Contemporary Planning Practice: Skills, Specialisms and Knowledges

Chapter 11: Transport Planning and Mobility

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Learning outcomes
After reading the chapter you should be able to:

- understand the development of transport planning
- identify the emerging perspectives of the discipline;
- recognise the key elements of mobility and accessibility planning;
- understand the strategies likely to be pursued by key transport planning actors;
- comprehend current challenges, skills and knowledges involved in mobility and accessibility planning.

Introduction

This chapter explores how transport systems are an important part of planning practice. The introduction to this topic area highlights how transport systems work and how they are influenced by other aims and wider planning systems and policies. Movements of people, goods and information have always been fundamental components of human societies. Mobility – the movement of people and goods – is not an end in itself however. Its value lies in accessibility to places, people and services, which contributes to the functioning and quality of people's lives, as individuals and as a society. Poor accessibility and transport can impair both daily life and the economic performance of areas. There is evidence of the benefits of ensuring strong linkage between transport and wider planning, and this understanding should inform policies to promote sustainable mobility as discussed below.

Transport planning goals are geared towards satisfying mobility needs, supporting economic development, aiding competition and effective participation in the global economy, and safeguarding the environment. This presents planners with a key dilemma. On the one hand the economic welfare and social well-being of society depends on mobility. On the other hand, contemporary urban mobility practices are not viewed as sustainable (Bertolini, 2017). Planners are one of the agents being asked to reconcile this dilemma and that is why mobility is such an important consideration in the wider world of planning. To face this dilemma, it is then very important to consider transport planning as a crucial and interconnected aspect of wider sustainable planning endeavours.

The next section explores how the relationship between planning and transport has evolved in recent decades and specifically how the concepts of sustainable mobility and accessibility

planning emerged. This leads on to analysis within sections covering the key elements involved, and skills and knowledge types needed in the delivery of transport planning. This is followed by a discussion of the strategies, interests and actions of key actors involved in transport planning. The chapter then focuses on the emerging challenges within transport planning practice and concludes with some reflections on where transport planning is heading and how new technologies, key actors and knowledge types are likely to reshape it in the coming years.

Development of the specialism

The evolution of transport planning is closely related to the societal shifts in relation to social and economic needs and can be explained by way of two main factors (Meyer, 2000): firstly, changes in the *demographic, market and technological* characteristics of society that influence the way in which we travel; secondly, evolution in planning policy *priorities*.

Until the 1970s, the main objective of transport planning was to resolve problems of increasing network capacity and reduce the congestion of car traffic. The purpose of the transport planner was to largely to improve the efficiency of the road network or increase its capacity. Relatedly, the primary aim of transport policy was to facilitate the rapid movement of people which was enacted through the roll out of road building programmes. Road building was conducted without much consideration of other transport modes or spatial planning activities. The indicators used in the practice of transport planning were indicators based on the average speed, on the relationship between volume and capacity, or service level of the road network (Venter, 2016). Transport planning was practiced according to a model of 'facilitating supply' for a predicted travel demand, following a process of a 'predict and provide': the demand for travel was extrapolated and then efforts were made to match the supply infrastructure to that demand. The main mode to which this approach was applied was roads. Accordingly, interventions in the transport system were focussed on increasing motor vehicle speed, such as by widening roads.

By the late 1970s an increasing societal awareness of the environmental consequences of transport developed and planners became more concerned with the impacts of transport on air, land and water. This shift was also accompanied by a more inclusive approach to planning with respect to stakeholders and community groups (see Chapter 12). The influence of and interaction with wider land use planning was found to be greater than previously thought. In addition, a growing awareness of a variety of physical, social, environmental and health-related effects of the use of private cars contributed to pressure for policy change.

The concept of sustainable development, as explained in Chapter 4, emerged in the 1980s reflecting increasing awareness of connections between human society and the natural environment. The previous approach was substituted by the introduction of the broader concept of mobility, oriented towards a multimodal vision (Banister, 2008) and known as 'sustainable mobility'. A multimodal vision refers to transportation and land use planning that considers

diverse transportation options, typically including walking, cycling, public transit and automobile, and accounts for land use factors that affect accessibility (Litman, 2020). Integration is one of the most important means to advance sustainable transport and sustainability more generally and it concerns:

- functional or modal integration: enabling different travel modes to complement each other, making multimodal journeys easier and efficient;
- transport and planning integration: land use and transport are closely linked, as patterns of land use are direct influences of travel generation and vice versa;
- social integration and inclusion: taking into account the diversity and needs of all travellers and non-travellers;
- environmental, economic and transport policy integration: all policy aims are combined in a holistic way (Potter and Skinner, 2000; Givoni and Banister, 2010).

