables that affect behaviour. It assumes reciprocal dynamics between attitudes and context by stating that attitudes affect behaviour most in cases where context variables are weak, and vice versa: attitudes have little effect if context factors strongly constrain choice (for empirical evidence see GUAGNANO et al. 1995).

Another psychological theory that deals with motivations for behavioural change is protection motivation theory (ROGERS 1975). In the transport context it has been applied to electric vehicle adoption (BOCKARJOVA and STEG 2014). It claims there are two stages of cognitive process in behavioural change. Firstly, current behavioural risks are assessed based on the severity of the current threat, vulnerability to the current threat, and the rewards connected to current practices (the 'good sides' of it). The second process is coping appraisal, which focuses on whether adaptive behaviour decreases the threat. This process includes self-efficacy, response efficacy (will change actually reduce risks?) and consideration of the costs of protective action. Note that all elements are based on subjective perceptions, rather than objective valuing (BOCKARJOVA and STEG 2014). Thus, four conditions are needed for change: (1) high (perceived) risks of current behaviour, (2) severe behavioural consequences (threat appraisal), (3) high expectancy that behaviour change decreases the threat (coping appraisal), and (4) high self-efficacy to perform the new behaviour.

These theories (in particular BANDURA (1977) and ROGERS (1975)) help recognise that (travel) behaviour change requires some expectation of positive outcome. Similarly, the expected benefit of behaviour has been introduced as a more rational, economic explanation for behaviour in sociological action theory (ESSER 1993).

All these theories are on the individual level. Transition theory aims to capture how change can occur for systems or societies as a whole³⁾, though it has been highlighted in the previous section that regimes tend to reinforce stability and prevent change. Transitions are understood here as radical, systemic changes (e.g. the transition to sustainable mobility) that require strong innovations, suggesting that niches are important “as the locus for radical innovations” (GEELS 2012, 472). Niches are “individual technologies and actors outside or peripheral to the regime” (KÖHLER et al. 2009, 2986). ‘Peripheral’ actors may create technological or behavioural innovations that reshape mainstream thinking and behaviour in the longer term. At the same time, individuals create such niches where innovations emerge in an interplay between the micro and macro levels or ‘structure and agency’ (GIDDENS 1984). For instance, the German ‘energy turn’ in 2011 was clearly a consequence of the Fukushima catastrophe, but the fact that it quickly became part of mainstream attitudes was also based on green anti-nuclear power politics that had been implemented a decade before, and this in turn can be traced back to the 1970s anti-nuclear social movements that led to the foundation of the Green party in 1979.

4.4 Understanding the process of change

The section above outlines what is needed to trigger behavioural change, but not how the process of change unfolds. Understanding of this process has been sought in theories that aim to find evidence for distinct stages of change.

The transtheoretical model of change (PROCHASKA and DiCLEMENTE 1982; PROCHASKA and VELICER 1997; see BULLY et al. 2015, for an application) was developed in health studies, and it has been used in transport studies, e.g. for studying the adoption of electric vehicles (LANGBROEK et al. 2016), travel behaviour adjustment during a mega event (PARKES et al. 2016), and mode choice change as a response to climate change information (WAYGOOD and AVINERI 2016). Related applications refer to wider environmental behaviour (HOWELL 2014).

The model assumes that individuals progress through stages of change over time. It does not assume a linear progression but includes the possibility

of relapse. It comprises six stages (PROCHASKA and VELICER 1997, slight variations can be found in earlier work; PARKES et al. 2016; a different conceptualisation with fewer stages can be found in BAMBERG 2013):

- Precontemplation – no consideration of alternative behaviour
- Contemplation – consideration of behaviour change but without feeling in a position to undertake it
- Preparation – action is taken to prepare for behaviour change
- Action – alternative behaviour has been practically performed
- Maintenance – alternative behaviour has been regularly performed for some time
- Termination – no temptation to relapse into earlier behaviour.

Prochaska’s model can to some extent be compared to other stage models of change, e.g. those developed by LEWIN (1951), ROGERS (1962) and (MITCHELL 2013).