The term sustainable transport came into use as a logical follow-on from sustainable development, and is used to describe modes of transport and systems of transport planning that are consistent with wider concerns of sustainability. This idea is explained in Boxed example 1, based on a definition from the European Union Council of Ministers of Transport.

Boxed example 1: Sustainable transport according to the European Union Council of Ministers of Transport

A sustainable transport system is one that:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- Is affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.
- Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

(Source: EC, 2001)

Sustainable mobility provides an alternative paradigm within which to investigate the complexity of cities, and to reinforce the links between land use and transport. The goal of the transport planner is no longer to ensure the efficient movement of vehicles, but to ensure accessibility to destinations. Sustainable transport refers to the broad subject of transport that is sustainable in the senses of social, environmental and climate impacts. Measures for evaluating sustainability include the vehicles used for road, water or air transport; the source of energy; and the infrastructure used to accommodate the transport (roads, railways, airways, waterways, canals and terminals). Transport sustainability is largely measured by transport system effectiveness and efficiency as well as the environmental and climate impacts of the system.

Accessibility is a key element to integrate into transport and land use planning, since it is a direct expression of mobility either in terms of people, freight or information. Accessibility is a measure of the glue holding place and network together; it is what ties land use to transport (Levinson and Krizek, 2007). The accessibility paradigm relates to four fundamental components: mobility, land use, temporal and individual (Geurs and Van Wee, 2004) and takes advantage of a holistic and integrated vision of the transport system, land use and the needs of individuals or groups of individuals. This approach allows the development of integrated and coordinated solutions between the urban system, the transport system, the social context and the time management of people and activities.

In synthesis, the transition from the old approach to the new transport planning approach has involved shifts from:

- an emphasis on methods and data in support of capital programming to improved information on a wide-ranging set of impacts for a wide variety of capital, operational, pricing, lifestyle, and land use decisions.
- a focus on the efficiency of highway networks towards multimodal systems operation and broad performance levels of service (speed and travel time) and measurement (accessibility and mobility).
- perspectives on how to get from point A to point B, to a broader understanding of transportation's role in a community and in the global, national, state, and local economic market. (Meyer, 2000)

What does the new approach imply for planners? The first implication is that transport and land use are now considered strongly connected. Transport studies have also broadened their relationship with other disciplines and established a stronger link with urban studies, design and planning (Banister, 1998; Ewing and Cervero, 2010). In practice this means that planners are more likely to be working with transport professionals like highway engineers, for example. in the pursuit of good place-making These closer ties have brought concepts from disciplines such as urban design (Chapter 8), among others, into the sphere of transport planning. Such concepts include:

- *Transit Oriented Development (TOD*). See Boxed example 2);
- *Walkable urbanism*, based on the principle of designing and planning streets and buildings from a pedestrian viewpoint;
- *Complete streets*, which is an approach that requires streets to be planned, designed, operated, and maintained to enable safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation (see Figure 1).
- *Safe routes to school*, with the main aim of making streets around schools safer for children;
- *Context-sensitive design*, based on the idea that all decisions in transport planning, project development, operations, and maintenance should be responsive to the context in which these activities occur, not simply the design process;

- *Healthy and active living* based on the principle that transport systems should de designed to support a healthy lifestyle and improve health (and see Chapter 6).
- *Urban retrofitting*, a systematic reconfiguration of socio-technologies of energy in the existing built environment and infrastructure.

The urban and transport planning strategy of Transit-Oriented Development (TOD) has been generating considerable interest in academic and professional circles recently (Bertolini et al., 2012; Renne, 2017). The key reason for centring on TOD is that it proves that integrating transport and urban planning is a way to achieve sustainability goals (see Boxed Example 2).

Boxed Example 2: **Transit Oriented Development (TOD)**

Under favourable conditions TOD is seen as delivering multiple benefits, such as helping shape polycentric cities and regions, mitigate urban sprawl, boost public transport ridership, increase biking and walking, while accommodating economic growth and creating attractive places.

TOD's approach of concentrating urban developments around railway networks builds upon strategies applied since the late 19th and early 20th centuries in the United States and Europe, when the construction of streetcar and metro lines was integrated with urban developments. After the Second World War, planners in parts of Europe were able to channel suburban development into satellite suburbs along transit corridors. In recent years, a third generation of TOD approaches has emerged. In the United States, since the 1990s, following experiences pioneered in the 1970s in cities such as Portland, TOD has become the dominant urban growth planning paradigm. It is focused on combating unbridled urban sprawl and closely connected with Smart Growth (SG) and New Urbanism (NU) approaches (Dittmar et al., 2004, see also Chapter 8). In Europe many metropolitan areas are promoting urban development along rail corridors as a tool and, at the same time, a target for achieving more cohesive territories and sustainable urban development.

Key elements

Transport system key components

Transport systems not only provide opportunities for the mobility of people and goods, but over the long term, influence patterns of growth, exert environmental impacts and shape the level of economic activity through the accessibility to land. Transport systems consist of numerous components whose interaction becomes a key factor for system effectiveness.

1. The first critical component is the *system user*, who represents the key driver of travel behaviour.
2. the *mode* of transport forms the second major component of the transport system. Much of the technical analysis in the transport planning process focuses on estimating the level of usage for different transport modes given the performance characteristics of each available mode and the characteristics of the individual user.

3. *Infrastructure* needed is the third component of a transport system. This provides the modal networks, facilities and services necessary for mobility in metropolitan areas (roads, paths, rail lines and stations etc).
4. The fourth component is the *operational performance* (i.e., the ease of travel, the quality of service provided, and service reliability) of the facilities that permit travel is therefore an important consideration in maintaining acceptable levels of mobility and accessibility.
5. Finally the *stakeholders* that are affected by transport are recognised as a critical component of the system.

The challenge for transport planners is to provide the coordination and oversight for all these five components to work together effectively. This brings us to consider skills and knowledges.

Transport planners' key tasks skills and knowledge

The practice of transport planning has evolved significantly since the 1980s. It moved from being a technical exercise, mostly aimed at the calculation of required roadway capacity, to a profession dealing with complex problems and demands, such as growing levels of congestion and worsening air quality, as well as neighbourhood preservation and social equity concerns (Handy et al., 2002).

Contemporary transport planning involves understanding the link between transport and land use, the future of our towns, cities and rural areas, and the activities which people want to undertake to meet their desires and needs. Indeed, transport planning is about creating connections between people and places, without which everyday life cannot function. More precisely, the transport profession is about preparing, assessing and implementing policies, plans and projects to improve and manage transport systems. As a result, those working in transport planning now and in the future will have to think like a behavioural psychologist, an engineer, a development planner, a computer analyst, an environmental scientist, a social scientist, a health expert and economist. In short, they have to be able to work across subjects and put the pieces of the transport jigsaw together (see Chapter 2).

From the rational planning approach to new transport planning skills

Part of the transport planner's role is to consider what the future will be like and recognise that their actions will help to shape it. They will therefore need to make transparent decisions and communicate complex issues to the public, to key stakeholders, and to politicians (Banister, 2008). Transport planning has historically followed the *rational planning model* of defining goals and objectives, identifying problems, generating alternatives, evaluating alternatives, and developing plans. Following an idealized process, transport planners usually apply a rational planning approach where decision making follows a set process of applying predefined steps-- as outlined in Boxed example 3. Those formalised steps have remained the major corner-stones of formalised transport planning practice since its inception in the USA during the 1950s. The rational transport planning approach has been applied world-wide in one form or other in many diverse places. It is important to point out that the idealised process described

will rarely materialise as smoothly or completely in the real world given the numerous factors that shape compromise (including resources and timing).

Boxed example 3: The rational transport planning approach steps

- Understanding the current situation such as trends and conditions relating to population, the transport system, and typologies, distribution and intensities of land uses. The first step is observational, to review and gather data about the system under consideration. An understanding of the world around is required, with a specific attention to identifying the transport system under analysis and its boundaries.
- Identifying a mission statement, goals, objectives, a vision of what a community wants and how the transport system fits into this vision, major issues, public outreach results, obstacles and opportunities.
- Understanding the types of decisions that need to be made to achieve this vision and identifying strategies and actions to reach the goal.
- Examining, evaluating, and recommending alternatives, assessing opportunities and limitations of the future in relationship to goals and desired system performance.
- Identifying the near - and long-term consequences for the community and transport system users of alternative choices designed to take advantage of these opportunities or respond to these limitations.
- Presenting this information to decision makers in an understandable and useful form. Helping decision makers establish priorities and develop an investment program. An example of effective visual communication is the use of accessibility analysis maps (see Boxed example 4).