The model also states that the ‘decisional balance’ of valuing pro and con criteria for change alters throughout the process, with the pro arguments for change gaining higher weight over time (PROCHASKA and VELICER 1997). Ultimately, regular performance of changed behaviour is assumed to result in new habits based on revised scripts (PROCHASKA and DiCLEMENTE 1982; FUJII and GÄRLING 2003; STERN 2000, 417). They may, thus, have long-term consequences, which is one of the reasons why behavioural change may be conceptualised from a life course perspective.

Stage models have been criticised for failing to understand the intention-behaviour gap (WALINGA 2008, 320), though intention has been conceptualised in some models (BAMBERG 2013). Another critical point raised by some commentators is that behavioural change may be a continuum rather than a sequence of stages (BRIDLE et al. 2005). While the idea of discrete stages may indeed be too simplistic, one may well argue that exactly this simplification implies a valuable reduction of complexity in change processes, which permits targeted interventions to be developed. It may also be argued that Prochaska’s model is not exclusively based on stages, but incorporates more continuous cognitive, affective and behavioural processes that may explain to some extent how change progresses. These processes include consciousness-raising, environmental re-evaluation, self-liberation, helping relationships, and more (HOWELL 2014; PROCHASKA and VELICER 1997).

³⁾Note that the term transition theory is also sometimes used in the context of individual-level learning theories, but this is avoided in this paper to prevent confusion.

The model may be characterised as a description and explanation of how new behaviour is being learnt. It does not have its roots in learning theory, however, but in motivational psychology that seeks to understand which processes trigger and sustain intentional behavioural changes. Learning theory is more concerned with the ‘doing’ based on, e.g., conditioning (SKINNER 1953) or imitating a model (BANDURA 1977). The transtheoretical model does however include learning processes as it covers the whole span of change from the emergence of an intention to sustaining the new behaviour. It has links to learning theory in that it includes self-efficacy, a key variable in social cognitive theory – also called social learning theory – (BANDURA 1977), to explain behavioural change (PROCHASKA and DiCLEMENTE 1982).

Learning has been defined as “a relatively permanent change in behavioural potentiality that occurs as a result of reinforced practice. Learning is more likely to happen when there is a change in the situational context (or behavioural goal), when deliberation is prompted by information or when the situation is uncertain” (SUNITIYOSO et al. 2013, 259). Hence, it is reasonable to assume that reconsideration of travel behaviour is more likely in a transition situation. Learning may then be imagined as a continuous interplay between trial, experience, assessment and behavioural – or in other cases attitudinal – adjustment.

Given that the transtheoretical model was developed for psychological therapy, strategies have been developed and tested to increase the effectiveness of various stages of change (see for overviews HUTCHINSON and ESTABROOKS 2009; Howell 2014), e.g. education, information, provision of resources and support, reminders and prompts, and positive feedback. The strategies are intended to work as incentives that may be needed for behavioural change over and above self-efficacy and expected outcome. However, this points to one of the major shortcomings of applying such approaches in the transport or sustainability sector. It is questionable whether education, information, reminders or prompts can be incentives as long as there is no suffering on the individual level. Among psychotherapists it is well-known that patients must be motivated to therapy in order to have a chance of success (SCHULTE 2015). The ‘suffering’ in travel behaviour, however, is mostly on the societal rather than the individual level, while on the individual level travel choices include a strong rational element, suggesting that travel is the outcome of rea-

sonable choices made under certain circumstances and needs. In terms of protection motivation theory: someone may be convinced of being capable of behaviour change (high self-efficacy), but it is unlikely that (s)he is convinced that his/her behaviour change substantially affects sustainability in general (low expectancy of threat decrease).

Once behavioural change has been tentatively performed, change may be established in the longer term if a personal goal has been achieved, i.e. people may continue “to behave differently because life is better” (AMPT and ENGWICHT 2007, 3). This highlights the importance of the quality of the choice alternatives. If people are provided with, say, free public transport tickets, and opt to use them but learn that public transport fails to satisfy their needs, they will hardly become permanent public transport customers.