The sequence of steps highlighted above is typically aligned with the sector's tradition of employing quantitative methods, models and engineering approaches (Cervero et al., 2017). Planners are increasingly expected to adopt a diverse approach, based on multidisciplinary methods including tools such as GIS based accessibility analysis (see Boxed example 4), and requiring the integration of different scientific and practical knowledges. The promotion of sustainability through integrated transport policies has been one driver of this shift. The 'new realism' movement in transport planning which emerged in the early 1990s (Goodwin, Hallett et al., 1991; Owens, 1995) has also been a prompt. This recognises that the traditional transport approach has failed to address many transport problems, in particular traffic congestion, road accidents, loss of productivity and transport inequalities (Litman, 2013).

Boxed example 4: accessibility metrics and tools

Accessibility is a powerful concept, that links land use and transport planning disciplines . Many different accessibility metrics have been developed and they are based on the principle that accessibility has four main components (Geurs and Van Wee, 2004)

- The land use component that reflects the amount, quality and spatial distribution of activities in space (houses, jobs, shops, health, social and recreational facilities, etc.);
- The transport component that describes the transport system, expressed as the disutility for an individual to travel between two places using a transport mode; the disutility includes the amount of time, the costs and effort of travelling. The weighted sum of these components is named generalized travel cost;
- The temporal component reflects the temporal constraints of individuals such as the availability of opportunities at different times of the day, the time available for individuals to participate in specific activities;
- The individual component reflects the needs (depending on age, income, educational level, household situation, etc.), abilities (depending on people's physical condition, availability of travel modes, etc.) and opportunities (depending on people's income, travel budget, educational level, etc.) of individuals.

These components interact in multiple ways and changes of one component, for example, the land use one might induce changes in the transport system component and vice versa. A major challenge is to create and use a comprehensive accessibility metric that treats the four components of accessibility. On the other hand, these types of metric are very complicated and hard to apply in practice.

The potential benefits of accessibility metrics and tools in applied planning practice are huge: they offer a data-rich, visually appealing lens through which to analyse highly complex realities. Accessibility metrics and tools can play a powerful role in facilitating decision making processes concerning policy, planning, and strategic investments to create more efficient, equitable, and sustainable communities. They can also contribute to reduce dependence on mobility to experience access.

The evolution of the discipline shows that transport planning has not only a technical dimension concerned with the economics of the transport sector, infrastructure design, and networks modelling, but also a governance dimension, a psychological and emotional dimension of mobility, a social exclusion component and a health dimension (Ferreira et al., 2013). Transport professionals must therefore have skills that are both broad, in the sense of understanding the big picture of transportation, and deep, in the sense of being an expert on one part of the continuum (Sussman, 2005).

Additional topics that the budding transport planner should have an understanding of include legislation, emerging technologies, public involvement skills, communication, working with the general public, and understanding the needs of the client. In particular, the importance of communication skills is emphasized by many studies and professionals; in a transport planning application these include writing, data presentation, public speaking, and interpersonal relations (Handy et al., 2002). For example, using behavioural psychology to persuade drivers to abandon their automobiles and use public transport instead could be part of the transport

planner's remit. The ability to work in an increasingly politicized climate is another requirement for today's transport planner. This would mean in practice that transport planners, should have more awareness of, the political and economic factors influencing planning. Shared insights from experienced planners, a knowledge of planning theory, and critical thinking skills all contribute to this ability.

New technologies, skills and knowledge types are likely to reshape transport planning further in the coming years. Boxed example 5 shows some key aspects that are shaping or will soon shape the transport planning profession in terms of skills and knowledges.