Another important point that mobility biographies research may take from learning theories is that learning needs experience. This is why personal history may serve as a mediating factor in deliberation over change (CLARK et al. 2016b). Practical experience pushes learning success further than any theoretical transmission of knowledge. This suggests that key events research as it is typically conducted to date may fail to address people’s subjective experience or perception of an event, and the consequences they draw. The very notion of experience requires more than just events, as experience involves a subject. Subjects may experience one and the same event very differently, based on their pre-experience, knowledge, valuation, and perception, as well as their future aspirations, needs, and wants. Research that addresses individuals’ subjective experience of events or other changes in circumstances and their associations with travel, rather than the effects of such events and changes per se on travel, may thus generate valuable knowledge on how people think and feel about these associations, and the strategies they use to cope with them.

The process of learning is predominantly an individual process – though affected by social influences (SUNITIYOSO et al. 2013, see below) – and, thus, a major topic for psychological theories. These, however, tend to rely on “overly individual assumptions” (JONES et al. 2013, 87), while underrepresenting external factors and the social construction of knowledge (HUTCHINSON and ESTABROOKS 2009). The role of other individuals and societal groups for change is discussed in the following, though psychology again plays an important role.

4.5 The role of socialisation in stability and change

Individuals' life courses are not isolated from other people's life courses. They are embedded in social structures on the personal level, in family, kin, friendship and neighbourhood networks, as well as in economic, political or administrative organisations. The personal, 'life world' dimension of these embeddings is studied in sociology and psychology using the term 'linked lives' (ELDER et al. 2006).

The term linked lives highlights the links between individuals over their life course, but without necessarily taking the perspective of either of the individuals. Socialisation is somewhat more. It refers to the integration of individuals in society over the course of their lives by means of learning from significant others who work as socialisation agents.

Socialisation has been proposed as a mechanism through which social norms regarding behaviours are transmitted to someone being socialised via socialising agents (HAUSTEIN 2009), or "the adoption of a group's (typical) behaviours, opinions and values by an individual" (HERKNER 1991, 41, author's translation) so that thus "an individual capable of social acting emerges" (TULLY and BAIER 2011, 195, author's translation). Sociological socialisation research highlights the learning and practising of social roles in a group (BAHRDT 1994, 78f). Hence, socialisation may be understood as mutual interaction that enables group integration. This may refer to a small group, such as a family or a clique, or society as a whole. Socialisation agents may be influential individuals, groups or organisations. Typical socialisation agents are parents and the family, peer groups, media, or schools.

Socialisation is not limited to childhood and adolescence (although these are the most formative stages), but rather spans the whole life course. It is a process of social integration or inclusion (just as resocialisation is the reintegration of criminals), and this means that norms play an important role here. The knowledge, pre-dispositions, attitudes or behaviour that is transmitted from socialisation agents are 'the normal' that needs to be known or done to be part of the group. Mobility socialisation is thus the process of transmitting mobility as a norm, and this process makes the individual part of the mobile society.

Socialisation thus typically works against change in the aggregate. It might be understood as sort of a 'habit on the aggregate (or system) level'. This may be a major obstacle to implementing voluntary change.

To take an example: Why should someone stop driving while most others around him or her continue to do so? On the other hand, if someone feels that his or her behaviour represents only a small minority, (s) he may adjust to the majority and, thus, change. For practical applications this means that if a concept succeeds in changing many people's behaviour, it is likely that even those who strongly resist changing may finally adapt. The theory of innovation diffusion helps better sort out and understand such processes by splitting a population by their inclination to adopt change into innovators, early adopters, early majority, late majority, and laggards (RASOULI and TIMMERMANS 2017, following ROGERS 1962).

There is much recent evidence for the impact of parents (HAUSTEIN et al. 2009), spouses (KROESEN 2015), schools (BASLINGTON 2008), neighbours (XING and HANDY 2011), collective urban mobility cultures (KLINGER and LANZENDORF 2016), cohorts (KUHNIMHOF et al. 2011; GARIKAPATI et al. 2016), and earlier peer groups (e.g. mobility cultures at previous places of residence) (WEINBERGER and GOETZKE 2011) on travel behaviour. There is also evidence for transmission of behaviour from parents to children in residential choice (MYERS 1999; BLAAUBOER 2011) as well as in demographic life paths (LIEFBROER and ELZINGA 2012). This research generally finds positive behavioural links, suggesting that conformity in behaviour predominates over non-conformity (SUNITIYOSO et al. 2013).