Boxed Example 5: key skills in planning for transport

- *Data analysis.* The ability of transport planners to analyse and evaluate transport systems has always been very dependent on the tools and methods available to collect data, model transport system performance, analyse results, and communicate this information to decision makers. The rapid evolution in computer processing capability will have a significant impact on transport planning skills.
- *Telecommunications technologies*. The use of information systems in all aspects of society will continue to shape personal and business decisions that directly relate to transportation. New transport professionals will have to approach the systems of physical mobility and transport, the spatial form (proximity, land use), and digital connectivity as an integrated system.
- *Quality of life and environmental justice*. In transport, quality-of-life and environmental justice have become important policy considerations, but they seldom have been placed in a larger context of community responsibility and values. As the disparity between central city and metropolitan median incomes continues to widen, decision-makers will be faced with increasing pressures to provide economic opportunity for all of society. Transport will have an important role to play in providing access to such opportunities.
- *Land use and growth management*. Incorporating different land use patterns into transport analysis has been a key concern for decades. Transport planners will have to encourage new patterns of development through the provision of transport infrastructure.
- *Transport and health*. A safe and healthy environment has been one of the mainstays of public opinion over the past several decades. This concern will continue and expand as global warming accelerates. In the context of community development, physical, biological, and social connectedness requires a broader perspective on how we should design our communities. This broader context suggests certain principles. Coordinating decisions relating to land use, transportation, environment, and social services; Reducing the exposure of natural hazards on people and property; Limiting exposure to air and water pollution and the consumption of non-renewable resources; Developing land efficiently with higher densities and contiguous to existing development; Promoting a sense of place by protecting views and encouraging compatible urban

design; Providing cultural life and vibrant public spaces which encourage the interaction of people from different social and economic groups; and Providing access and mobility for all socio-economic groups. This is likely to mean new demands upon the planning process to place proposed actions in a much broader environmental evaluation context.

- *Complexity and uncertainties*. Over the last decades, transport planning has engaged more proactively with planning complexity and as a result been confronted with a fundamental reframing of its main assumptions and developmental objectives. The key challenge that transport studies faces is related to the need to deal with complexity and uncertainty. In a context characterized by those aspects, traditional transport planning practices based on a predict and provide approach are no longer applicable (Bertolini, 2008).
- *Communication and involvement*. More communicative, open, learning-oriented approaches should include an opening up of specific tools for debate but also facilitate a more general sense of stakeholder involvement in the design of policy processes as well as policy development, choice and implementation. The principal challenge for transport professionals is to figure out how to engage such communities in the practice of policy development.

Key actors in transport

Deepening the relationship with other disciplines

Transport is a multi-modal, multi-disciplinary field that requires input from people of a wide range of backgrounds.

In the United Kingdom, transport planning has traditionally been a branch of civil engineering. Transport engineers gave it a markedly mechanistic character, in which the planning process was seen as a series of rigorous steps undertaken to measure likely impacts and to propose engineering solutions. In the 1950s and the 1960s, the role of the transport planner was to match motorway and rural road capacity against the demands of economic growth. Now the role of transport planners is much wider. Just as urban planning requires the inputs of many specialists, transport planning is beginning to utilize multi-disciplinary teams in order to broaden the scope of the planning process.

In 2018 the Transport Planning Society defined the transport planning goals needed in order to move to a more spatial planning orientation (TPS, 2018; see Boxed Example 6).

Boxed Example 6: broadening the perspective of transport planning

- Maximising connectivity for people and businesses while minimising the need to travel, thus reducing cost for users and non-users alike
- Managing demand as an end in itself, for example by:

    - working with spatial planners to minimise the need for movement of people or goods
    - supporting options that encourage the least damaging alternatives, such as non-motorised modes, sustainable goods transport and digital connectivity
- Meeting the key quality of life objectives of:
    - environmental, economic and social sustainability
    - health and wellbeing, safety and security for all users and nonusers
    - equality of access for all members of society to the connectivity they need
    - respect for the needs of local communities
- Providing a range of choices to people on how and when they can travel
- Being adaptable and flexible for a range of possible future scenarios, and resilient to major shocks and events, such as extreme weather, attacks and disruption
- Being innovative and working creatively with new technologies so that they benefit the whole of society.

(Source: Transport Planning Society, 2018)

This means that transport planners have to work closely with many other experts, seeking to establish stronger relationships with other practitioners to acknowledge the widened scope and mutability of the planning environment. Transport has to build connections with economic geography and econometric analysis experts (Baum-Snow, 2007), as well as environmental scientists (Banister, 2002). Transport practitioners should borrow concepts and methodologies from, and work together with, sociologists, psychologists, behavioural economists, and computer scientists (Batty, 2013) to better understand the complex and diverse need of transport users, and to contribute to the development of optimal solutions.

Who is involved in transport planning?

Broadening the relationship with other relevant disciplines is a necessity, as stated in section one and defined in the Boxed example 1; it is also an effect of the high number of different experts and stakeholders involved in the transport planning process. Indeed, the transport system involves numerous actors – users and providers – including citizens, policy makers, public institutions, local communities, governmental organizations, NGOs, public transport operators, experts, retailers, the private sectors and the third sector. For freight, the number of actors grows further still, including complex global supply chains, shipping and storage companies. Those actors can be categorized in three classes: experts (i.e. key informants), stakeholders (e.g. institutions, groups, environmental associations, transport companies) and citizens (individuals or groups) (Le Pira et al., 2016).