However, over and above behavioural correlation, the idea of mobility socialisation presupposes that mobility is a relevant phenomenon for group integration; otherwise there would be no pressure to adjust mobility. The high relevance of mobility may well be assumed for adolescents – the first moped/scooter, gaining a driving license, and owning a car are associated with considerable subjective and objective liberty (MIENERT 2003; TULLY and BAIER 2011). However, for societal integration as a whole this cannot simply be assumed likewise. Even if mobility is a basic dimension that structures modern societies, the size of activity spaces, or the use of the car, train or bicycle is not necessarily linked to social inclusion or exclusion and the need to adjust behaviour. On the other hand one may assume that a certain level of mobility has become a norm in today's society, and that high mobility levels are typically associated with high social status, while forced constraints in activity spaces may cause exclusion tendencies.

In terms of learning theory, socialisation can be seen as social learning, as opposed to individual learning. It is enabled by social interaction, "where

individuals learn from others' experiences, preferences or observed behaviours" (SUNITIYOSO et al. 2011, 334). SUNITIYOSO et al. (2011 2013) identify three types of interaction based on levels of intensity and directness (the way information is exchanged):

(1) Interdependent situation, but without communication. For instance, someone's decision to drive affects congestion and, hence, other drivers' behaviour – be they aware of this interdependence or not.

(2) Observation. Examples are the influence of neighbourhood and urban mobility cultures on travel, or direct comparison of behaviour to other individuals (ABOU-ZEID and BEN-AKIVA 2011)

(3) Communication via media or personal interaction (one-way or two-way). Diverse forms include, e.g., word of mouth (TANIGUCHI and FUJII 2007), personal talks to closer, more trusted peers, the media, marketing campaigns.

As can be seen, the three types include various scale levels and channels.

The results of the experiments conducted by SUNITIYOSO et al. (2011, 2013) suggest "strategic behaviours that follow social learning models of confirmation (reinforcing behaviour if other group members have similar behaviour) and conformity (following the majority choice in the group)" (SUNITIYOSO et al. 2011, 342, similar for the 2013 study), and this suggests socialisation has a stabilising function. This confirms social information processing models which suggest "that an individual's readiness to change may be shaped by the readiness of others" (WALINGA 2008, 319), as shown by SHERWIN et al. (2014) for the influence of partners, family members, and the wider social context on people who recently started to cycle.

5 Making links: A framework to study mobility biographies

The previous section introduced a large number of concepts and ideas from various disciplines that help further understanding of mobility biographies. This section is an attempt to summarise them into an overall framework, although such a framework clearly requires further enhancement and detailed elaboration of its elements in the future.

Mobility biographies research started from the idea of links between mobility and various other life domains (Fig. 1). Events in one or more of these domains stimulate changes in mobility tool ownership and/or travel behaviour. The conceptual link may be

seen in changes in needs, requirements, opportunities or abilities, and associated stress as an outcome of mismatch between actual mobility and mobility needs or constraints. Besides changes in social roles, resources or competencies, mismatch may also occur between travel behaviour and attitudes or norms (e.g. environmental norms). The emerging stress works as a trigger that motivates people to reconsider their behaviour and, possibly, adjust their mobility. On the other hand, life situations themselves may change due to mobility, as can be seen from research on couples separating as a result of stress caused by long-distance commuting (SANDOW 2014).

Events may refer to the individual (or household) level, where they include changes in social roles, resources, constraints or needs. They can also occur on the wider environmental level, where they refer to spatio-temporal accessibility or other external circumstances of living. The levels and domains may be linked directly or indirectly in multiple and complex ways. For instance, policies may become effective via intermediate levels and network members, such as the partner, employer, or friends. An example for indirect effects mediated via other domains is a new light rail line that may not only have direct effects on mode choice, but may motivate people to adjust their residence to either move closer to or further away from the line (e.g., because parking spaces get lost along the line), and this may in turn affect their travel patterns in various directions.

The process of travel behaviour change itself has been sought to understand by using stage models such as the transtheoretical model of change (visualised in figure 1 in the arrow with a grey gradient). This model spans the process from precontemplation to maintenance of revised behaviour. It incorporates a number of cognitive, affective and behavioural processes that guide further understanding of how change progresses, and it argues that pro arguments for change gain greater weight throughout the process. This may not be an automatically self-reinforcing process but may rather be because progress through the stages depends on a certain level of initial success and benefit.

Perhaps the biggest obstacle to applying such psychotherapeutic models to travel behaviour change is that there is typically little individual suffering in travel behaviour (as opposed, e.g., to drug abuse). Hence, one may ask where motivation for change should come from. This is where stress comes into play. Motivation alone, however, does not necessarily result in change. People need to feel able to change (self-efficacy, subjective behavioural

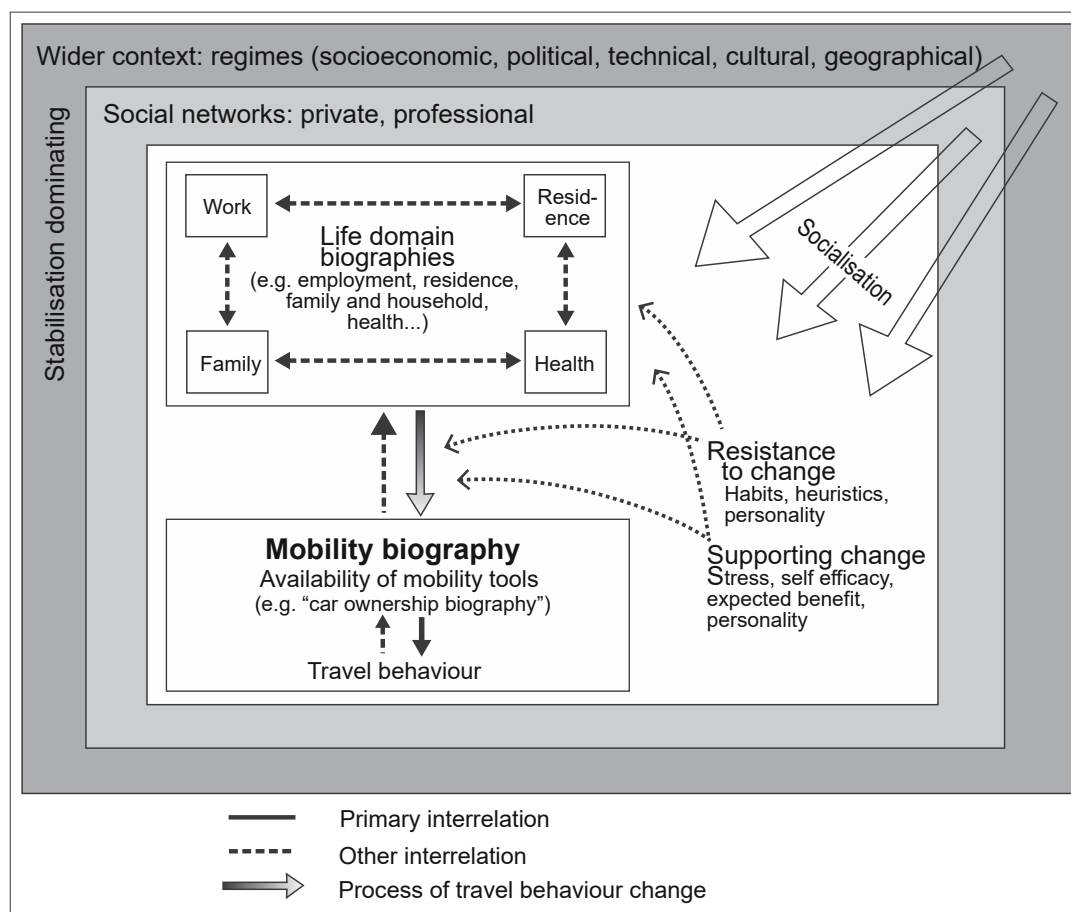


Fig. 1: A framework to study mobility biographies

control), and they need to have some expectation of benefit (coping appraisal, expected utility) in order to start a behavioural change process.