In the context of urban transport planning, decision makers are faced with the problem of allocating resources among competing needs to achieve certain ends. Decision makers thus include, at a minimum, the following actors:

- *Elected politicians* who set general policies for resource allocation and who appropriate funds for the implementation of specific actions;
- *Transport agency managers* responsible for operating and maintaining components of the transport system;

- *Private sector managers* who must determine the most efficient routing of urban commodity shipments; and
- *Corporate officials* concerned with employee transport.

It is also important to note that the decision-making structure is constantly changing. The transport planning process needs to be flexible in responding to changing concerns and agendas, yet continue with a long range perspective with clear aims in relation to sustainable transport in sight.

The governance of transport systems is usually highly complex, and is certainly so in the UK, reflecting the evolution of different transport modes over time. Legislation and regulation were targeted at each mode or industry (road, rail, air, maritime) at specific points in time, and each form of infrastructure and service provision has evolved its own unique institutional structure, with various levels of state involvement. As a result of these modal silos, governance approaches have also tended to be modal i.e. focussed on one form of transport at a time and in contrast to 'multi-modal' approaches.

The effective implementation of sustainable mobility requires the engagement of key stakeholders, so that they can understand the reasoning behind different policy initiatives and support or inform their introduction. The professional planner acts then to orchestrate and synthesise people and information. Seen through this lens, transport planning becomes the management of a multi-directional communication process and it requires skills of anticipation and coordination across many players, conflicting interests and variables (see also Vigar, 2017).

Conclusion

We live in a time of unprecedented and rapid change in relation to many aspects of life, including transport systems. Changes in or ways of working and shopping, new technologies and behaviours (i.e. automation, vehicle electrification and the 'sharing economy') are already having an impact on how systems function (Government Office for Science, 2019). As a result of this, and combined with past issues, transport planning is a discipline in the midst of a paradigmatic transition.

One of the key challenges that the discipline is facing is the complexity and uncertainty of mobility systems in the wider context. Mobility systems transport, and land use behaviours continuously interact with each other and the broader societal context in complex ways. Other factors play a role in those interactions between land use and transport, such as policies and individual household and firms characteristics. The rising complexity and uncertainties of those interactions is having a crucial impact on the transport planning discipline.

Some old or more established goals such as easing congestion and processes used to organise (i.e. rational-technical planning) and tools (such as the four-step model or 'level of service' indicators) are still in use and are deeply engrained in existing institutions and practices.

Nevertheless. new planning goals centring on achieving sustainable and multimodal mobility, tools, such as accessibility measures, and processes, such as more collaborative planning

approaches, are being introduced and can help the sustainable transition and to overcome the current challenges.

Further Study

To gain further insight into the key issues and concerns pertaining to transport planning, reference to some of the main textbooks on the topic will be beneficial to expand understanding of the subject introduced above. These include: Knowles et al. (2008), Banister (2002) and the older Meyer and Miller text (1984). Bertolini (2017) is also essential reading for students of urban planning who are looking for key issues and dilemmas facing transport planners. David Levinson and Kevin Krizek (2018) is another useful book which provides a unique and updated perspective on metropolitan transport networks and land use planning. It explains transport and land use by focusing on the behaviours of multiple actors, and the myriad decisions made by a multitude of households and governments. In the field of transport and social exclusion, Karen Lucas' work (Lucas, 2006 and 2012), outlines the main issues. Banister (2018) covers the transport dimension of inequality in society, through an exploration of the nature, measurement and extent of inequality. The work of Karel Martens on transport justice (2016) is another key reading, which develops a new paradigm for transport planning based on principles of justice. While the scientific literature on accessibility is vast, an extensive review of the state of the art and a useful place to start is Bhat et al (2000).

Web Resources

A comprehensive Wikibooks on transport planning is available at: https://en.wikibooks.org/wiki/Fundamentals_of_Transport. The main source on access is available at the 'transportist' website https://transportist.org/. In terms of professional planning done by institutions, consider the TPS website: https://tps.org.uk/.

Another riche web resource is the Victoria Transport Policy Institute, an independent research organization dedicated to developing innovative solutions to transport problems available at https://www.vtpi.org/

The Transportist blog, edited by David Levinson is a rich source of open access materials on the topic of Accessibility Planning https://transportist.org/

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