Lack of self-efficacy, coping appraisal or expectations of benefit are factors that serve behavioural stability. There are, however, other forces that resist change. The habitual character of travel behaviour is perhaps the most important of these forces, but the use of schematic heuristics may also contribute to stability in travel behaviour. While the use of heuristics and habits is more or less universal, resistance to change may also be due to individual personality traits, such as risk aversion or identity maintenance.

These concepts are taken primarily from psychology, and they are on the individual level. Life courses, including the mobility domain, are embedded in social environments on various levels, however. Events in some domains depend strongly on interactions with other people and/or organisations, such as workplace change, residential relocation, marriage or the birth of a child. Individual life courses are embedded in closer family and

household networks, wider social networks, and the wider society. Socialisation agents – individuals, peer groups, organisations – span various levels, communicating norms and, hence, providing guidelines for mobility. Socialisation tends to strengthen conformity in behaviour and to serve as a stabilising factor but may support change, e.g. when peers change. Socialisation agents may also directly support people in their efforts to change by providing guidelines, information, and mental, affective or physical support.

The upper, 'system' level of society also tends to support stability. This is due to habits, existing competencies, past investment, prevailing practices, norms, shared assumptions and regulations (considered together: regimes) that are reflected in path dependencies and inertia in organisations and institutions. These considerations may to a certain extent explain the somewhat limited changes that have been found even after strong changes in circumstances of daily life (as highlighted by SCHEINER and HOLZ-RAU 2013).

It is noteworthy to mention that factors supporting either change or resistance to change may affect any life domain biography and, thus, only indirectly affect the mobility domain, for instance when lack of self-efficacy prevents a residential move. On the other hand such factors may directly affect the change process. For instance, the process of change may be interrupted in the 'action' stage after trying alternative behaviour because of lack of success or limited self-efficacy.

Any one of the concepts discussed here deserves much deeper deliberation than that which can be provided in this paper. This includes, e.g., the complexity of forces resisting change, the interplay between people belonging to a social group such as a family or neighbourhood (linked lives), the links between agents on different levels (e.g. individuals vs. organisations), and the processes in which travel behaviour change unfolds. Hence, taken together, the mobility biographies approach may be seen as a broad, rich field in travel studies, rather than a unified theory.

6 Research needs

Research requirements in the context of mobility biographies have been formulated several times in recent papers (GOULIAS and PENDYALA 2014; MÜGGENBURG et al. 2015; CHATTERJEE and SCHEINER 2015). There is no need to repeat them all here. Instead I focus on some broad key issues.

(1) *Develop and test theories.* This paper has touched on multiple theoretical concepts that may help understand behavioural stability and change over the life course, including habits, motivations, attitudes, expected benefits, self-efficacy, and the interaction of individuals with close others, as well as with the wider social, economic and spatial environment on various levels. These ideas need to be elaborated upon in more depth, and some of them call for empirical studies about the evolution of travel behaviour in a life course framework.

(2) *Link quantitative and qualitative approaches.* There is a general focus on quantitative studies in mobility biographies research, and more qualitative work is needed. Linking the two can provide mutual enrichment, which is perhaps even more important. This could also help bridge the gap between life course and biography studies. Recent attempts to add multiple layers of meaning to the somewhat 'positivist' empiricist approaches to mobility biographies may be a start. It is helpful here to go back to the humanistic geography approaches of the 1970s and phenomenol-

ogist sociology. Anne Buttimer writes that "lifeworld, in geographic perspective, could be considered as the latent substratum of experience. Behavior in space and time could be regarded as the surface movements of icebergs, whose depths we can sense only vaguely" (BUTTIMER 1976, 287). The mobility biographies approach resonates in these words. Phenomenological approaches have been used in transport studies before (SCHEINER 2005), but have remained rare. They call for taking narratives of people's biographies and their interpretations seriously, and understanding their mobility at a given point in time within the framework of their own self-(re)constructed biography (SATTLEGGER and RAU 2016). This does not, though, relieve researchers from questioning the validity of narratives. This can be done, for instance, against the background of other sources of historical information (on the individual or societal level).

(3) *The social embedding of travel.* Rich research has developed in recent years about personal social networks and travel. This research has few links as yet to life course and biography perspectives, though the need to understand social networks and travel in such a longitudinal sense has clearly been recognised (SHARMEEN et al. 2014; GOULIAS and PENDYALA 2014). Future research in this area should also include socialisation effects and the social embedding of travel in a wider sense, linking individual behaviour over the life course with the behaviour of collectives and organisations in policy, the economy or the neighbourhood or city of residence ('urban mobility culture', KLINGER and LANZENDORF 2016), and looking at the role of social norms over time. Social embedding also includes the effects of events and changes experienced by close others on someone's travel, pointing towards interactions within households and families. For instance, a person's mode choice may change as an outcome of not only her own, but also her husband's workplace change ('partner effects'). Generation-specific mobility biographies could be a worthwhile field of investigation not only from an intra-family perspective, but also in terms of cohorts. Mobility socialisation in childhood, adolescence or young adulthood can be considered a 'pre-structuring' of the later mobility biography, while ongoing socialisation in adult life by various socialisation agents contributes to the constant shaping and reshaping of travel behaviour.

(4) *Interactions between life domains, behavioural dimensions, and population groups.* While the previous point touches on interactions within society and, specifically, between people, there are also multiple interactions between various life domains, events and

developments over the life course (ZHANG 2017). For instance, residential moves often go along with events in the household or work career. It is not clear yet how multiple events and changes work together to shape travel behaviour. This also refers to the sequence in which changes occur, including lead and lagged effects that have clearly been recognised, but rarely studied (VERHOEVEN et al. 2007; OAKIL 2013).

Interrelations between various dimensions of travel behaviour have been studied in transport research, but hardly in a longitudinal perspective. Previous mobility biographies research has sought to understand direct links between key events and mode choice changes, for instance, but these links may be moderated by changes in activity patterns, destination choice and associated distances, and other variables. Looking at such interrelations may contribute to understanding of the cause-impact structure between various variables, e.g. between destination choice and mode choice. Finally, there is a need for dedicated studies of certain population groups. For instance, there are few mobility biographies studies on immigrants, and on the elderly.

(5) *Develop policy approaches.* It is an important task to develop policy approaches that take knowledge from mobility biographies studies into account. Such policies should not be based on the manipulative ‘education’ of people but on participatory techniques that take people actively into account and take them seriously (JONES et al. 2013). Still, the widespread information campaigns, trial tickets and the like that may be linked to life course events such as residential or workplace relocation, the birth of a child, or entry into retirement have proven valuable. On the other hand, policies can make use of socialisation effects. Peers and other socialisation agents can help target people’s travel. “Snowball effects” (effects may be stronger in the long run than in the short run) may increase the effectiveness of concepts (SUNITIYOSO et al. 2011). Policies should take path dependencies in people’s life courses into account. Early decisions on the locations of residence, education, and workplace can have lifelong consequences for travel behaviour, and they can even affect subsequent generations in a family via socialisation. Policies should also recognise long-term stability in people’s travel behaviour and recognise that people may adapt their travel slowly and only to a minor extent, even if circumstances in the environment change dramatically.

(6) *Question findings.* This last point may refer to wider transportation research. Many researchers appear somewhat overly enthusiastic about (limited) findings of change. Connections between life do-

mains and mobility are often only moderate, just as correlations between sociodemographics, lifestyles and the built environment on the one hand, and travel behaviour on the other hand are mostly very limited. This is reflected in poor variance explanation in modelling. Transport research needs to face that travel is only loosely associated with life circumstances. A critical attitude towards its own findings is helpful for any study.

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Author

Prof. Dr. Joachim Scheiner
Technische Universität Dortmund
Faculty of Spatial Planning
Department of Transport Planning
44227 Dortmund
Germany
joachim.scheiner@tu-dortmund.de